**Local Building Official**
(Print Name):_____ Signature:_____ Date:_____
**Local Fire Marshal**
(Print Name):_____ Signature:_____ Date:_____
**Local Health Official**
(Print Name):_____ Signature:_____ Date:_____
**Local Federal 504 Official**
(Print Name):_____ Signature:_____ Date:_____

*Specifications*

***State Project # 094-0109 RNV***

***January 14, 2022—Phase 1 of 3***

# Renovations
# Anna Reynolds Elementary School
# Newington, CT

# Volume I of II
# Divisions 00—14

**Issued for Local Approval**
**State Project #094-109 RNV**

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END OF SECTION 00 01 10

**Local Building Official**
(Print Name):_____ Signature:_____
Date:_____

**Local Fire Marshal**
(Print Name):_____ Signature:_____
Date:_____

**Local Health Official**
(Print Name):_____ Signature:_____
Date:_____

**Local Federal 504 Official**
(Print Name):_____ Signature:_____
Date:_____

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KAESTLE BOOS associates, inc

# PROJECT TEAM AND LOCAL OFFICIALS LIST

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Newington, CT
KBA # 21011.00 | SPN #094-0109 RNV



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Ethan Cannon
Jorge Bejarano

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E7.07 ELECTRICAL DETAILS
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THE FOLLOWING ARE NOT PROVIDED IN THIS DOCUMENT/SET

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~~SE0.02 SECURITY DEMO PLAN - MAIN LEVEL - AREAS~~ B & C
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~~SE0.04 SECURITY DEMO PLAN - MAIN LEVEL - AREAS~~ E & F
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~~SE1.05 UPPER LEVEL SECURITY FLOOR PLAN - AREA~~ A
~~SE2.00 SECURITY DEVICE SCHEDULES~~
~~SE2.01 SECURITY DEVICE SCHEDULES~~
~~SE2.02 SECURITY DEVICE SCHEDULES~~
~~SE2.03 SECURITY DEVICE SCHEDULES~~
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~~SE3.01 SECURITY DEVICE RISER DIAGRAMS~~
~~SE3.02 SECURITY DEVICE RISER DIAGRAMS~~
~~SE4.00 SECURITY DEVICE TYPICALS~~
~~SE4.01 SECURITY DEVICE TYPICALS~~

END LIST OF DRAWINGS

# SECTION 00 31 26 – EXISTING HAZARDOUS MATERIALS INFORMATION

## PART 1 - GENERAL

### 1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A Hazardous Building Materials Inspection Report for the Project, prepared by Fuss & O'Neill, Inc., dated September 14, 2021, is appended to this document.

C. Related Requirements:

1. Division 02 Section "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.
2. Division 07 Section "Preparation for Re-Roofing" for notification requirements if materials suspected of containing hazardous materials are encountered.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

END OF SECTION 00 31 26

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FUSS & O'NEILL

September 14, 2021

Mr. Lucian Jachimowicz
Chief Finance & Operations Officer
Newington Public Schools
131 Center Street
Newington, CT 06111

RE: Anna Reynolds Elementary School – Petroleum-Impacted Soil Excavation Report
85 Reservoir Road, Newington, Connecticut
DEEP Spill Case #2017-3811
DEEP UST Site ID # 94-6165
Fuss & O'Neill Reference No. 20140495.A80

Dear Mr. Jachimoicz:

Fuss & O'Neill is pleased to provide this report documenting the removal of petroleum impacted soil associated with a former underground storage tank (UST), which was located on the southern side on the Anna Reynold's Elementary School building. The petroleum-impacted soil was encountered during the removal of the former heating oil UST in 2017 and could not be fully remediated at the time of the tank removal due to an electrical transformer and its associated electrical conduit that intersected the impacted area. The Town of Newington is in the process of updating the transformer, which allowed us to access and remove the full extent of the release to the soil.

## Applicable Regulatory Criteria

The Connecticut Remediation Standard Regulations (RSRs) are the clean-up standards in the State of Connecticut. We used these standards as guidelines to evaluate impacts to soil from Site activities. The RSR Soil Remediation Standards (Section 22a-133k-2 of the Regulations of Connecticut State Agencies (RCSA)) require polluted soil at a release area to be remediated to meet the Direct Exposure Criteria (DEC) to protect human health from exposure to constituents of concern. Soil must also meet the Pollutant Mobility Criteria (PMC), which is intended to prevent the pollution of groundwater through the leaching of constituents from impacted soil. Based on the Site's location in a GA-designated area, the GA PMC apply to the Site.

Refer to *Table 1* for a complete list of the detected constituents of concern and the site-specific applicable regulatory criteria.

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## Impacted Soil Removal Activities

As previously discussed, the petroleum impacted soil was encountered during the UST removal in 2017 and all of the impacted soil could not be accessed due to the potential for undermining the adjacent electrical transformer or damaging the transformer's electrical lines. On June 15, 2021, after the transformer and lines were removed, , Fuss & O'Neill directed the contractor, Service Station Equipment (SSE), to excavate the overburden clean material to a depth where the historical contamination remained, at approximately nine feet below grade. The depth was confirmed when SSE encountered a marker layer that was placed in 2017 demarcating the area of petroleum impacted soil that remained in place. The initial extent of impacted soil that was removed in 2017 is depicted in *Figure 1.*

Once the area of petroleum-impacted soil was encountered, SSE excavated the visually impacted soil. We completed field screening procedures using a PetroFlag® field screening kit to delineate the extent of the release. At about a depth of ten feet below grade we encountered a concrete slab that ran diagonally from east to west that was 9 feet by 3 feet in area. The release did not migrate through the slab, but traversed down to the southern side of the slab to approximately 14 feet below grade. Soil samples were collected along the visually and screened clean limits of the excavation and their locations are depicted in *Figure 2.* Photographs of the excavation are included in *Attachment A.*

Impacted soil was excavated on June 15, 2021 and was sent to Clean Earth of Plainville, Connecticut for disposal. Disposal documentation and tonnage will be provided by Service Station Equipment under separate cover.

## Confirmatory Sample Collection and Results

Fuss & O'Neill collected confirmatory soil samples from the field screened limits of the excavated area. A total of 5 confirmatory soil samples (SS-01, SS-02, SS-02A, SS-03A, and SS-04A) were collected from the excavation on June 15, 2021. Sample locations are depicted in *Figure 2.*

The soil samples were delivered same-day to Phoenix Environmental Laboratories, Inc. of Manchester, Connecticut for the analyses of ETPH (Extractable Total Petroleum Hydrocarbons).

Prior to reviewing the analytical data, an evaluation of the Reasonable Confidence Protocol (RCP) deliverable packages was conducted and the data were found to be usable for their intended purpose.

Analytical results indicated non-detects for all samples with the exception of the sample collected from the side of the concrete slab located at the base of the excavation. This sample still returned

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results under regulatory limits at 130 mg/kg ETPH (well below the ResDEC of 500 mg/kg). Confirmatory soil sample results are included in *Table 1*. Laboratory reports are included in *Attachment B*.

## Conclusions and Recommendations

With the removal of impacted soil completed and based on the confirmatory sampling analytical data, it appears that impacted soil was removed and disposed of properly and that the remaining soil on site complies with DEEP guidelines.

In accordance with Section 22a-449 (d)-107(e) of the Regulations of Connecticut State Agencies (RCSA), this closure documentation should be maintained for a minimum of five years. We recommend that you keep this documentation indefinitely of until such time that the property is transferred.

Thank you for requesting environmental services from Fuss & O'Neill. If you have any questions regarding this investigation, or if we may be of further assistance, please feel free to contact either of the undersigned at (860) 646-2469.

Sincerely,

Marilee D. Gonzalez, LEP
Project Manager

Sudip Bafna, PE, CHMM
Associate

c: Newington Fire Marshal

Attachments:

| | |
|---|---|
| Figure 1 | Site Plan |
| Figure 2 | Site Sampling Plan / Excavation Extent |
| Table 1 | Summary of Soil Analytical Results |
| Attachment A | Site Photographs |
| Attachment B | Laboratory Analytical Reports |


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Legend

X Sample location collected during tank removal on 7/27/17

X Sample location collected during soil removal on 7/27/17

Approximate extent of tank grave (20' by 8', 9' deep)

Approximate extent of impacted soil (Removed)
(8' by 7', 9.5' deep)

Approximate location of electrical conduit

**FIGURE 1**

NOTES:

BASED ON ASSESSORS MAPPING PROVIDED TO FUSS & O'NEILL BY THE TOWN OF NEWINGTON (http://www.propertyrecordcards.com/). LOCATION OF ANNOTATED FEATURES ARE APPROXIMATE AND BASED ON FIELD OBSERVATIONS.

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**2017 Tank Closure Sampling Plan**
**Anna Reynolds School**

**85 Reservoir Road** **Newington, Connecticut**

**DATED: September 2017** **SCALE = NTS**




**FIGURE 2**

NOTES:

BASED ON ASSESSORS MAPPING PROVIDED TO FUSS & O'NEILL BY THE TOWN OF NEWINGTON (http://www.propertyrecordcards.com/). LOCATION OF ANNOTATED FEATURES ARE APPROXIMATE AND BASED ON FIELD OBSERVATIONS.

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**Sampling Locations – Anna Reynolds School**
**Site Plan**

**85 Reservoir Road** **Newington, Connecticut**

**DATED: June 2021** **SCALE = NTS**

# Tables


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Table 1
Soil Analytical Summary
Closure Sampling
Anna Reynolds School
Newington, CT
20140495.A80

| | | | Site ID: | SS-01 | SS-02 | SS-02 | SS-02A | SS-03A | SS-04A |
|---|---|---|---|---|---|---|---|---|---|
| | | | Sample No: | 16530615-01 | 16530615-02 | 16530615-03 | 16530615-04 | 16530615-05 | 16530615-06 |
| | | | Sample Date: | 6/15/2021 | 6/15/2021 | 6/15/2021 | 6/15/2021 | 6/15/2021 | 6/15/2021 |
| | | | Sample Type: | Primary | Primary | Duplicate | Primary | Primary | Primary |
| | | | Sample Depth (feet): | 10 | 10 | 10 | 13 | 14 | 13 |
| CONSTITUENT | GA PMC* | Res DEC* | | | | | | | |
| ETPH (mg/kg) | 500 | 500 | | < 56 | < 57 | < 59 | < 57 | < 62 | 130 |

Notes:

Units: ug = micrograms; mg = milligrams; kg=kilogram

< (Value) = Not detected at specified laboratory reporting limit

* RSR Criteria = baseline clean-up criteria specified in Connecticut's Remediation Standard Regulations

RSR criteria provided for comparison purposes. An exceedance of criteria at a single sampling location does not necessarily mean that remediation will be required.

GA PMC = GA Pollutant Mobility Criteria; Res DEC = Residential Direct Exposure Criteria

# ATTACHMENT A

Site Photographs


© 2018 Fuss & O'Neill, Inc.



**Initial Excavation Condition upon arrival, June 15, 2021**



**Old Utility Lines in upper portion of excavation, June 15, 2021**

 © 2018 Fuss & O'Neill, Inc.



**Clean fill stockpile, June 15, 2021**



**Initial Excavation view from southwest, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Initial Excvation to depth of clean fill - northeast view, June 15, 2021**



**Initial Excavation to depth of clean fill - southwest view, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Initial Excavation to depth of clean fill overview, June 15, 2021**



**Discovery of concrete slab at ~10 ft, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Excavation process to south of concrete slab, June 15, 2021**

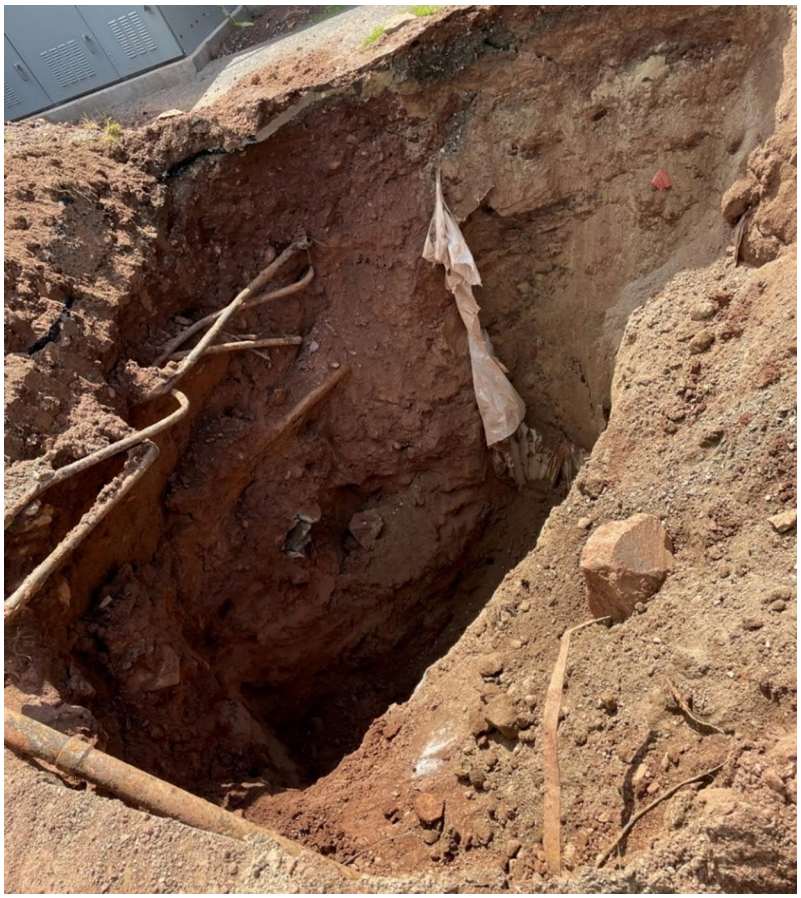


**Concrete slab from southwest view, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Concrete Slab from northeast view, June 15, 2021**



**Extent of excavation, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Placement of plastic sheeting to delineate clean backfill, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.



**Polyliner containing impacted soil on site, June 15, 2021**



**Backfill of area where impacted soil was removed, June 15, 2021**


© 2018 Fuss & O'Neill, Inc.

# ATTACHMENT B

Laboratory Analytical Report


© 2018 Fuss & O'Neill, Inc.

PHOENIX
Environmental Laboratories, Inc.

**Tuesday, June 22, 2021**

**Attn: Marilee Gonzalez**
**Fuss & O'Neill, Inc.**
**146 Hartford Road**
**Manchester, CT 06040**

**Project ID:** ANNA REYNOLDS
**SDG ID:** GCI55279
**Sample ID#s:** CI55279 - CI55284

**This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.**

**This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.**

**All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.**

**A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.**

**If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.**

**Sincerely yours,**

***REVIEWED***
*By Paula M. Bibeau at 11:32 am, Jun 22, 2021*

**Phyllis Shiller**
**Laboratory Director**

**NELAC - #NY11301**
**CT Lab Registration #PH-0618**
**MA Lab Registration #M-CT007**
**ME Lab Registration #CT-007**
**NH Lab Registration #213693-A,B**
**NJ Lab Registration #CT-003**
**NY Lab Registration #11301**
**PA Lab Registration #68-03530**
**RI Lab Registration #63**
**UT Lab Registration #CT00007**
**VT Lab Registration #VT11301**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Sample Id Cross Reference

June 22, 2021

SDG I.D.: GCI55279

Project ID: ANNA REYNOLDS

| Client Id | Lab Id | Matrix |
|---|---|---|
| 16530615-01 | CI55279 | SOIL |
| 16530615-02 | CI55280 | SOIL |
| 16530615-03 | CI55281 | SOIL |
| 16530615-04 | CI55282 | SOIL |
| 16530615-05 | CI55283 | SOIL |
| 16530615-06 | CI55284 | SOIL |

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 12:30 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55279

Project ID: ANNA REYNOLDS
Client ID: 16530615-01

SS-01 (10')

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 88 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 56 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ND | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 52 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 74 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| Client MS/MSD | Completed | | | | 06/16/21 | | |

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

**Phyllis Shiller, Laboratory Director**
**June 22, 2021**
**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 12:35 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55280

Project ID: ANNA REYNOLDS
Client ID: 16530615-02

SS-02 (10')

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 87 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 57 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ND | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 92 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 108 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

**Phyllis Shiller, Laboratory Director**
**June 22, 2021**
**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 12:36 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55281

Project ID: ANNA REYNOLDS
Client ID: 16530615-03

SS-02 (10') Field Duplicate

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 85 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 59 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ND | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 58 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 101 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

**Phyllis Shiller, Laboratory Director**
**June 22, 2021**
**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 13:20 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55282

Project ID: ANNA REYNOLDS
Client ID: 16530615-04

SS-02A (13')

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 87 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 57 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ND | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 81 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 88 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

**Phyllis Shiller, Laboratory Director**
**June 22, 2021**
**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 13:21 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55283

Project ID: ANNA REYNOLDS
Client ID: 16530615-05

SS-03A (14')

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 81 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 62 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ND | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 110 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 118 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

**Phyllis Shiller, Laboratory Director**
**June 22, 2021**
**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

June 22, 2021

FOR: Attn: Marilee Gonzalez
Fuss & O'Neill, Inc.
146 Hartford Road
Manchester, CT 06040

| Sample Information | | Custody Information | | Date | Time |
|---|---|---|---|---|---|
| Matrix: | SOIL | Collected by: | | 06/15/21 | 13:22 |
| Location Code: | F&O | Received by: | B | 06/15/21 | 15:30 |
| Rush Request: | 24 Hour | Analyzed by: | see "By" below | | |
| P.O.#: | 20140495.A80 | | | | |

## Laboratory Data

SDG ID: GCI55279
Phoenix ID: CI55284

Project ID: ANNA REYNOLDS
Client ID: 16530615-06

SS-04A (13')

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|
| Percent Solid | 81 | | % | | 06/15/21 | AR | SW846-%Solid |
| Extraction of ETPH | Completed | | | | 06/16/21 | I/CC/K | SW3546 |
| **TPH by GC (Extractable Products)** | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | 130 | 62 | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| Identification | ** | | mg/Kg | 1 | 06/17/21 | JRB | CTETPH 8015D |
| **QA/QC Surrogates** | | | | | | | |
| % COD (surr) | 64 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |
| % Terphenyl (surr) | 109 | | % | 1 | 06/17/21 | JRB | 50 - 150 % |

**Ver 1**

Project ID: ANNA REYNOLDS
Client ID: 16530615-06

Phoenix I.D.: CI55284

| Parameter | Result | RL/ PQL | Units | Dilution | Date/Time | By | Reference |
|---|---|---|---|---|---|---|---|

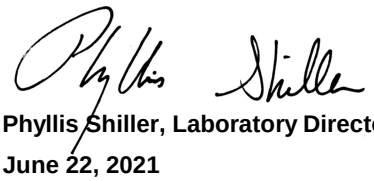
RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

## Comments:

TPH Comment:
**Petroleum hydrocarbon chromatogram contains a multicomponent hydrocarbon distribution in the range of C9 to C24. The sample was quantitated against a C9-C36 alkane hydrocarbon standard.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



**Phyllis Shiller, Laboratory Director**

**June 22, 2021**

**Reviewed and Released by: Phyllis Shiller, Laboratory Director**

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

# QA/QC Report

June 22, 2021

## QA/QC Data

SDG I.D.: GCI55279

| Parameter | Blank | Blk RL | LCS % | LCSD % | LCS RPD | MS % | MSD % | MS RPD | % Rec Limits | % RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|
| QA/QC Batch 579800 (mg/Kg), QC Sample No: CI55279 (CI55279, CI55280, CI55281, CI55282, CI55283, CI55284) | | | | | | | | | | |
| **TPH by GC (Extractable Products) - Soil** | | | | | | | | | | |
| Ext. Petroleum H.C. (C9-C36) | ND | 50 | 114 | 120 | 5.1 | 99 | 113 | 13.2 | 60 - 120 | 30 |
| % COD (surr) | 97 | % | 115 | 117 | 1.7 | 75 | 83 | 10.1 | 50 - 150 | 30 |
| % Terphenyl (surr) | 91 | % | 96 | 101 | 5.1 | 70 | 75 | 6.9 | 50 - 150 | 30 |

Comment:

Additional surrogate criteria: LCS acceptance range is 60-120% MS acceptance range 50-150%. The ETPH/DRO LCS has been normalized based on the alkane calibration.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
June 22, 2021

Tuesday, June 22, 2021

# Sample Criteria Exceedances Report

**GCI55279 - FO**

Criteria: CT: GAM, RC

State: CT

| SampNo | Acode | Phoenix Analyte | Criteria | Result | RL | Criteria | RL Criteria | Analysis Units |
|---|---|---|---|---|---|---|---|---|

*** No Data to Display ***

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

# REASONABLE CONFIDENCE PROTOCOL
# LABORATORY ANALYSIS QA/QC CERTIFICATION FORM

***Laboratory Name:*** Phoenix Environmental Labs, Inc. ***Client:*** Fuss & O'Neill, Inc.

***Project Location:*** ANNA REYNOLDS ***Project Number:***

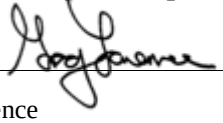
***Laboratory Sample ID(s):*** CI55279-CI55284 ***Sampling Date(s):*** 6/15/2021

***List RCP Methods Used (e.g., 8260, 8270, et cetera)*** ETPH

| | | |
|---|---|---|
| **1** | **For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the CT DEP method-specific Reasonable Confidence Protocol documents?** | ☑ Yes ☐ No |
| **1A** | **Were the method specified preservation and holding time requirements met?** | ☑ Yes ☐ No |
| **1B** | ***VPH and EPH methods only:*** **Was the VPH or EPH method conducted without significant modifications (see section 11.3 of respective RCP methods)** | ☐ Yes ☐ No ☑ NA |
| **2** | **Were all samples received by the laboratory in a condition consistent with that described on the associated Chain-of-Custody document(s)?** | ☑ Yes ☐ No |
| **3** | **Were samples received at an appropriate temperature (< 6 Degrees C)?** | ☐ Yes ☑ No ☐ NA |
| **4** | **Were all QA/QC performance criteria specified in the CTDEP Reasonable Confidence Protocol documents achieved?** | ☑ Yes ☐ No |
| **5** | **a) Were reporting limits specified or referenced on the chain-of-custody?**<br>**b) Were these reporting limits met?** | ☑ Yes ☐ No<br>☑ Yes ☐ No |
| **6** | **For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the Reasonable Confidence Protocol documents?** | ☑ Yes ☐ No |
| **7** | **Are project-specific matrix spikes and laboratory duplicates included in the data set?** | ☑ Yes ☐ No |

**Notes: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1A or 1B is "No", the data package does not meet the requirements for "Reasonable Confidence". This form may not be altered and all questions must be answered.**

**I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete.**

**Authorized Signature:**  **Position:** Assistant Lab Director

**Printed Name:** Greg Lawrence **Date:** Tuesday, June 22, 2021

**Name of Laboratory** Phoenix Environmental Labs, Inc.

**This certification form is to be used for RCP methods only.**

**Environmental Laboratories, Inc.**
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

# RCP Certification Report

June 22, 2021

SDG I.D.: GCI55279

## *SDG Comments*

Temperature above 6C:
The samples were received in a cooler with ice packs. The samples were delivered to the Laboratory within a short period of time after sample collection. Therefore no significant bias is suspected. Answer to question 3.

## *ETPH Narration*

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

**Instrument:**

**AU-FID84 06/17/21-1** Jeff Bucko, Chemist 06/17/21

CI55279 (1X), CI55280 (1X), CI55281 (1X), CI55282 (1X), CI55283 (1X), CI55284 (1X)

The initial calibration (ETPH503I) RSD for the compound list was less than 30% except for the following compounds: None.
As per section 7.2.3, a discrimination check standard was run (617A003_1) and contained the following outliers: None.
The continuing calibration %D for the compound list was less than 30% except for the following compounds:
Samples: CI55279, CI55280, CI55281, CI55282, CI55283
Preceding CC 617A017 - None.
Succeeding CC 617A029 - % COD (surr) -50%L (30%)
Samples: CI55284
Preceding CC 617A029 - % COD (surr) -50%L (30%)
Succeeding CC 617A033 - % COD (surr) -55%L (30%)

**QC (Site Specific):**

**Batch 579800 (CI55279)**

CI55279, CI55280, CI55281, CI55282, CI55283, CI55284

All LCS recoveries were within 60 - 120 with the following exceptions: None.
All LCSD recoveries were within 60 - 120 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
All MS recoveries were within 50 - 150 with the following exceptions: None.
All MSD recoveries were within 50 - 150 with the following exceptions: None.
All MS/MSD RPDs were less than 30% with the following exceptions: None.
Additional surrogate criteria: LCS acceptance range is 60-120% MS acceptance range 50-150%. The ETPH/DRO LCS has been normalized based on the alkane calibration.

## *Temperature Narration*

The samples were received at 10.3C with cooling initiated.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

**FUSS & O'NEILL**
(860) 646-2469 • www.FandO.com

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☐ 56 Quarry Road, Trumbull, CT 06611
☐ 317 Iron Horse Way, Suite 204, Providence, RI 02908
☐ 1550 Main Street, Suite 400, Springfield, MA 01103
☐ 108 Myrtle Street, Suite 502, Quincy, MA 02171
☐ 540 North Commercial Street, Manchester, NH 03101
☐ 276 Newport Road, New London, NH 03257
☐ 205 Billings Farm Road, Suite 6B, White River Junction, VT 05001
☐ 5 Fletcher Street, Suite 1, Kennebunk, ME 04043
☐ 23046 Avenida de la Carlota, Suite 600, Laguna Hills, CA 92653
☐ Other _____

WCICE 10.3

# CHAIN-OF-CUSTODY RECORD

45029

**Turnaround**
☐ 24-Hour* ☐ 72-Hour* ☐ Other _____ (days)
☐ 48-Hour* ☒ Standard (____ days) *Surcharge Applies

| PROJECT NAME | PROJECT LOCATION | PROJECT NUMBER | LABORATORY |
|---|---|---|---|
| Anna Reynolds | Newington CT | 20140495.A80 | Phoenix |

REPORT TO: Marilee Gonzalez
INVOICE TO: ↓
P.O. NO.:
Sampler's Signature: _____ Date: 6/15/21

**Source Codes:**
MW=Monitoring Well PW=Potable Water T=Treatment Facility S=Soil B=Sediment
SW=Surface Water ST=Stormwater W=Waste A=Air C=Concrete
X=Other _____

Analysis Request

Containers

| Item No. | Transfer Check 1 | 2 | 3 | 4 | Sample Number | Source Code | Date Sampled | Time Sampled | ETPH | Soil VOA Vial, ☐ methanol | Soil VOA Vial, ☐ water | Glass Soil Container (8) oz | ☐ $Na(SO_4)_2$ | Other: | Other: | Water VOA Vial, ☐ As is ☐ HCl | Glass Amber (___) ml, ☐ As is ☐ $H_2SO_4$ | Plastic - As is, ☐ 250 ml ☐ 500 ☐ 1000 ml | Plastic - $H_2SO_4$, ☐ 250 ml ☐ 500 ml | Plastic - $HNO_3$, 250 ml ☐ Filtered ☐ 0.45µ ☐ 10µ | Plastic - NaOH, 250 ml | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | | | | | 165306l5-01 | S | 6/15/21 | 1230 | X | | | 5 | 5 | 2 | 7 | 9 | | | | | 3 | MS/MSD |
| 02 | | | | | -02 | | | 1235 | X | | | 5 | 5 | 2 | 8 | 0 | | | | | 1 | |
| 03 | | | | | -03 | | | 1236 | X | | | 5 | 5 | 2 | 8 | 1 | | | | | 1 | dup |
| 04 | | | | | -04 | | | 1320 | X | | | 5 | 5 | 2 | 8 | 2 | | | | | 1 | |
| 05 | | | | | -05 | | | 1321 | X | | | 5 | 5 | 2 | 8 | 3 | | | | | 1 | |
| 06 | | | | | -06 | | | 1322 | X | | | 5 | 5 | 2 | 8 | 4 | | | | | 1 | |

| Transfer Number | Relinquished By | Accepted By | Date | Time |
|---|---|---|---|---|
| 1 | | | 6/15/21 | 1530 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

Charge Exceptions: ☐ CT Tax Exempt ☐ QA/QC ☐ Other _____
1 Duplicates 0 Blanks (Item Nos: )
Reporting and Detection Limit Requirements: ☒ RCP Deliverables ☐ MCP CAM Cert.
Res DEC, GA criteria, GIS deliverables
Additional Comments:

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☐ 146 Hartford Road, Manchester, CT 06040
☐ 56 Quarry Road, Trumbull, CT 06611
☐ 317 Iron Horse Way, Suite 204, Providence, RI 02908
☐ 1550 Main Street, Suite 400, Springfield, MA 01103
☐ 108 Myrtle Street, Suite 502, Quincy, MA 02171
☐ 540 North Commercial Street, Manchester, NH 03101
☐ 276 Newport Road, New London, NH 03257
☐ 205 Billings Farm Road, Suite 6B, White River Junction, VT 05001
☐ 5 Fletcher Street, Suite 1, Kennebunk, ME 04043
☐ 23046 Avenida de la Carlota, Suite 600, Laguna Hills, CA 92653
☐ Other _____

WCICE 10.3

# CHAIN-OF-CUSTODY RECORD

45029

Turnaround

☐ 24-Hour* ☐ 72-Hour* ☐ Other ____ (days)
☐ 48-Hour* ☒ Standard (____ days) *Surcharge Applies

| Project Name | Project Location | Project Number | Laboratory |
|---|---|---|---|
| Anna Reynolds | Newington CT | 20140495.A80 | Phoenix |

Report To: Mailee Gonzalez
Invoice To:
P.O. No.:
Sampler's Signature: _____ Date: 6/15/21

**Source Codes:**
MW=Monitoring Well PW=Potable Water T=Treatment Facility S=Soil B=Sediment
SW=Surface Water ST=Stormwater W=Waste A=Air C=Concrete
X=Other _____

Analysis Request / Containers

| Item No. | Transfer Check 1 | 2 | 3 | 4 | Sample Number | Source Code | Date Sampled | Time Sampled | ETPH | Soil VOA Vial, ☐ methanol | Soil VOA Vial, ☐ water ☐ $NaSO_4$ | Glass Soil Container (6) oz | Other: | Other: | Water VOA Vial, ☐ As is ☐ HCl | Glass Amber (___) ml, ☐ As is ☐ $H_2SO_4$ | Plastic - As is, ☐ 250 ml ☐ 500 ml ☐ 1000 ml | Plastic - $H_2SO_4$, ☐ 250 ml ☐ 500 ml | Plastic - $HNO_3$, 250 ml ☐ Filtered ☐ 0.45µ ☐ 10µ | Plastic - NaOH, 250 ml | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | | | | | 165306l5-01 | S | 6/15/21 | 1230 | X | | | 5 | | | 3 | | | | | | MS/MSD |
| 02 | | | | | -02 | | | 1235 | X | | | 5 | | | 1 | | | | | | |
| 03 | | | | | -03 | | | 1236 | X | | | 5 | | | 1 | | | | | | dup |
| 04 | | | | | -04 | | | 1320 | X | | | 5 | | | 1 | | | | | | |
| 05 | | | | | -05 | | | 1321 | X | | | 5 | | | 1 | | | | | | |
| 06 | | | | | -06 | | | 1322 | X | | | 5 | | | 1 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | Change to | | | | | | | | | | | | | | | | |
| | | | | | Rush 24 HR | | | | | | | | | | | | | | | | |
| | | | | | per Anna 6-17-21 | | | | | | | | | | | | | | | | |

| Transfer Number | Relinquished By | Accepted By | Date | Time |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | 6/15/21 | 1530 |
| 3 | | | | |
| 4 | | | | |

Charge Exceptions: ☐ CT Tax Exempt ☐ QA/QC ☐ Other _____
_1_ Duplicates _0_ Blanks (Item Nos: )
Reporting and Detection Limit Requirements: ☒ RCP Deliverables ☐ MCP CAM Cert.
Res DEC, GA criteria, GIS deliverables
Additional Comments:

**SECTION 00 31 32 – GEOTECHNICAL DATA**

PART 1 - GENERAL

1.1 SUMMARY

A. This document with its referenced attachments is part of the Procurement and Contracting Requirements for this project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidder's own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This document and its attachments are not part of the Contract Documents unless otherwise noted and referenced in the Sections of Division 31. This Section includes the following:

1. Geotechnical Report.
2. Soil Boring and Test pit Data.

1.2 SUBSURFACE EXPLORATIONS

A. Subsurface conditions at the site have been explored by the performance of test borings, test pits, and laboratory testing.

B. Boring and test pit logs and laboratory test reports are attached at the end of this Section. The logs describe subsurface conditions encountered at the exploration locations at the time explorations were made.

C. No warranty is made of the continuity of strata or material between the exploration locations. The stratification lines on the logs represent approximate boundaries between soil types. The actual transitions may be gradual.

D. Water level readings may have been observed in the drill holes at times and under conditions as stated on the boring logs. Fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature and other factors not evident at the time measurements were made.

E. Subsurface exploration locations shown on the Drawings are approximate only and the Owner, Architect, OPM and/or design consultants make no representations regarding correctness of such information.

1.3 PROJECT CONDITIONS

A. Existing Conditions: Data and information furnished or referenced in the Geotechnical Engineering Report is for the Contractors' information. The Owner, Architect, or Construction Manager shall not be responsible for any interpretation of, or conclusion drawn from the data or information, by the Contractor.

B. Bidders shall make their own interpretations and conclusions of subsurface conditions that may affect methods or cost of construction. Bidders may conduct additional on-site subsurface investigations, at their own expense, in order to ascertain existing site conditions. Any such explorations must be coordinated and scheduled with the Owner. All disturbed areas must be restored to pre-investigative conditions.

1.4 GEOTECHNICAL DATA

A. Geotechnical Report: The following is attached at the end of this Section.

1. Geotechnical Study for Additions & Renovations to Anna Reynolds Elementary School, 85 Reservoir Road, Newington, CT; prepared by Welti Geotechnical, P.C., dated August 12, 2020.

B. Soil Boring Data: Boring Location Plan, Test Boring Logs, and Test Pit Logs are attached at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 31 32

**WELTI GEOTECHNICAL, P.C.**

227 Williams Street · P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

August 12, 2020

Mr. Freddie Khericha
Kaestle Boos Associates, Inc.
416 Slater Road
New Britain, CT 06050-2590

Re: **Geotechnical Study for Additions & Renovations to Anna Reynolds Elementary School, 85 Reservoir Road, Newington, CT**

Dear Freddie:

**1.0** Herewith are boring data pertaining to the above. One boring was taken at a proposed elevator addition and 4 borings were taken in areas of proposed new pavements. The boring locations are shown on the attached plan. The data for six borings taken for a 1999 building addition are also included. *The borings were drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

**2.0** The **Subject Project** will include an (1) entryway/elevator addition within the existing courtyard area, (2) reconstruction and expansion of the existing pavements and (3) regrading within the existing courtyard area. It is assumed that the elevator will have a pit about 5 feet below the1st floor level and that the pit foundation will extend 1 to 2 feet below the existing foundations which are at frost depth. The proposed entry way/elevator floor plan and elevations were not available at the time of those report.

**3.0** The **Geologic Origin** of the natural inorganic soils at the site are from shallow glacial moraine deposits atop bedrock. The moraine deposits consist generally of fine to medium sand with some silt and gravel.

**3.1** The **Soils Cross Section** from the borings is generally as follows:

**At Proposed Elevator Addition (see boring BB-1):**

Topsoil to 2"

Moraine; fine to coarse SAND, some Silt and Gravel to refusal on probable weathered rock at 1.6

feet, very dense
*Note: Nearby borings (see borings B-2/99, B-3/99, B-5/99 and PC-1) encountered auger refusal on bedrock at 2.2 to 4.5 feet*
Bedrock; Sandstone or Traprock

Ground water was not evident above the bedrock at the completion of the borings

**Areas of Proposed Reconstructed or New Pavements (see borings SB-4, SB-5, PC-1, PC-2 & B-5/99):**

Topsoil to 3"; or Bituminous Concrete to 3" to 7" atop fine to coarse SAND and GRAVEL, trace Silt to 6" to 13"

Locally FILL; fine to coarse SAND, little Silt and Gravel, trace Asphalt to 1.5 feet

Moraine; fine to coarse SAND, some Silt, little to some Gravel to auger refusal at 1.5 to 10+ feet, dense to very dense

Bedrock; Sandstone or Traprock

Ground water was evident at 10 feet below grade at the completion of boring SB-5.

**Proposed Regrading in Courtyard Area (see borings BB-1, B-2/99 & B-3/99):**

Topsoil to 2" to 6"

Moraine; fine to coarse SAND, some Silt and Gravel to top of rock at 1.6 to 4.5 feet, dense to very dense

Bedrock; Sandstone or Traprock, locally weathered in top 2 to 2.5 feet

Ground water was not evident above the bedrock at the completion of the borings

**4.0** The **Criteria for Foundation Type and Loading** are as follows:

1. The maximum total settlement should not exceed 3/4" and the maximum differential settlement should not exceed ½ the maximum settlement.

2. The foundation must address the seismic section of the building code

3. The Slab on Grade must not settle differentially more than ½" in excess of the structure subsidence.

*These criteria are those normally applied to structures of similar character. If the structural engineer or owner has other criteria, the writer should be notified for possible supplemental input.*

**4.1** Regarding item 2 (above) the Seismic Site Soil Profile Classification is C. The mapped MCE Spectral Acceleration values for Newington, CT are as follows; For short periods $\mathbf{S_S}$ **=0.182** and for one second value $\mathbf{S_1}$**=0.064.** For transfer of ground shear into the soil the friction factor between the concrete and the soil can be **0.6.**

**5.0** The **Foundation Type** for entryway and elevator can be with spread footings or a mat. Based on the borings the foundations will be on the weathered or hard bedrock and the existing building foundations are probably directly on the rock or atop a 4" leveling layer of 3/8" crushed stone. Excavation into the bedrock would be required. Based on the limited area, the excavation depths and proximity to the existing building it is assumed that this would be done with large excavator or by hoe ramming. If the existing foundations are on the bedrock, temporary excavations for the mat foundation which extend to 1 to 2 feet below those foundation could be cut vertical. That condition should be verified in field by a representative from our office prior to proceeding with the excavations.

**5.1** The **Allowable Bearing Pressure** on the bedrock or on a 4" layer of 3/8" crushed stone atop the moraine soils or bedrock can be 3 Tons/sf. The allowable loading can be increased by 1/3 for seismic or wind loading. At retaining walls the maximum pressure on the toe can be 50% higher than the average pressures, cited above.

**5.2** Lateral soil loading on retaining walls which are part of the building should be with at rest pressure with the coefficient cited below. Lateral loading on retaining walls apart from the building (assumed level backfill) can be designed with the active coefficient. The sliding coefficient for retaining walls on soil will be 0.6.

**5.3** The **Frost Protection Depth** for areas exposed to the weather is 3.5 feet below finish grades.

**5.4 Summary of design parameters**:

| Parameter | Value |
|---|---|
| Allowable Bearing Pressure | 3 Tons/sf |
| Soil Unit Weight * | 125 pcf |
| At rest coefficient * | 0.45 |
| Active coefficient* | 0.28 |
| Sliding Coefficient | 0.6 |
| Frost Protection Depth | 3.5 feet |

| | |
|---|---|
| Seismic Site Soil Profile Classification | C |
| Mapped MCE Spectral Acceleration for Short Periods $S_S$ | 0.182 |
| Mapped MCE Spectral Acceleration for One Second Periods $S_1$ | 0.064 |

* The above values are based on the material cited below in section 6.0

**6.0** Regarding **Controlled Fill, Backfill of Retaining Walls and Excavations at Columns and Walls, plus Slab on Grade Underlayment** (to 4" below the slab on grade, or as noted in section 6.1 below) the material should conform to the following or be 3/8" crushed stone:

| Percent Passing | Sieve Size |
|---|---|
| 100 | 3.5" |
| 50 - 100 | 3/4" |
| 25 - 75 | No.4 |

The fraction, passing the No.4 sieve should have less than 15%, passing the No. 200 sieve.

All backfill and fill must be compacted to at least 95% of modified optimum density in accordance with ASTM D-1557.

***The on site soils will generally not meet to above gradation.***

**6.1** All existing fills, asphalt, foundations, topsoil, and frost disturbed soils should be removed from beneath the proposed entryway/elevator addition. There should be at least 12" of controlled fill conforming to the above gradation beneath the entryway floor slab. There should be a minimum 4" layer of 3/8" crushed stone directly beneath slabs on grade. Where finished floor slab elevations are below the existing grades, there should be a 6" layer of 3/8" crushed stone beneath the floor slab. A vapor retarder is required beneath slabs on grade. There should be water proofing beneath the elevator pit and water stops at mat foundation/wall interface.

**7.0** Regarding **earthwork**, this will be primarily in soils, which would fall in OSHA Type B. This will require sloping excavations, which are not shored and exceed 5 feet in height, to be cut back to less than 45° from horizontal (1H : 1V).

**8.0 Regarding New Pavements,** there should be minimum 8" layer of Gravel Subbase beneath new or reconstructed pavement sections. Based on borings PC-1 and PC-2 the existing pavement section included 3" to 6" of processed base atop the natural moraine soils. The recommended pavement

sections above the subbase are as follows:

1. Passenger Car Parking: 3" of Bituminous Concrete on 6" of Processed Stone Base

2. Truck & Bus Access: 4.5" of Bituminous Concrete on 8" of Processed Stone Base

**9.0** This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Welti Geotechnical, P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

If you have any questions please call me.

Very truly yours

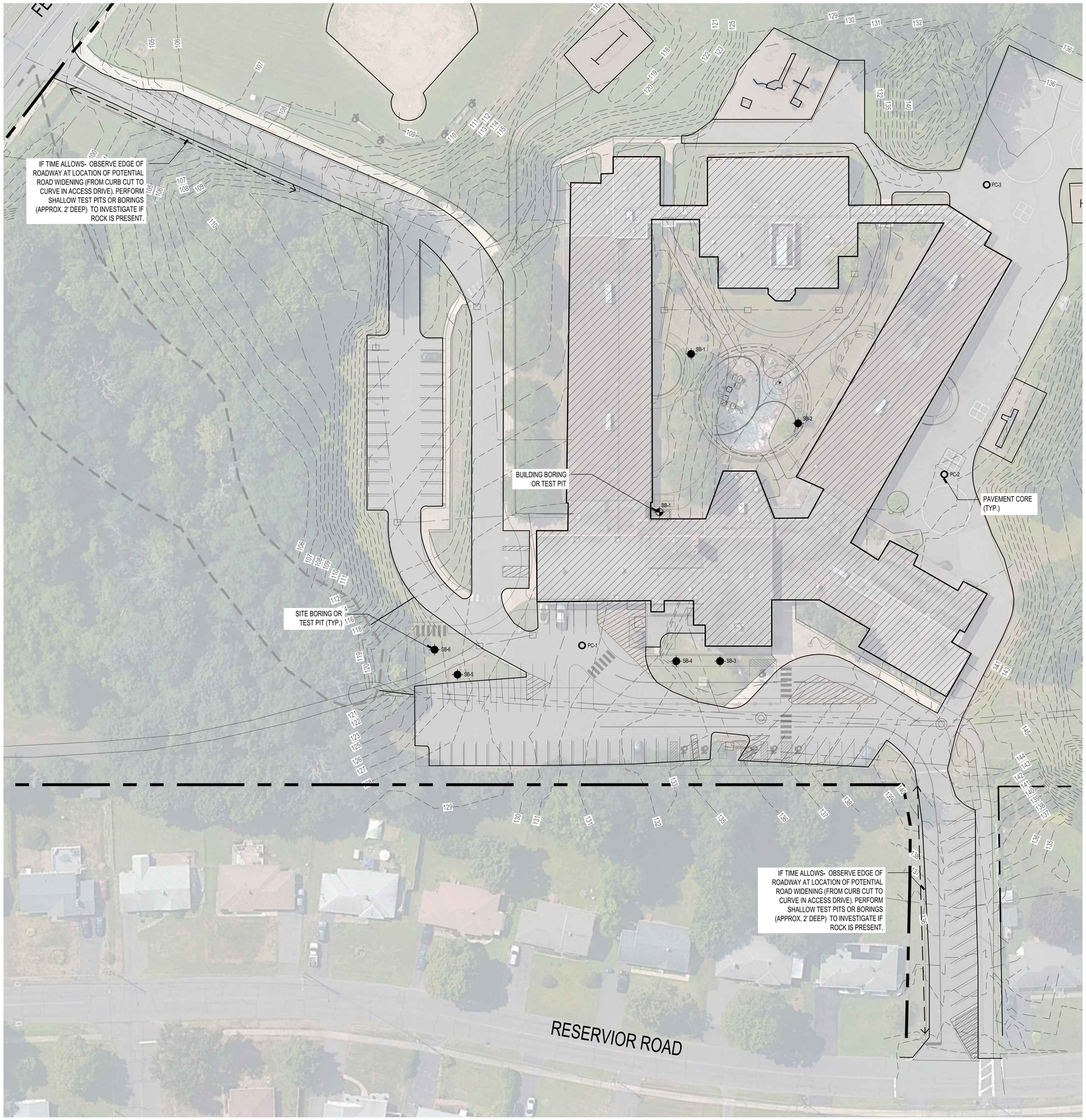
Max Welti

Max Welti, P. E.
President, Welti Geotechnical, P.C.

# APPENDIX

## Boring Location Plan

## Boring Data




## BORING LEGEND

| | |
|---|---|
| PC- | PAVEMENT CORE (APPROX. 24" PAVEMENT CORE INTO PAVEMENT SECTION) |
| SB- | SITE BORING OR TEST PIT (MIN. 5' BORING/TEST PIT OR UNTIL REFUSAL) |
| BB- | BUILDING BORING (DEPTH/METHOD TBD BY GEOTECH DUE TO LIMITED CY ACCESS) |

## BORING NOTES

1. GEOTECHNICAL ENGINEER SHALL PERFORM BORINGS OR TEST PITS WITHIN AGREED CONTRACT TIME. NOTE THAT THE BUILDING BORING (BB), SITE BORING (SB), PAVEMENT CORE (PC) ARE IN NUMERICAL ORDER OF PRIORITY TO COMPLETE WITHIN ORIGINALLY PROPOSED TIME FRAME.
2. ALL SOIL BORING WORK SHALL BE SUPERVISED BY A GEOTECHNICAL ENGINEER REGISTERED AS A PROFESSIONAL ENGINEER IN THE STATE OF CONNECTICUT. HE SHALL INTERPRET THE RESULTS OF THE SUBSURFACE EXPLORATION AND PREPARE A WRITTEN REPORT OF THE FINDINGS RELATING TO THE BUILDING FOUNDATION DESIGN RECOMMENDATIONS.
3. BUILDING BORINGS SHALL EXTEND DOWN TO A MINIMUM DEPTH OF 15 FEET BELOW PRESENT GRADE, INTO NON-PLASTIC SOIL HAVING A MINIMUM SAFE BEARING CAPACITY OF 2 TONS/SQ. FT. UNLESS REFUSAL OR LEDGE OCCURS SOONER. *(FINAL METHOD/ DEPTH DETERMINED BY GEOTECH ENG. DUE TO LIMITED COURTYARD ACCESS)
4. BORING BB1 SHALL EXTEND DOWN TO ROCK OR HARDPAN, INTO A NON-LIQUIFATION ZONE, AND CORE 5 FEET MINIMUM.
5. RECORD PRESENCE OF GROUND WATER & ELEVATION BELOW EXISTING GRADE.
6. TEST BORING PROCEDURES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM-D1586, STANDARD METHOD FOR PENETRATION TEST AND SPLIT BARREL SAMPLING OF SOILS.
7. IF OBSTACLES ARE ENCOUNTERED WHERE BORINGS ARE CALLED FOR,CONTRACTOR SHALL MOVE TO A SUITABLE LOCATION WITHIN 10 FEET OF ORIGINAL LOCATION. IF THIS IS NOT POSSIBLE, THE ENGINEER SHALL BE NOTIFIED FOR INSTRUCTIONS. THE BORING CONTRACTOR IS FULLY RESPONSIBLE FOR AVOIDING BORING IN THE VICINITY OF ANY POSSIBLE UNDERGROUND UTILITY LINES, OIL TANKS, ETC.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR STAKING OUT ALL BORINGS AND DETERMINING GROUND SURFACE ELEVATIONS AT TEST HOLES.
9. GEOTECHNICAL ENGINEER SHALL LAYOUT ALL BORING AND TEST PIT LOCATIONS.
10. THE CONTRACTOR SHALL INCLUDE THE COSTS FOR FOLLOWING ITEMS:
    - A. FURNISHING A COMPLETE RECORD OF ALL INFORMATION DERIVED FROM BORINGS, INCLUDING THE LOCATION OF EACH BORING, GROUND SURFACE ELEVATION AT THE BORING, TOGETHER WITH A LOG OF SOIL TYPES AND GROUND WATER LEVEL.
    - B. PERFORMING LABORATORY TESTS AS NECESSARY TO DETERMINE CLASSIFICATION, GRADING CHARACTERISTICS, AND STRENGTH OF THE SURFACE AND SUBSOILS IN REGARDS TO SUPPORT FOR BUILDING AND PAVEMENT CONSTRUCTION.
    - C. PREPARING A FINAL REPORT INCLUDING AN ENGINEER'S RECOMMENDATION FOR THE BUILDING FOUNDATION DESIGN, SHEET PILING OR OTHER RECOMMENDED SHORING SYSTEM FOR BUILDING EXCAVATION AND THE POTENTIAL FOR LIQUEFACTION AND ITS POSSIBLE RAMIFICATIONS ON THE STRUCTURAL DESIGN. THE PROPOSED NEW STRUCTURES CONSIST OF SINGLE STORY STEEL AND MASONRY FRAMED STRUCTURES. THE REPORT SHALL INCLUDE RECOMMENDATIONS PAVEMENT CONSTRUCTION ON THE SITE INCLUDING, CONCRETE WALKS, CONCRETE PAVEMENT IN VEHICULAR AREAS, ASPHALT WALKS, HEAVY DUTY ASPHALT PAVEMENT (BUS & SERVICE ROADWAY) LIGHT DUTY ASPHALT PAVEMENT (PASSENGER CAR & GENERAL PARKING).
11. GENERAL REVIEW OF THE FINAL FOUNDATION DESIGN DRAWINGS AND SPECIFICATIONS TO ENSURE GEOTECHNICAL DESIGN RECOMMENDATIONS HAVE BEEN PROPERLY INTERPRETED AND IMPLEMENTED AS THEY WERE INTENDED.
12. EXCEPT WERE GROUND WATER OBSERVATION WELLS ARE SPECIFICALLY REQUESTED, ALL BORING HOLES ARE TO BE FILLED AND LEVELED UPON COMPLETION OF WORK.
13. REFER TO THE PROPOSED CONCEPTUAL SITE PLAN FOR ADDITIONAL INFORMATION.
14. GEOTECHNICAL ENGINEER SHALL LAYOUT ALL BORING AND TEST PIT LOCATIONS
15. GEOTECHNICAL ENGINEER SHALL COORDINATE LAYOUT WITH EXISTING UTILITY LOCATIONS. NOTIFY 1 800 CALL BEFORE YOU DIG FOR UTILITY MARKING PRIOR TO COMMENCING SUB SURFACE INVESTIGATION.

KAESTLE BOOS associates, inc

416 Slater Road, P.O. Box 2590, New Britain, CT 06050-2590
Phone: 860-229-0361 ▲ Phone: 860-229-5303
Additional Offices Located in Massachusetts & Rhode Island
Email: kba@kba-architects.com ▲ Web: www.kba-architects.com

ISSUE DATE

| DATE | DESCRIPTION |
|---|---|
| JUNE 25 | DRAWINGS ISSUED FOR BORINGS |

REVISIONS

| DATE | DESCRIPTION |
|---|---|

FOR ALL ABBREVIATIONS, SYMBOL LEGENDS, AND GENERAL NOTES SEE SHEET R0.01

KEY PLAN

0' 20' 30' 60'
SCALE: 1"=30'-0"
PROJECT TRUE

ANNA REYNOLDS ELEMENTARY SCHOOL
85 RESERVOIR ROAD,
NEWINGTON, CT 06111
STATE PROJECT NO. -----

PROJECT NO.: 21011.00 DRAWN BY:

# SITE BORING PLAN

DRAWING NO.:
BP1.01

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**CLARENCE WELTI ASSOC., INC.**
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
KAESTLE BOOS ASSOCIATES, INC.

PROJECT NAME
ADDITIONS AND RENOVATIONS TO ANNA REYNOLDS SCHOOL

LOCATION
85 RESERVOIR ROAD, NEWINGTON, CT

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | | | SS | |
| SIZE I.D. | | | 1.375" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

**HOLE NO. BB-1**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 8/4/21
FINISH DATE 8/4/21

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | 1 | 10-28-50-200 | 0.0'-1.6' | | TOPSOIL 0.10<br>BR.FINE-MED.SAND, SOME SILT & GRAVEL<br>1.6'<br>BOTTOM OF BORING @ 1.6' (REFUSAL)<br><br>NOTE: MADE 2ND ATTEMPT 5 FEET AWAY WITH REFUSAL AT 1.6' | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

**LEGEND: COL. A:**
**SAMPLE TYPE:** D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
**PROPORTIONS USED:** TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 1

HOLE NO. **BB-1**

**CLARENCE WELTI ASSOC., INC.**
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
KAESTLE BOOS ASSOCIATES, INC.

PROJECT NAME
ADDITIONS AND RENOVATIONS TO ANNA REYNOLDS SCHOOL

LOCATION
85 RESERVOIR ROAD, NEWINGTON, CT

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.375" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

**HOLE NO. SB-4**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 8/4/21
FINISH DATE 8/4/21

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | 1 | 7-33-38 | 0.0'-1.5' | | BR.FINE-CRS.SAND, LITTLE SILT & GRAVEL, TRACE ASPHALT & GRAVEL - FILL | |
| | | | | | 1.5' BOTTOM OF BORING @ 1.5' | |
| | | | | | NOTE: TERMINATED BORING AT 1.5 FEET DUE TO POSSIBLE BURIED UTILITIES | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

**LEGEND: COL. A:**
**SAMPLE TYPE:** D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
**PROPORTIONS USED:** TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 1

HOLE NO. **SB-4**

**CLARENCE WELTI ASSOC., INC.**
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
KAESTLE BOOS ASSOCIATES, INC.

PROJECT NAME
ADDITIONS AND RENOVATIONS TO ANNA REYNOLDS SCHOOL

LOCATION
85 RESERVOIR ROAD, NEWINGTON, CT

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.375" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

**HOLE NO. SB-5**

GROUND WATER OBSERVATIONS
AT 10.0 FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 8/4/21
FINISH DATE 8/4/21

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | 1 | 4-17-47-24 | 0.0'-2.0' | | TOPSOIL 0.25 | |
| | | | | | BR.FINE-CRS.SAND, SOME SILT, LITTLE GRAVEL | |
| | 2 | 17-21-16-19 | 2.0'-4.0' | | | |
| | | | | | | |
| | 3 | 17-12-6-7 | 4.0'-6.0' | | | |
| 5 | | | | | | |
| | 4 | 6-60 | 6.0'-7.0' | | | |
| | | | | | GREY FINE-CRS.SAND, SOME SILT, LITTLE GRAVEL 7.0 | |
| | | | | | | |
| | | | | | | |
| 10 | 5 | 60 | 10.0'-10.4' | | BOTTOM OF BORING @ 10.5 10.5 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 15 | | | | | | |
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| 20 | | | | | | |
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| 25 | | | | | | |
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| 30 | | | | | | |
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| | | | | | | |
| 35 | | | | | | |

**LEGEND: COL. A:**
**SAMPLE TYPE:** D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
**PROPORTIONS USED:** TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 1

HOLE NO. **SB-5**

**CLARENCE WELTI ASSOC., INC.**
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
KAESTLE BOOS ASSOCIATES, INC.

PROJECT NAME
ADDITIONS AND RENOVATIONS TO ANNA REYNOLDS SCHOOL

LOCATION
85 RESERVOIR ROAD, NEWINGTON, CT

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.375" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

**HOLE NO. PC-1**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 8/4/21
FINISH DATE 8/4/21

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | 1 | 60 | 0.5'-1.0' | | ASPHALT 0.25<br>GREY/BR.FINE-CRS.SAND AND GRAVEL, TRACE SILT - FILL 0.50<br>BR.FINE-CRS.SAND, SOME SILT, LITTLE GRAVEL, FEW COBBLES 2.5<br>BOTTOM OF BORING @ 2.5' (AUGER REFUSAL) | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

**LEGEND: COL. A:**
**SAMPLE TYPE:** D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
**PROPORTIONS USED:** TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 1

HOLE NO. **PC-1**

**CLARENCE WELTI ASSOC., INC.**
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
KAESTLE BOOS ASSOCIATES, INC.

PROJECT NAME
ADDITIONS AND RENOVATIONS TO ANNA REYNOLDS SCHOOL

LOCATION
85 RESERVOIR ROAD, NEWINGTON, CT

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.375" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

**HOLE NO. PC-2**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

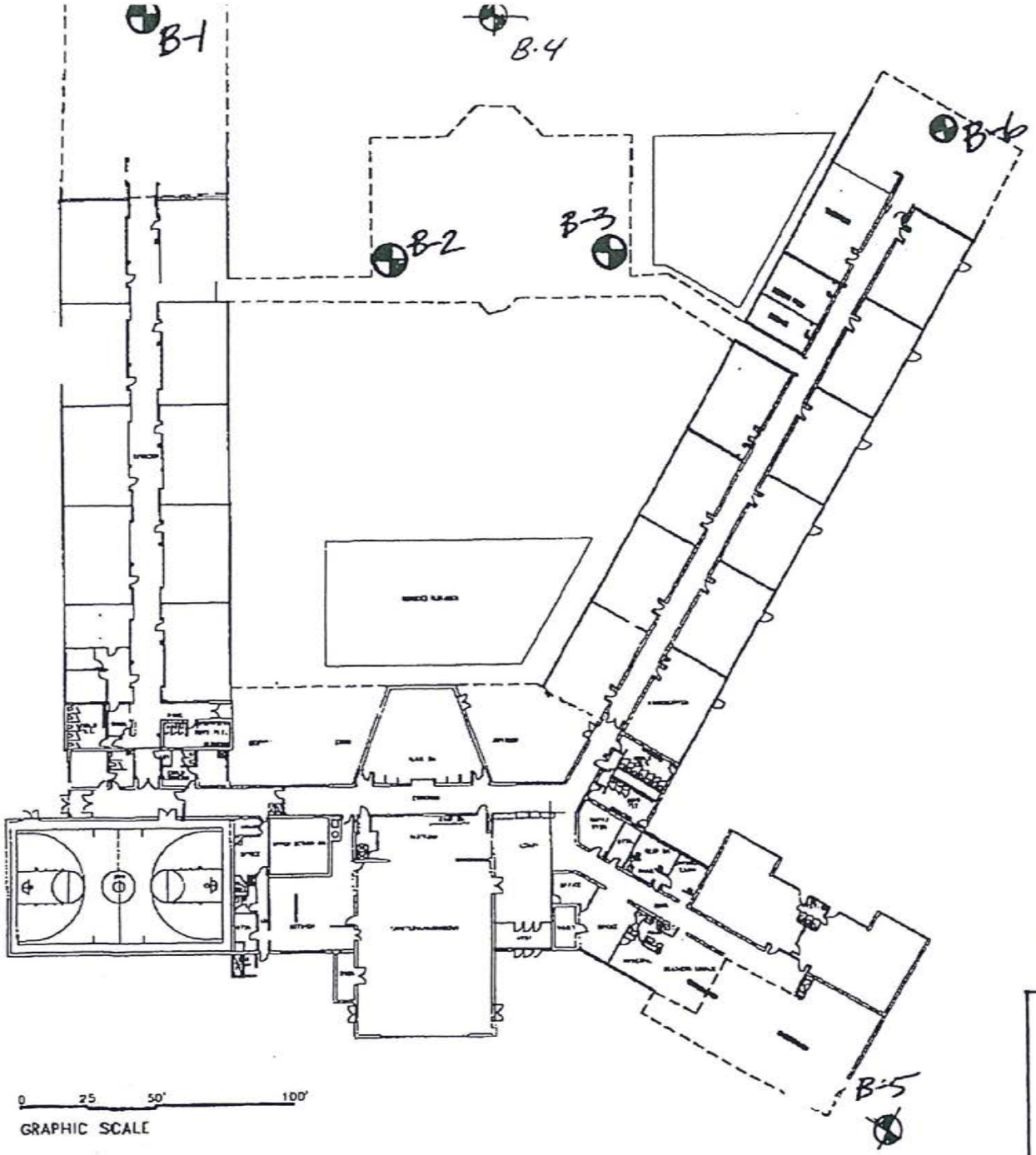
START DATE 8/4/21
FINISH DATE 8/4/21

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | 1 | 60 | 0.5'-1.0' | | ASPHALT 0.56 | |
| | | | | | GREY FINE-CRS.SAND AND GRAVEL, TRACE SILT - FILL 1.1 | |
| | | | | | BR.FINE-CRS.SAND, SOME SILT, LITTLE GRAVEL 2.0 | |
| | | | | | BOTTOM OF BORING @ 2.0' (SPOON REFUSAL) | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

**LEGEND: COL. A:**
**SAMPLE TYPE:** D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
**PROPORTIONS USED:** TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 1 HOLE NO. **PC-2**







## BORING LOCATION PLAN

**Additions to Anna Reynolds Elementary School**
**Newington, Connecticut**

**Scale: 1" = 60'+/-  March 1999**

**Dr. Clarence Welti, P. E., P. C.**

| CLARENCE WELTI ASSOC., INC.<br>P.O. BOX 397<br>GLASTONBURY, CONN 06033 | CLIENT<br>TOWN OF NEWINGTON | PROJECT NAME<br>ANNA REYNOLDS ELEMENTARY SCHOOL<br>LOCATION<br>NEWINGTON, CT |
|---|---|---|

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.5" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-2

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 2/15/99
FINISH DATE 2/15/99

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | | | | | TOPSOIL .4<br>RED/BR. FINE-MED. SAND, SOME SILT & FINE-CRS. GRAVEL | |
| 5 | | | | | AUGER REFUSAL @ 4.5' 4.5 | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. B-2

| CLARENCE WELTI ASSOC., INC.<br>P.O. BOX 397<br>GLASTONBURY, CONN 06033 | CLIENT<br>TOWN OF NEWINGTON | PROJECT NAME<br>ANNA REYNOLDS ELEMENTARY SCHOOL<br>LOCATION<br>NEWINGTON, CT |
|---|---|---|

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.5" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-3

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 2/15/99
FINISH DATE 2/15/99

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | | | | | TOPSOIL — .5 | |
| | | | | | GREY FINE-MED. SAND, TRACE SILT, SOME FINE-MED. GRAVEL | |
| | | | | | WEATHERED ROCK — 2.5 | |
| 5 | 1 | 60 | 5.00'-5.08' | | AUGER REFUSAL @ 5.1' — 5.1 | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BREWER
INSPECTOR:

SHEET 1 OF 1 HOLE NO. B-3

| CLARENCE WELTI ASSOC., INC.<br>P.O. BOX 397<br>GLASTONBURY, CONN 06033 | CLIENT<br>TOWN OF NEWINGTON | PROJECT NAME<br>ANNA REYNOLDS ELEMENTARY SCHOOL<br>LOCATION<br>NEWINGTON, CT |
|---|---|---|

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.5" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-5

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 2/15/99
FINISH DATE 2/15/99

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | | | | | RED/BR. FINE-MED. SAND, SOME SILT, LITTLE FINE-MED. GRAVEL | |
| | | | | | AUGER REFUSAL @ 2.2 — 2.2 | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. B-5

| CLARENCE WELTI ASSOC., INC.<br>P.O. BOX 397<br>GLASTONBURY, CONN 06033 | CLIENT<br>TOWN OF NEWINGTON | PROJECT NAME<br>ANNA REYNOLDS ELEMENTARY SCHOOL<br>LOCATION<br>NEWINGTON, CT |
|---|---|---|

| | AUGER | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|---|
| TYPE | HSA | | SS | |
| SIZE I.D. | 3.75" | | 1.5" | |
| HAMMER WT. | | | 140lbs | |
| HAMMER FALL | | | 30" | |

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-6

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 2/15/99
FINISH DATE 2/15/99

| DEPTH | SAMPLE NO. | SAMPLE BLOWS/6" | SAMPLE DEPTH | A | STRATUM DESCRIPTION + REMARKS | ELEV. |
|---|---|---|---|---|---|---|
| 0 | | | | | ASPHALT .3<br>RED/BR. FINE-MED. SAND, LITTLE SILT, SOME FINE-CRS. GRAVEL<br>WEATHERED ROCK 2.0 | |
| 5 | | | | | AUGER REFUSAL @ 5.0' 5.0 | |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. B-6

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**SECTION 01 10 00 - SUMMARY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 “The General Conditions of the Contract for Construction”, 2017 Edition as amended, the Supplementary General Conditions, and Division 01 General Requirements are bound herein, are hereby made a part of this Section, and shall be binding on the Contractor and all Subcontractors who perform this work.

1.2 SUMMARY

A. This Section includes the following:

1. Project information.
2. Work covered by Contract Documents.
3. Work sequence.
4. Phased construction.
5. Work under Owner's separate contracts.
6. Future work not part of this Project.
7. Owner-furnished/Contractor-installed (OFCI) products.
8. Contractor's use of premises.
9. Coordination with occupants.
10. Work restrictions.
11. Specification and Drawing conventions.
12. Codes, Standards and Permits.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Division 02 Abatement Sections for scope of hazardous materials abatement.

1.3 PROJECT INFORMATION

A. Project Identification: Additions and Renovations to Anna Reynolds Elementary School.

1. Project Location: 85 Reservoir Road, Newington, CT.

B. Owner: Town of Newington.

C. Architect: The Contract Documents were prepared for Project by Kaestle Boos Associates, New Britain, CT.

D. Owner's Project Manager: Construction Solutions Group, LLC.

E. Construction Manager: Newfield Construction.

1. Construction Manager for this Project is Project's Constructor. In Divisions 01 through 33 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Division 01 Section "Project Management and Coordination." for requirements for using web-based Project software.

## 1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Demolition, hazardous materials abatement, sitework, and general construction including fire protection, plumbing, mechanical and electrical systems.

B. Type of Contract:

Project will be constructed under coordinated, concurrent multiple contracts.

## 1.5 SCHEDULE

A. The sequence of Work shall be conducted in accordance with the Construction Manager's Construction Schedule.

1. The Construction Schedule is critical to the project. All work is required to be Substantially Complete, with a Certificate of Occupancy obtained, and ready for occupancy by the Owner, on or before the date agreed upon in the CM/Owner Agreement.
2. The final Construction Schedule will be subject to the approval of the Owner, the Architect, Project Manager and the Construction Manager.
3. Each Subcontractor shall coordinate work with the Construction Manager and other Subcontractors at the site.

## 1.6 PHASED CONSTRUCTION

A. The Work shall be conducted in multiple phases, with each phase substantially complete as indicated:

1. Phase 1: Hazardous Materials Abatement, Demolition, Site, Concrete, Steel, Architectural, and MEP.

2. Phase 2: FF&E.
3. Phase 3: Playground Equipment.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

## 1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Toilet accessories as indicated in Division 10 Section “Toilet and Bath Accessories.”

## 1.8 CONTRACTOR USE OF PREMISES

A. General: Each Contractor shall have limited use of premises for construction operations as determined by the Construction Manager.

B. Use of Site: Limit use of premises to areas determined by the Construction Manager. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Confine the parking of workmen's and construction vehicles, and the storage of construction materials to a designated staging area determined by the Construction Manager.
2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Building Security: Continuously maintain the security of the building and the Work. Cooperate with the Owner in particularly sensitive areas where security and special safeguards are required.

1. Provide security guards or patrols as necessary for adequate protection of the interests of the Contractor, Owner, and the general public on the site, or in public ways around the site.
2. Ensure that all windows, doors and other openings are secured at the end of each work day.

D. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

## 1.9 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.

1. Weekend Hours: Coordinate with Owner and Construction Manager.
2. Hours for Utility Shutdowns: Coordinate with Owner and Construction Manager.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
2. Obtain Construction Manager’s written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to abutters with Owner.

1. Notify Construction Manager not less than two days in advance of proposed disruptive operations.
2. Obtain Construction Manager's permission before proceeding with disruptive operations.
3. The Construction Manager and all Trade Contractors must comply with all Town Ordinances.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor and Subcontractors’ personnel working on Project site. Require personnel to use identification tags at all times.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
3. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
4. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
5. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

D. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

E. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

F. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

G. In general, the Specifications will describe the quality of the work and the Drawings, the extent of the work. The Drawings and Specifications are cooperative and supplementary; however, each item of the work is not necessarily mentioned in both the Drawings and the Specifications. All work necessary to complete the project, so described, is to be included in this Contract.

1. Comply with additional requirements for Interpretations as stated in the Construction Manager at Risk General Conditions of the Contract.

H. In case of disagreement between the Drawings and Specifications, or within either document itself, the Architect shall interpret the Documents to require the better quality or greater quantity of work for the Owner that can reasonably be construed therefrom. Any work performed by the Contractor without consulting the Architect, when the same requires a decision, shall be performed at the Contractor's risk.

## 1.12 CODES, STANDARDS AND PERMITS

A. All work under this contract shall conform to all codes and standards in effect as of the date of receipt of Bids which are applicable to this Project. All work shall also conform to specific requirements and interpretations of local authorities having jurisdiction over the Project. These Codes, standards, and authorities are referred to collectively as "the governing codes and authorities" and similar terms throughout the Specifications. Determination of applicable codes and standards and requirements of the authorities having jurisdiction shall be the responsibility of the Contractor; as shall be the analysis of all such codes and standards in regard to their applicability to the Project for the purposes of determining necessary construction to conform to such code requirements, for securing all approvals and permits necessary to proceed with construction, and to obtain all permits necessary for the Owner to occupy the facility for their intended use. In the case of conflicts between the requirements of different codes and standards, the most restrictive or stringent requirements shall be met.

B. The codes that were used in the design of this Project are as follows:

1. 2018 State Building Code (CSBC) including:

a. 2015 International Building Code (IBC)
b. 2015 International Existing Building Code (IEBC)
c. 2015 International Mechanical Code (IMC)
d. 2015 International Plumbing Code (IPC)
e. 2017 NFPA 70, National Electrical Code (NEC)
f. 2015 International Energy Conservation Code (IECC)
g. 2009 ICC/ANSI A117.1- Accessible and Usable Buildings and Facilities

2. 2018 Connecticut Fire Safety Code (CSFSC) including:

a. 2015 International Fire Code (IFC), including all referenced standards.

3. 2018 Connecticut Fire Prevention Code (CSFSC) including:

    a. 2015 NFPA, 1 Fire Code.

4. Current Connecticut Public Health Code (2009).
5. Current OSHA.
6. Connecticut General Statutes.
7. Title II of the Americans with Disabilities Act (ADA) including the 2010 ADA Standards for Accessible Design.
8. Section 504, Rehabilitation Act 1973 including 504 Regulations.

C. Code Enforcement and Approvals: Secure the general building permit for the work, and conform to all conditions and requirements of the permit and code enforcement authorities.

D. Identify and pay for all permits required from authorities having jurisdiction over the Project for the construction and occupancy of the work. Prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner.

1. Display all permit cards as required by the authorities and deliver legible photocopies of all permits to the Construction Manager and Owner promptly upon their receipt.
2. Arrange for all inspections, testing and approvals required for all permits. Notify the Owner, Construction Manager and Architect at least three business days in advance, so they may arrange to observe.
3. Comply with all conditions and provide all notices required by all permits.
4. Perform and/or arrange for and pay for all testing and inspections required by the governing codes and authorities, other than those provided by the Owner, and notify the Owner, Construction Manager, and Architect of such inspections at least three business days in advance, so they may arrange to observe.
5. Where inspecting authorities require corrective work in conjunction with applicable codes and authorities, promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case proceed in accordance with the procedures for modifications to the Work established in the Contract Documents.

## 1.13 OCCUPATIONAL SAFETY AND HEALTH ACT

A. The Contractor and each Subcontractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which administer such Acts. Said requirements, standards and regulations are incorporated herein by reference.

1. In accordance with Connecticut General Statutes Sec. 31-53b, all employees on the Project site must show proof of completing and maintaining the OSHA 10 hour certification requirements in accordance with federal OSHA Training Institute standards.

B. The Contractor and each Subcontractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employees material men and Subcontractors; and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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**SECTION 01 23 00 - ALTERNATES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Courtyard – Sod & Irrigation in Lieu of Synthetic Grass Surfacing

1. Delete base bid synthetic grass surfacing, associated stone base and anchor curbing and underdrainage. Install topsoil and sod in lieu of synthetic grass as shown on the drawings (Center playground area will remain as synthetic grass in alternate bid). The alternate shall include irrigation throughout the courtyard at sodded lawns and plant beds, with new waterline and backflow preventer from the mechanical room. Install concrete tiered seating in lieu of base bid granite seating. Steel edging at all plant beds shall be installed in lieu of concrete edging. Delete water line to water table at the play area. Refer to sheets including but not limited to L4.01, IR1.01, C4.03, P2.01, E2.01, E2.07 & ECC1.01 for additional alternate information.

B. Alternate No. 2: Gymnasium Entrance Canopy.

1. Eliminate all work associated with the gymnasium entrance canopy. Refer to A1.05, A3.02, and structural drawings.

C. Alternate No. 3: Main Entrance and Cafeteria Canopies.

1. Eliminate all work associated with the main entrance canopy and cafeteria entrance canopy. Refer to A1.02, A3.02, civil, and structural drawings.

D. Alternate No. 4: Reuse Under Slab Sanitary Piping at Areas E&F.

1. Eliminate sawcutting of concrete slabs related to replacement of under slab sanitary piping.
2. Delete new underslab sanitary piping where existing underslab sanitary piping will be reused.
3. Delete slab on grade infills where existing underslab sanitary piping will be reused.
4. Refer to plumbing drawings for extent of reuse.

END OF SECTION 01 23 00

# SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
2. Division 01 Section “Project Management and Coordination” for submitting Requests for Information (RFIs).
3. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

### 1.3 MINOR CHANGES IN THE WORK

A. Architect, through Construction Manager, will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, as follows:

1. **“Architect’s Supplemental Instruction” (ASI)** form, included at end of Part 3, is an Owner/Architect-initiated supplemental instruction.

    a. Architect’s Supplemental Instructions, including attachments, will be issued to the contractor electronically via email, in the form of a “portable document file” (.PDF).

### 1.4 CONTRACTOR REQUEST FOR INFORMATION

A. Contractor-Initiated Requests for Information: If clarification is required to the Contract Documents, the Contractor may submit a “Request for Information” (RFI) to the Architect. This request will be responded to by the Architect with a “Response to Request for Information” (RRFI) form.

1. RFI forms shall be submitted in a typewritten, standardized format, including title and description, and sequentially numbered.
2. Submit RFI, including attachments, electronically via email in the form of a "portable document file" (.PDF); fax submittals are not acceptable.
3. RFI forms are not to be submitted as requests for shop drawing approval. Comply with requirements in Division 01 Section "Submittal Procedures."
4. **"Response to Request for Information" (RRFI)**, included at the end of Part 3, will be issued in response to Contractor's Request for Information (RFI).

    a. A Response to Request for Information (RRFI), including attachments, will be issued to the contractor electronically via email, in the form of a "portable document file" (.PDF).
    b. If the RRFI directs the Contractor to carry out the Work with no change in Contract Sum or Contract Time, but the Contractor anticipates a change associated with the Work, the Contractor must submit to the Architect in writing within 5 days of receipt of the RRFI, the reason for the anticipated change in Contract Sum and/or Contract Time. A change in Contract Time must be submitted with a revised CPM Schedule in accordance with Division 01 Section "Construction Progress Documentation."

## 1.5 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. **"Proposal Requests" (PR)** included at the end of Part 3**,** including attachments, will be issued to the contractor electronically via email, in the form of a "portable document file" (.PDF).
2. **"Proposal Requests" (PR)** issued by the Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
3. Within **21 days** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by first submitting a "Request for Information" to the Architect. This request will be responded to by the Architect, wherein the Contractor may submit a Change Order Proposal.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a quote sheet from the supplier as backup for costs.
3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
5. Include costs of labor and supervision directly attributable to the change.
6. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

C. If the Contractor fails to provide proper documentation for merit of the claim / change order request, or if the Contractor does not provide adequate backup documentation for the claim / change order request, the Contractor shall be responsible for any schedule delays due to any time lost waiting for the proper documentation of the claim / change order request.

## 1.6 CHANGE ORDER PROCEDURES

A. Change Order Proposal Form: Use **AIA Document G709**, or similar document, for Change Order Proposals.

1. Submit Change Order Proposals (COP), including attachments **from vendors and subcontractors and the initiating document,** electronically in the form of a "portable document file" (.PDF).

a. Change Order Request Costs:

1) The cost or credit to the Owner resulting from a Change in the Work, absent the applicability of a unit price for such item(s) set forth in the Contract shall be determined as follows:

a) The cost of material and equipment incorporated into the Work
b) The cost of wages, including fringe benefits mandated by collective bargaining agreements.
c) Cost of Workers' Compensation, employer Liability Insurance, Federal Social Security (FICA), Federal Unemployment Compensation *FUTA)
d) Cost of Builder's Risk Insurance

e) Cost of rental of equipment whose purchase price is greater than two hundred fifty dollars ($250.00). Cost of rental shall be substantiated by invoice for the actual rental cost; or in the case where the equipment is owned, the cost shall include the daily, weekly and monthly rates for such equipment. The applicable rate shall be as mutually agreed by the Contractor and Owner

f) Cost of fuel consumed by equipment used in the performance of the Work if not included in the publicized rate

g) Cost of pro rata share of debris removal and dumpster rental. This cost shall be allowed only when the debris removal is associated with Work such as demolition but shall not be allowed as part of general cleanup.

h) Cost of a foreman that does not work with the tools. This cost shall be allowed if the crew size of a respective trade exceeds a combined total of six journeymen and apprentices. In such instances the total of the foreman's hours may not exceed one sixth of the hours of the working crew.

i) Cost of project management, site management field office personnel, superintendence, field coordination, superintendent's truck, foremen's truck, uniforms, mileage, mailings/copying, and as-build drawings shall be included in overhead and profit, and shall not be allowed as separate line items.

j) Costs of small tools whose individual cost is less than two hundred fifty dollars ($250.00) shall be included in overhead and profit, and shall not be allowed as separate line items.

k) Cost of cleanup shall be included in overhead and profit, and shall not be allowed as a separate line item unless the Work is performed in a portion of the building or site that has been previously cleaned, inspected by the Architect, and is ready for occupancy by the Owner.

l) Cost of revisions to shop drawings shall not be allowed as a separate line item unless the shop drawings have been previously submitted and approved by the Architect.

m) All other costs which are not specifically enumerated in Section 7.2.3 shall be included in overhead and profit, and shall not be allowed as separate line items.

2. Each Change Order Proposal is to include reference to the initiating document (PR, RRFI, etc.), a title and description, and be sequentially numbered.
3. **"Response to Change Order Proposal" (RCOP)**, included at the end of Part 3, will be issued in response to Contractor's Change Order Proposal (COP).

    a. A Response to Change Order Proposal (RCOP) will be issued to the Contractor electronically via email, in the form of a "portable document file" (.PDF).
    b. Following review of a COP by the Architect, if corrections are required prior to inclusion in a Change Order, resubmit revised COP with revision number and include all backup documentation **and the initiating document**.

B. On Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of Owner and Contractor on **AIA Document G701**.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on **AIA Document G714**. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit a Changer Order Proposal associated with the Work of a Construction Change Directive, including an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
2. The Architect will prepare a Change Order upon approval by the Architect and Owner of a Change Order Proposal.

C. Failure of Contractor and Owner to agree on adjustment of Contract Sum or Contract Time shall not excuse the Contractor from proceeding with prosecution and performance of Work. Contractor and Subcontracts, Sub-subcontractors and Suppliers shall administer all disputes in a manner that will permit Work to proceed on schedule while matter in dispute is being resolved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FORMS

A. The following forms referenced in this Section are attached:

1. ASI – Architect's Supplemental Instructions, 1 page.
2. RRFI – Response to Request for Information, 1 page.
3. PR – Proposal Request, 1 page.
4. RCOP – Response to Change Order Proposal, 1 page.

END OF SECTION 01 26 00

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KAESTLE BOOS
associates, inc

# ASI - ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

**PROJECT**
City, State

KBA #


**CONTRACTOR: (or CM)**

**GENERAL CONTRACTOR OR CM**
Address
City, State, Zip
Attn: M.

**ASI NO. (3 digit)-(2 digit)**

**ISSUED BY:** (Name and Credentials)
(Project Architect, Landscape Architect, etc.)

**DATE:** (Month, Day, Year)

**COPIES TO:**
- ☐ KBA – CT/MA
- ☐ Owner
- ☐ Official
- ☐ Consultant
- ☐ Consultant

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time. If the Contractor believes that additional cost or time is involved, the Contractor shall make Claims as provided in the General Conditions of the Contract.

**Description: ASI Title**

Description of work……

**Attachments**: Sketches, Bulletins, etc.

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KAESTLE BOOS
associates, inc

# RRFI – RESPONSE TO REQUEST FOR INFORMATION

**PROJECT**
City, State

KBA #
Page: 1 of 1

| | | |
|---|---|---|
| **CONTRACTOR: (or CM)** | **GENERAL CONTRACTOR OR CM**<br>Address<br>City, State, Zip<br>Attn: M. | **RRFI NO.: (3 digit)-(2 digit)** |
| **ISSUED BY:** | (Name and Credentials)<br>(Project Architect, Landscape Architect, etc.) | **COPIES TO:**<br>☐ KBA – CT/MA<br>☐ Owner<br>☐ Official |
| **DATE:** | (Month, Day, Year) | ☐ Consultant<br>☐ Consultant |

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time. If the Contractor believes that additional cost or time is involved, the Contractor shall make Claims as provided in the General Conditions of the Contract.

**Description: RRFI Title**

Response……

**Attachments**: RFI #

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KAESTLE BOOS
associates, inc

# P R – P R O P O S A L R E Q U E S T

**PROJECT**
City, State

KBA #


**CONTRACTOR: (or CM)**
**GENERAL CONTRACTOR OR CM**
Address
City, State, Zip
Attn: M.

**PR NO. (3 digit)-(2 digit)**

**ISSUED BY:** (Name and Credentials)
(Project Architect, Landscape Architect, etc.)

**DATE:** (Month, Day, Year)

**COPIES TO:**
- ☐ KBA – CT/MA
- ☐ Owner
- ☐ Official
- ☐ Consultant
- ☐ Consultant

*Please submit an itemized quotation for changes in the Contract Sum and/or Contract Time for proposed modifications to the Contract Documents described herein. Notify the Architect in writing of the date on which you anticipate submitting your proposal.*
***THIS IS NOT A CHANGE ORDER, CONSTRUCTION CHANGE DIRECTIVE, OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.***

**Description: PR Title**

Response …….

**Attachments**:

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KAESTLE BOOS
associates, inc

# RCOP – RESPONSE TO CHANGE ORDER PROPOSAL

**PROJECT**
City, State

KBA #
Page: 1 of 1

**CONTRACTOR: (or CM)** **GENERAL CONTRACTOR OR CM**
Address
City, State, Zip
Attn: M.

**RCOP NO. (3 digit)-(2 digit)**

**ISSUED BY:** (Name and Credentials)
(Project Architect, Landscape Architect, etc.)

**DATE:** (Month, Day, Year)

**COPIES TO:**
- ☐ KBA – CT/MA/NH
- ☐ Owner
- ☐ Official
- ☐ Consultant
- ☐ Consultant

☐ **Change Order Proposal has been reviewed by the Architect and is recommended to the Owner for approval.**

☐ **Change Order Proposal is rejected.**

☐ *Owner will not require the Contractor to proceed with the Work described in Change Order Proposal*
☐ *Work described in Change Order Proposal is required by the Contract Documents.* ☐ *Refer to comments below.*

☐ **Revise and resubmit Change Order Proposal.**

☐ *Overhead/Profit is incorrect.* ☐ *Labor and material costs breakdown is insufficient.*
☐ *Backup documentation is insufficient.* ☐ *Refer to comments below.*

**Description: RCOP Title**

Response……

**Attachments:** COP No.

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# SECTION 01 29 00 - PAYMENT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.
4. Division 01 Section “Sustainable Design Requirements” for administrative requirements governing submittal of cost breakdown information required for CTHPB documentation.

### 1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

### 1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets.
b. Submittals Schedule.
c. Contractor's Construction Schedule.

1. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of Contractor's initial Application for Payment. No payment shall be processed until schedule of values has been submitted and approved by the Architect.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. For major trades with line item values greater than $25,000, provide a separate line item for units of work within each trade with a value not exceeding $25,000.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of Architect.
   c. Name of Construction Manager.
   d. Architect's project number.
   e. Contractor's name and address.
   f. Date of submittal.

2. Submit draft of AIA Document G702 and AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include the following mandatory line items:

   a. Include separate line items under Contractor and principal subcontracts for CTHPBS documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
   b. Include the following mandatory line items:

      1) Mobilization
      2) Demobilization
      3) Builders Risk Insurance
      4) Bonds
      5) Coordination Drawings

6) Scheduling
7) Construction Photographic Documentation
8) Field Engineering
9) Daily Building Cleanup
10) Daily Site Cleanup
11) Safety Program
12) Full-Time Project Manager
13) Full-Time Project Superintendent
14) Field Offices
15) Dumpsters
16) Cold Weather Protection
17) Temporary Heat
18) Punch lists
19) Operation and Maintenance Manuals
20) Warranty Manual
21) Demonstration and Training
22) Tools and Services
23) Project Record Documents
24) Attic Stock
25) General Contract O & P (not to be included in each line item).

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
    b. All requests for payment for materials store on- or off-site shall include an invoice for those materials. If the invoice is not provided, payment may be held by the Owner. There shall not be payment of materials stored off-site for Contractor's "stock" material requiring fabrication before delivery to the site.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
2. At least ten days before the date established for each formal Application for Payment, the Contractor shall submit to the Architect an itemized preliminary application for payment for review and comment. The Contractor shall then revise the preliminary application and at least two days prior to the date established for formal application, shall submit to the Architect the revised preliminary application, to allow time for the Architect to prepare a written letter of explanation setting forth any objections and recommended changes to be forwarded along with the formal application to the owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

1. In order to expedite monthly payment during the course of the Project, the Contractor shall review with the Architect and Owner's Project Manager a preliminary draft of each Application for Payment before final copies of the Application are formally submitted. The draft copy shall be typed and include the application date and application number. The draft copy shall include the total of each column and extension of each row on the Application as if this was the formal submission. The cover sheet shall include the Original Contract Sum and a summary of Changes to the Contract Sum, retainage, and payments to date as if this was the formal submission.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment, or form as approved by Owner.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders executed before last day of construction period covered by application.

a. List each Change Order at the end of the Schedule of Values. Under each Change Order number, list each Change Order Proposal by number with a brief description of the Work and its value.

E. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. CTHPBS submittal for project materials cost data.
4. Contractor's construction schedule (preliminary if not final).
5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
6. Products list (preliminary if not final).
7. CTHPBS action plans.
8. Schedule of unit prices.
9. Submittal schedule (preliminary if not final).
10. List of Contractor's staff assignments.
11. List of Contractor's principal consultants.
12. Copies of building permits.
13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
14. Initial progress report.
15. Report of preconstruction conference.
16. Certificates of insurance and insurance policies.
17. Performance and payment bonds.
18. Data needed to acquire Owner's insurance.
19. Certified payrolls.
20. OSHA training certificates.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
3. Include a copy of the executed Occupancy Permit.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

# SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. The Contractor and each Trade Subcontractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Trade Subcontractor in each Bid Package.

C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.
4. Division 01 Section “Sustainable Design Requirements.”
5. Division 01 Section "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

### 1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Keep list current at all times, resubmit upon update.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
5. No claim for additional compensation or extension of Contract Time will be permitted for conditions resulting from lack of coordination.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Preinstallation conferences.
6. Progress meetings.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 24 by 36 inches but no larger than 30 by 42 inches at a scale suitable for presentation of the information.
3. Number of Copies: Submit **six (6) hard copies** of each submittal for Architect and Consultants to retain one copy each.

   a. Submit all hard copies in full color.

b. One hard copy and scanned electronic file will be returned to Construction Manager.
c. One hard copy and scanned electronic file will be returned to Owner's Project Manager.

4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
5. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c. Fire-rated enclosures around ductwork.
d. Indicate maintenance boundary zones around equipment so that other trades can accommodate their design.

7. Electrical Work: Show the following:

a. Runs of vertical and horizontal conduit 1-1/2 inches in diameter and larger, including conduit racks.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Clearances required for recessed lighting fixtures.

d. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
e. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings (Revit 2013).
2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
3. 3D File Incorporation: Develop and incorporate coordination drawing files into 3D Model established for Project.

a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

4. Architect will furnish Contractor one set of 3D-digital data files of Drawings for use in preparing coordination digital data files.

a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
b. Digital Data Software Program: Drawings are available in Revit 2013.
c. Contractor shall execute a data licensing agreement in Agreement form acceptable to Owner and Architect, in accordance with the BIM Disclaimer attached to this Section.

## 1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model and CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD Architectural Desktop 2010.
4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

5. The following digital data files will be furnished for each appropriate discipline:

    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Software: Use Construction Manager's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project software site includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Track status of each Project communication in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.
    l. Mobile device compatibility, including smartphones and tablets.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.8 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

## 1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner, Project Manager, Construction Manager, and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda and distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner, Project Manager, Construction Manager and Architect, within three days of the meeting.

B. Preconstruction Conference: Arrange for attendance of subcontractors at Preconstruction Conference convened by Architect, together with any other persons necessary for full review of scheduling and coordination matters for the Project.

1. Attendees: Authorized representatives of Owner, Project Manager, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Include the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Payment of on- and off-site stored materials.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.

l. CTHPBS v4 and sustainable design requirements.
m. Preparation of Record Documents.
n. Use of the premises.
o. Work restrictions.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Construction waste management and recycling.
s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. First aid.
w. Security.
x. Progress cleaning.
y. Working hours.
z. Owner-furnished and provided items.
aa. Work performed under separate contracts.

3. Minutes: The Owner's Project Manager will record and distribute meeting minutes.

C. CTHPBS Coordination Conference: Construction Manager will schedule and conduct a CTHPBS coordination conference before starting construction, at a time convenient to Owner, Owner's Project Manager, Construction Manager, Architect, and Contractor.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent and CTHPBS coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect meeting requirements for CTHPBS certification, including the following:

a. CTHPBS Project Checklist.
b. General requirements for CTHPBS-related procurement and documentation.
c. Project closeout requirements and CTHPBS certification procedures.
d. Role of CTHPBS coordinator.
e. Construction waste management.
f. Construction operations and CTHPBS requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Project Manager, Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. The Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present, the Owner, Architect, Project Manager, Construction Manager, and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Progress Meetings: Attend progress meetings at interval determined by the Architect. Dates of meetings may coincide with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Project Manager, Construction Manager, and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review minutes of previous progress meeting. Review other items of significance that could affect progress.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Deliveries.
4) Access.
5) Site utilization.
6) Temporary facilities and controls.
7) Work hours.
8) Hazards and risks.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.
19) CTHPBS v4 credit and submittal status.

3. Minutes: The Owner's Project Manager will record and distribute the meeting minutes.
4. Reporting: The Owner's Project Manager will distribute minutes of the meeting to each party present.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Schedule Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes.

1. Attendees: In addition to representatives of the Contractor, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Deliveries.
        4) Access.
        5) Site utilization.
        6) Temporary facilities and controls.
        7) Work hours.
        8) Hazards and risks.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

## 1.10 REQUESTS FOR INFORMATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI, to the Architect, in the form specified.

1. RFIs shall originate with Contractor or Subcontractor. RFIs submitted by entities other than the Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. The Construction Manager is responsible to review Subcontractors’ RFIs prior to submission to the Architect to ensure the content is accurate and fully describes the reason for the request.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect and Construction Manager.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs:

1. Identify each page of attachments with the RFI number and sequential page number.

D. RFI Forms: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's and Construction Manager’s Action: Architect and Construction Manager will review each RFI, determine action required, and return it. Allow five working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FORMS

A. The following forms referenced in this Section are attached:

1. Electronic File Release & Liability Waiver, 1 page

END OF SECTION 01 31 00

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**THIS PAGE INTENTIONALLY LEFT BLANK**

KAESTLE BOOS
associates, inc

Renovations Anna Reynolds
Elementary School
Newington, CT
KBA PROJECT #21011.00

# ELECTRONIC FILES USE AND LIABILITY WAIVER

At the request of the Contractor, Kaestle Boos Associates, Inc. (KBA) agrees to provide you with electronic files developed by KBA for the above referenced project ("the Project") for your use and convenience for this project exclusively and subject to the following terms and conditions:

KBA's electronic files are compatible with Revit 2019 and/or AutoCAD 2019 . KBA makes no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

Data contained on these electronic files are part of KBA's instruments of service and must not be used by the undersigned for any purpose other than as a convenience and reference for the Project and shall not be used in place of Contract Documents. Each party receiving these files is required to sign this waiver. Any other use by others will be at the sole risk of the undersigned without liability or legal exposure to KBA. By signing this document, the undersigned agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against KBA, its officers, directors, employees, agents or subconsultants which may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold harmless KBA from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files.

These electronic files are not Contract Documents. Significant differences may exist between these electronic files and corresponding hard copy Contract Documents due to addenda, change orders or other revisions. KBA makes no representation regarding the accuracy or completeness of the electronic files. In the event that a conflict arises between the Contract Documents prepared by KBA and electronic files, the signed contract documents shall govern. KBA shall not be held responsible for determining if any conflict exists. The use of these electronic files, shall not relieve the duty of the Contractor to fully comply with the Contract Documents, including and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate work with that of other contractors for the project.

Because of the potential that the information contained in the electronic files can be modified, unintentionally or otherwise, KBA reserves the right to remove all indicia of its ownership and/or involvement from the electronic files.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by KBA and KBA makes no warranties, either express or implied, of merchantability or fitness for any particular purpose. In no event shall KBA be liable for any loss of profit or any consequential damages.

Agreed to by,

| | |
|---|---|
| CONTRACTOR – COMPANY NAME | TRADE |
| COMPANY OFFICER - [PRINT NAME] | SIGNATURE |
| TITLE | DATE |

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# SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Certified payroll records.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.
5. Division 01 Section “Sustainable Design Requirements.”

### 1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

## 1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

1. Include project calendar.

C. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.

5. Description of the Work covered.
6. Scheduled date for Architect's and Construction Manager's final release or approval.

D. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Daily Construction Reports: Submit two copies at weekly intervals, to the Construction Manager.

G. Material Location Reports: Submit two copies at monthly intervals, to the Construction Manager.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions, to the Architect, through the Construction Manager.

I. Special Reports: Submit two copies at time of unusual event, to the Architect.

J. Certified Payroll Records: Submit two copies at weekly intervals to Owner’s Representative.

## 1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Calendar: Compile a project calendar for use in scheduling. Incorporate all limitations on working days and working hours, including the following:

1. Legal Holidays. Coordinate National and all City of New Britain Legal Holidays.
2. Other non-working days determined by the Contractor.
3. Optional working days determined by the Contractor.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
4. Update the submittals schedule periodically as the work progresses. Submit concurrently with each Application for payment.
5. Utilize a computerized program such as Primavera Expedition or Prolog for tracking submittals. Submit the following reports bi-weekly:

    a. Complete list of reviewed submittals.
    b. Listing of submittals to date.
    c. Listing of approved submittals.
    d. Listing of rejected submittals.
    e. Listing of submittals returned for correction.
    f. List of outstanding submittals.

6. At the request of the Architect provide reports capable of being sorted by the following criteria:

    a. Approved status.
    b. Subcontractor/Supplier.
    c. Submission date.
    d. Number of days late for return.
    e. Number of days under review.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 10 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than one day for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work under More Than One Contract: Include a separate activity for each contract.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
4. Owner-Furnished Products: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.

5. Work Restrictions: Show the effect of the following items on the schedule:

a. Partial occupancy before Substantial Completion.
b. Use of premises restrictions.
c. Provisions for future construction.
d. Seasonal variations.
e. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.

c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.

7. Other Constraints: Include the following specific activities in each trade in each phase.

a. Interface between Contractor and Subcontractor.
b. Electrical connections to each piece of equipment.
c. Mechanical connections to each piece of equipment.
d. Concrete finishing.
e. Site work constraints on other activities.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

F. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Indicate the following items on the note representing each activity on the network.

    a. Duration and remaining duration for those activities in progress.
    b. A four-character (or less) code indicative of party responsible for activity.
    c. A brief description of activity.
    d. A four-character (or less) code.
    e. A four-character (or less) code indicating the Phase area. (Area code).
    f. A four-character (or less) code indicating the type of activity (type code), including but not limited to the following:

        1) Submittal
        2) Construction
        3) Testing

4) Fabrication

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

## 2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## 2.6 CERTIFIED PAYROLL RECORDS

A. The Owner has the authority to verify payroll reports by checking employees’ pay stubs and personal identification.

B. The Owner may withhold a portion of the Application for Payment if payroll reports have not been submitted for a portion of the Work.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before submission of Application for Payment.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.
4. Evaluate progress of the work jointly with the Owner and Construction Manager at the end of each week to show progress and identify conflicts.

B. Distribution: Distribute two copies each of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

### 3.2 SCHEDULE COMPLIANCE

A. Whenever it becomes apparent from the current CPM schedule that delays to the critical path have resulted and Contract completion date will not be met, or when so directed by the Owner's Representative, take some or all of the following actions at no additional cost to the Owner:

1. Submit to the Owner's Representative, a written recovery statement of proposed methods to remove or arrest delay to critical path in approved schedule, and a proposed schedule with the corresponding revisions in activities and logic ties.
2. Increase construction manpower as necessary to substantially eliminate backlog of work.
3. Increase the number of working hours per shift, shifts per day, working days per week, amount of construction equipment, or any combination therefore, sufficiently to substantially eliminate backlog of work.
4. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities, and comply with revised schedule.

B. If Contractor fails to submit a written statement of proposed methods or fails to take such steps as requested and approved by the Owner's Representative, the Owner may direct the Contractor to increase the level of effort in manpower (trades), equipment and work schedule including overtime, weekend and holiday work, to be employed by Contractor in order to remove or arrest delay to the critical path in approved schedule.

1. The Contractor shall promptly provide such level of effort at no additional cost to the Owner.

C. Contractor's failure, refusal or neglect to promptly comply with these schedule recovery requirements shall be reasonable evidence that Contractor is not prosecuting the Work with due diligence. Any such failure, refusal or neglect shall give sufficient basis to the Owner to elect any of the following:

1. Demand adequate written assurance of due performance, as provided in the General Conditions;
2. Withhold liquidated damages, and;
3. At the Owner's sole discretion, direct alternate schedule recovery actions.

3.3 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME

A. If Contractor desires to make changes in its method of operating which affect the approved CPM schedule, notify the Owner's Representative in writing, stating the nature of and reason for the proposed changes. Revise and resubmit the CPM schedule only after proposed changes are approved by the Owner's Representative. Adjustment may consist of changing portions of the activity sequence, activity durations, division of approved activities, or other adjustments as may be approved by the Owner's Representative.

1. Addition of extraneous, nonworking activities, or activities which add unapproved constraints to the CPM schedule will not be approved.
2. Make all revisions to the CPM schedule without any additional cost to the Owner.

B. If completion of any activity, whether or not critical, falls more than 100 percent behind its approved duration, submit a schedule adjustment to the Owner's Representative for approval, showing each activity divided into two activities reflecting completed and uncompleted work.

C. Immediately reschedule with added activities shown on the schedule, Shop Drawings which are not approved on the first submittal or within schedule time, and equipment which does not pass specified tests.

D. Submit requests for any extension of Contract completion date to Owner's Representative for approval, including such justification and supporting evidence as Owner's Representative may deem necessary to determine whether Contractor is entitled to an extension of time under provisions of this Contract. The Owner's Representative will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof.

1. The total number of days of extension to which the Contractor is entitled, if any, will be determined by the Owner's Representative, based upon the currently approved CPM schedule and on all data relevant to extension.

2. Actual delays in activities which, according to the CPM schedule, do not affect any Contract completion date shown by critical path in the network will not constitute basis for a change therein.

E. Subject to the provisions of the General Conditions of the Contract and other Division 01 Sections, submit each request for change in Contract completion date to the Owner's Representative within 20 calendar days after beginning of delay for which a time extension is requested but before date of final payment under this Contract. No extension will be granted for requests which are not submitted within the aftermentioned time limit.

1. In the case of Contractor claims for delays in the work due to causes beyond the Contractor's control, demonstrate by recalculating the progress schedule to indicate the actual effect on related activities. Only interferences with specific work activities that, through correct network analysis, result in a net increase in the critical path will be allowed. Extension of time shall be determined through analysis of the progress schedule.
2. From time to time it may be necessary for the project schedule or completion time to be adjusted, as directed by the Owner, to reflect affects of job conditions, weather, technical difficulties, strikes, unavoidable delays on part of the Owner or its representatives, and other unforeseeable conditions which may indicate schedule adjustments or completion time extensions. Under such conditions, Owner's Representative will direct the Contractor to reschedule the work or Contract completion time to reflect changed conditions.

    a. Revise and recalculate the schedule accordingly to indicate the actual effect on related activities.

F. Float: If the Progress Schedule anticipates early completion of entire Work or any portion of the Work with a separate Contract Time, Contract Float is the number of days between the anticipated date for completion of the Work, or any such portion of the Work, and the corresponding Contract Time. Proceed with the Work according to early start dates. Owner's Representative shall have the right to apportion float time according to the needs of the Project.

1. Contractor agrees that actual delays affecting paths of activities containing float time will not have any affect upon Contract completion times, providing that actual delay does not exceed float time associated with those activities.

END OF SECTION 01 32 00

# SECTION 01 33 00 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
5. Division 01 Section "Closeout Procedures" for submitting warranties.
6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
9. Division 01 Section “Sustainable Design Requirements” for the CTHPBS Submittal Sheet to be submitted with each product.
10. Division 01 Section “General Commissioning Requirements.”
11. Divisions 02 through 33 Sections for specific requirements for submittals in those Sections.

### 1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's and Construction Manager’s responsive action.

B. Informational Submittals: Written information that does not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

## 1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
4. Update the submittals schedule periodically as the work progresses. Submit concurrently with each Application for payment.
5. Utilize a computerized program for tracking submittals. Submit the following reports bi-weekly:

    a. Complete list of reviewed submittals.
    b. Listing of submittals to date.
    c. Listing of approved submittals.
    d. Listing of rejected submittals.
    e. Listing of submittals returned for correction.
    f. List of outstanding submittals.

6. At the request of the Architect provide reports capable of being sorted by the following criteria:

    a. Approved status.
    b. Subcontractor/Supplier.
    c. Submission date.
    d. Number of days late for return.
    e. Number of days under review.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Submittals: Submittals, including but not limited to, shop drawings and product data are required to be electronically submitted, tracked, and distributed for the duration of the project in PDF form. Use a web-based system of transmitting and tracking electronic documents to the Architect for review using Submittal Exchange.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
    b. Coordinate transmittal of all submittals requiring color selection, so that comprehensive selection can be processed.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow two (2) weeks for initial review of each submittal. Allow two (2) additional weeks for review of architectural submittals that require plumbing, HVAC, or electrical work to complete the installation. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow two (2) weeks for review of each resubmittal. Allow two (2) additional weeks for review of architectural submittals that require plumbing, HVAC, or electrical work to complete the installation.

    a. Resubmittals will be reviewed no more than two times at the Owner’s expense. Resubmittals which fail to comply with Contract requirements will be reviewed at the Contractor’s expense, based on an hourly rate of $75 per hour, not to exceed $600 for each subsequent submittal.

b. The Owner reserves the right to deduct said reimbursement from the Contractor's application for payment on a monthly basis.

4. Concurrent Consultant Review: Submittals shall be transmitted simultaneously to Architect and to Architect's consultants. Allow two weeks for review of each submittal. Consultant will return submittal to Architect before being returned to Contractor.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

**a.** File name shall be formatted as follows: **ARES-064023.01-8-2.4A.**

1) Project Name-
2) Specification Section number followed by a decimal point and then a sequential number for the submittal number of that product-
3) Specification Section page number-
4) Paragraph number where product is specified.
5) Resubmittals shall include a numerical suffix after submittal number as follows:

a) **ARES-064023.02-8-2.4A.**

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.

r. Other necessary identification.
s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked “Approved” or “Approved as Corrected.”
4. The Contractor shall resubmit submittals that are returned from the Architect as “Revise and Resubmit” or “Not Approved” using the same submittal number as the original submittal. The Contractor shall revise the Review number, as appropriate.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS, GENERAL

A. Shop Drawings, Product Data, Samples, and similar submittals are not contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals.

1. The Contractor represents to the Owner and Architect that the Contractor has reviewed and approved the submittal, determined and verified materials, field measurements and field construction criteria related thereto, and checked and coordinated the information contain within such submittals with the requirements of the Work and to the Contract Documents.

B. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

C. The Architect's review of the Contractor's submittals shall not relieve the Contractor of their obligations under the Contract.

D. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures.

E. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

F. Refer to the Contract Documents for further submittal requirements and limitations in the scope to the Architect's review.

## 2.2 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

    a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with specified referenced standards.
    l. Testing by recognized testing agency.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**.**

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.
    l. Notation of dimensions established by field measurement.

m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional structural engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.

a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
b. Refer to Division 01 Section "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit five copies of product schedule or list, unless otherwise indicated. Architect, through Construction Manager, will return four copies.

    a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

4. Number of Copies: Submit five copies of subcontractor list, unless otherwise indicated. Architect, through Construction Manager, will return four copies.

    a. Mark up and retain one returned copy as a Project Record Document.

J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

K. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

L. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

M. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

O. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

P. CTHPBS Submittals: Comply with requirements specified in Division 01 Section " Sustainable Design Requirements."

Q. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

R. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

S. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

T. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

U. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

V. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

W. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

X. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Y. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

Z. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

AA. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

BB. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

CC. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

DD. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

EE. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.

2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

FF. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

GG. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

HH. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

## 2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit five copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM File Incorporation: Construction Manager will incorporate delegated-design drawing and data files into Building Information Model established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Provide “Combined Contractor/Construction Manager/KBA Inc. Shop Drawing Review Stamp” attached after this Section.

### 3.2 ARCHITECT'S AND CONSTRUCTION MANAGER’S ACTION

A. General: Architect and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. “Approved”: The portion of Work covered by the submittal may proceed provided it complies with the Contract Documents.
2. “Approved as Corrected”: The portion of Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal, and with the Contract Documents.
3. “Not Approved” or “Revise and Resubmit”: Revise or prepare a new submittal in accordance with notations; resubmit. Do not proceed with that portion of the Work covered by the submittal.

C. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Construction Manager will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

3.3 FORMS

A. The following form referenced in this Section is attached:

1. Combined Contractor/Construction Manager/KBA Inc. Shop Drawing Review Stamp, 1 page.

END OF SECTION 01 33 00

## COMBINED CONTRACTOR / CONSTRUCTION MANAGER / K.B.A. INC. SUBMITTAL REVIEW STAMP

CONTRACTOR: _____

PROJECT: _____

PARAGRAPH NO.: _____ SUBMITTAL NO.: _____

CONTRACTOR HAS DETERMINED AND VERIFIED MATERIALS, FIELD MEASUREMENTS AND FIELD CONSTRUCTION CRITERIA AND HAS CHECKED AND COORDINATED THE INFORMATION CONTAINED IN THIS SUBMITTAL WITH THE REQUIREMENTS OF THE WORK AND OF THE CONTRACT DOCUMENTS AND RECOMMENDS APPROVAL BY THE CONSTRUCTION MANAGER / ARCHITECT / ENGINEER.

BY: _____ DATE: _____

TO BE FILLED IN BY THE CONTRACTOR

CONSTRUCTION MANAGER: _____

☐ REVISE AND RESUBMIT ☐ NOT APPROVED

CONSTRUCTION MANAGER HAS COORDINATED THIS SUBMITTAL WITH INFORMATION CONTAINED IN RELATED DOCUMENTS AND RECOMMENDS APPROVAL BY THE ARCHITECT / ENGINEER.

☐ APPROVED ☐ APPROVED AS NOTED

BY: _____ DATE: _____

TO BE FILLED IN BY THE CONSTRUCTION MANAGER

KAESTLE BOOS ASSOC. PROJECT NO.: 21011.00

ARCHITECTS/ENGINEERS DATE RECEIVED STAMP:

TO BE FILLED IN BY THE CONSTRUCTION MANAGER

TO BE FILLED IN BY KAESTLE BOOS ASSOC., INC.

COMMENTS MADE ON THE SUBMITTALS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE CONTRACT DOCUMENTS. REVIEWING IS ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT THE SITE; FOR INFORMATION THAT PERTAINS SOLELY TO THE FABRICATION PROCESSES OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION; AND FOR COORDINATION OF THIS WORK WITH THE WORK OF ALL TRADES.

ACTION STAMP:

**DO NOT REMOVE**
**THIS PAGE INTENTIONALLY LEFT BLANK**

# SECTION 01 40 01 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control, and mockup requirements.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 01 Section “Special Inspections and Structural Testing.”
3. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
4. Divisions 02 through 33 Sections for specific test and inspection requirements.
5. Divisions 02 through 33 Sections for specific mock-up requirements.

### 1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Project Manager, Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Structural Engineer Qualifications: A professional structural engineer who is legally qualified to practice in the State of Connecticut and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
    g. Payment for preconstruction testing will be made by the Contractor.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion, where indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings and as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 33.

## 1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by the Owner.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
4. The Owner reserves the right to have the following inspections performed by the Owner’s Commissioning Agent, or other consultant:

    a. Infrared thermal scan of building envelope at project completion with HVAC systems running at operating temperature.
    b. Infrared thermal scan of completed membrane roofing system.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

1. Retesting to be performed by the Inspection and Testing Agency that performed the original tests.
2. Retest original failed test and perform two additional tests at new locations to be determined by Architect and Testing Agency.
3. Continue retesting until compliance is achieved.

E. Testing Agency Responsibilities: Cooperate with Architect, Project Manager, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Project Manager, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.
7. Do not permit the Contractor to deviate from the requirements of the Contract Documents.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.
2. Provide the Testing Agency with a complete set of Contract Documents.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to Owner, Architect, Project Manager, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## 1.9 SPECIAL TESTS AND INSPECTIONS

A. Comply with Division 01 Section “Special Inspections and Structural Testing.”

B. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by the Connecticut State Building Code and by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Project Manager, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

a. Costs associated with retesting and reinspecting are the responsibility of the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Project Manager, Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 01

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**SECTION 01 41 00 - SPECIAL INSPECTIONS AND STRUCTURAL TESTING**

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary."

B. Special Inspections and Structural Testing shall be in accordance with Section 1704 of the Connecticut State Building Code.

1.2 QUALIFICATIONS

A. The Special Inspector shall be a Professional Engineer licensed in the State of Connecticut who is approved by the Structural Engineer of Record (SER) and Building Official.

B. The testing laboratory shall be NVLAP accredited and approved by the Structural Engineer of Record (SER) and Building Official.

C. The testing laboratory shall maintain a full time Professional Engineer licensed in the State of Connecticut on staff who shall stamp and sign all test reports. The Professional Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.

D. Special Inspections shall be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-in-Training (EIT) with an education and background in structural engineering except as indicated below.

1. Special Inspections of soils and foundations may be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-in-Training (EIT) with an education and background in geotechnical engineering.
2. Technicians performing tests of concrete shall be ACI certified Concrete Field-Testing Technicians - Grade 1.
3. Inspectors performing inspections of concrete work may be ACI certified Concrete Construction Inspectors in lieu of being a P.E. or EIT.
4. Technicians performing tests or inspections of welds shall be AWS Certified Welding Inspectors. Technicians performing ultrasonic testing shall also be certified as an ASNT-TC Level II or Level III technician.
5. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be conducted. They shall be under the supervision of a Professional Engineer and shall not be permitted to independently evaluate test results.

1.3 SUBMITTALS

A. The Special Inspector and Testing Laboratory shall submit to SER and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.

B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.4 PAYMENT

A. The Owner shall engage and pay for the services of the Special Inspector and Testing Laboratory.

B. If any materials which require Special Inspections are fabricated in a plant which is not located in Connecticut, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.

C. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents.

1.5 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and testing may be performed without hindrance.

B. The Contractor shall notify the Special Inspector or Testing Laboratory at least twenty-four (24) hours in advance of a required inspection or test.

C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

D. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the inspectors and testing technicians.

E. The Special Inspection program shall in no way relieve the Contractor of this obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program.

F. The Contractor shall be solely responsible for construction site safety.

1.6 LIMITS ON AUTHORITY

A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.

B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.

C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.

D. The Special Inspector or Testing Laboratory has no authority to stop the work.

1.7 STATEMENT OF SPECIAL INSPECTIONS

A. The Statement of Special Inspections will be prepared by the Structural Engineer of Record (SER).

B. CEPP/SEC Form 101 - 2004 shall be used for the Statement of Special Inspections.

C. The Statement of Special Inspections shall be submitted with the application for Building Permit.

1.8 RECORDS AND REPORTS

A. Detailed reports shall be prepared for each inspection or test. Reports shall include:

1. Date of test or inspection
2. Name of inspector or technician
3. Location of specific areas tested or inspected
4. Description of test or inspection and results
5. Applicable ASTM standard
6. Weather conditions
7. Professional Engineer's stamp and signature

B. Interim reports shall be submitted at the end of each week which include reports for all inspections and tests performed that week.

C. Reports shall be addressed to the Building Official with copies sent to the SER, Architect, and Contractor.

D. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor. If the discrepancies are not corrected, the Special Inspector shall notify the SER and Building Official.

E. The Test Laboratory shall immediately notify the SER by telephone or fax of any test results which fail to comply with the requirements of the Contract Documents.

F. Reports shall be submitted within seven (7) days of the inspection or test. Handwritten reports may be submitted if final typed copies are not available.

G. At the completion of the work requiring Special Inspections, each inspection agency and testing laboratory shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.9 FINAL REPORT OF SPECIAL INSPECTIONS

A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the SER and Building Official prior to the issuance of a Certificate of Use and Occupancy.

B. CEPP/SEC Form 102 - 2001 shall be used for the Final Report of Special Inspections.

C. The Final Report of Special Inspections will certify that all required inspections have been performed and will itemize any discrepancies which were not corrected or resolved.

1.10 SCHEDULE OF INSPECTIONS AND TESTS

A. Required inspections and tests are described in the Schedule of Special Inspections and in the individual Specification Sections for the items to be inspected or tested.

END OF SECTION 01 41 00

**SECTION 01 42 00 - REFERENCES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. “Contractor”: The person, corporation, or other entity with whom the Awarding Authority has executed an Agreement. Also referred to as CM, Construction Manager, Contractor, or General Contractor.

D. “Trade Contractor”: Also referred to as Filed Subcontractor, Subcontractor, and Filed Sub Bid.

E. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

# SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.
4. Division 01 Section “Indoor Air Quality Requirements.”
5. Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

### 1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water-service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

### 1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

## 1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.

## 1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Pavement: Comply with Division 32 Section "Asphalt Paving."

B. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.

## 2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground, unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for demolition operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line and one facsimile line for field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine.
b. Provide one telephone line(s) for common use.

2. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Architect's office.
e. Engineers' offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

## 3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Temporary Signs: Provide signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

I. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.

1. Comply with Division 01 Section "Execution" for progress cleaning requirements.
2. Provide sufficient quantity of dumpsters at strategic locations within the Contract limit lines for collection of waste from the work of all Subcontractors.
3. Do not pass materials through open windows, or through window openings when any portion of the window remains in the opening.

J. Temporary Elevator Use: Use of elevators is not permitted.

K. Temporary Lifts and Hoists: The Contractor shall provide, operate and maintain in safe operating order facilities for hoisting materials, rubbish, employees and to otherwise carry out the Work. Truck cranes, fork lifts, man lifts and similar devices required for the performance of the Work by each Subcontractor shall be provided by the Subcontractor.

1. Provide temporary lifts and hoists that comply in all respects with the most stringent of all applicable Federal (including OSHA), state and local laws, rules, regulations, codes and ordinances, and provisions of Division 01 of this Specification.
2. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

L. Staging and Scaffolding: Where staging and scaffolding is required, the Contractor shall provide the entire installation.

1. Staging shall be of approved design, erected and removed by experienced stage builders and shall have all accident prevention devices required by State and local laws.

M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

N. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 31 Section "Site Clearing."

D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: The Construction Manager shall provide all temporary enclosures for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Provide enclosures as required on the exterior or interior side of the building, whether the roof has been installed or not, and whether windows or doors have been installed or not, in order to protect the Work and allow Work to continue in accordance with the requirements of

the Specifications. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

a. Erect and maintain temporary enclosures and temporary heat during the months of November through March.

2. Install tarpaulins securely, with fire-retardant-treated wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.
5. Do not use new permanent doors and frames for temporary enclosures until finishing work is begun, and then only if carefully protected from damage. Prior to installation of permanent doors and frames, provide temporary wood or plywood doors with wood frames and proper hardware to make the doors self-closing.

a. Close and lock all openings accessible from ground level at end of each day=s work to prevent entry of unauthorized persons.

J. Protection: Protect the Work at all times from damages. Provide all pumps, equipment and enclosures to ensure this protection.

1. Remove all snow and ice as may be required for proper protection and prosecution of the work.
2. Provide all shoring, bracing and sheeting as required for safety and for proper execution of work.
3. Protect all work from damage during cold weather. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, cease work and notify Architect. Repair and/or replacement of all work damaged from frost, freezing or any elements of the weather are the responsibility of the Contractor responsible for temporary protection of the Work.
4. Should high wind warnings be issued by the U.S. Weather Advisory Bureau, take every precaution to minimize danger to persons, to the Work, and to adjacent properties, including, but not limited to, removing all loose materials, tools and/or equipment from exposed locations, and removing or securing scaffolding or other temporary work.
5. Protect the building and the site from damage, loss or liability due to theft or vandalism when the work is not in progress at night, weekends, or holidays.
6. Exercise precaution for the protection of persons and property at all times. Observe the provisions of applicable laws and construction codes. Take additional safety and health measures, or cause such measures to be taken as reasonably necessary. Maintain guards on machinery, equipment and other hazards as set forth in the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable laws.
7. Protect and preserve in operating conditions all utilities traversing the work area. Repair all damages to any utility due to work performed under this Contract, the satisfaction of the Architect at no additional cost to the Owner.

8. Protect all existing and new finished surfaces against damage from work under this Contract. Restore or replace finishes that are damaged to their original condition, subject to approval by the Architect, and at no additional cost to the Owner.

K. Roof Protection: The Contractor shall protect all existing roof surfaces to prevent damage from selective demolition and new construction operations. Keep traffic on roof systems to a minimum, and permit traffic only as required to complete the work under this Contract.

1. Repair or replace roofing system components and substrates to their original condition where damaged by operations under this Contract. Comply with Specifications and/or roofing manufacturer's written recommendations for maintaining new and existing roofing warranties, subject to approval by the Architect, and at no additional cost to the Owner.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

## 3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

**SECTION 01 56 39 – TEMPORARY TREE AND PLANT PROTECTION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the specific protection, fertilization, and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limits placed on Contractor's use of the site.
2. Division 31 Section "Site Clearing" for temporary tree protection, removal limits of trees, shrubs, and other plantings affected by new construction.
3. Division 31 Section "Earth Moving" for site excavation, backfilling, compacting and grading requirements, and soil materials.
4. Division 32 Section "Plants" for tree and shrub planting and transplanting, tree support systems, and soil materials.

1.3 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Certification from a qualified arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

D. Maintenance Recommendations from a qualified arborist for care and protection of trees affected by construction during and after completing the Work.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: An arborist certified by the International Society of Arboriculture or licensed in the State of Connecticut.

B. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated.

C. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least three working days before convening conference. Record discussions and agreements and furnish a copy to each participant.

PART 2 - PRODUCTS

2.1 DRAINAGE FILL: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

2.2 TOPSOIL: Conform to Division 32 Section “Topsoil”.

2.3 FILTER FABRIC: Refer to Division 31, Section “Earth Moving”, “Drainage Fabric” paragraph.

2.4 FERTILIZER

A. The fertilizer shall be injected into the soil as an aqueous suspension or solution.

B. The fertilizer shall contain nitrogen, phosphorus and potassium in a 3:1:1 ratio. (Three times as much nitrogen as phosphorus and potassium). Suitable analysis would include 28-9-9, 18-6-6 or 12-4-4.

C. At least 75% of the nitrogen in the fertilizer shall be derived from a slow release source such as Ureaform Sulfur coated Urea or IBDU.

D. The salt index of the fertilizer shall not exceed 35.

2.5 SAND: Refer to Division 31, Section “Earth Moving.”

2.6 PERLITE: Horticultural, inorganic perlite.

PART 3 - EXECUTION

3.1 PREPARATION

A. Safety Barricade: Install safety barricade located as indicated or outside the drip line of trees to protect remaining vegetation from construction damage. Refer to Division 31, Section "Site Clearing" of this Specification.

B. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.

D. Do not allow fires under or adjacent to remaining trees or other plants.

3.2 EXCAVATION

A. Install sheeting, shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within drip line of trees, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond drip line of trees. Maintain existing grades within drip line of trees.

B. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

C. Moderate Fill: Where existing grade is more than 6 inches, but less than 12 inches, below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:

1. Carefully place drainage fill against tree trunk or restraint and extend to dripline on all sides. Depth – typical 8".
2. Place filter fabric with edges overlapping 6 inches' minimum.
3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

## 3.4 TREE PRUNING AND FERTILIZATION

A. Prune and fertilize all designated trees and shrubs.

B. Prune to compensate for root loss caused by damaging or cutting root system.

C. Pruning Standards: Prune trees according to ANSI A300 and National Arborists Association as follows, to remove dead, diseased, decayed and obviously weak branches.

1. Type of Pruning: Crown cleaning and thinning (Class II), and crown raising, where designated branches are to be removed to provide additional head room.

D. Cut branches with sharp pruning instruments; do not break or chop.

E. All designated trees are to be pruned and fertilized. Fertilizer rates are based on the nitrogen content of the fertilizer.

Determine fertilizer rates by the crown spread technique – based on the soil surface area beneath the crown. Apply 3 lbs. of actual nitrogen per 1000 sq. ft. of soil surface beneath the crown and 3' beyond the dripline of the tree.

F. The fertilizer shall be applied using a hydraulic sprayer operating at 200 psi and an injection probe that will permit subsurface placement of the fertilizer solution. Injection holes should be two to three feet apart and 12 inches deep. Begin injection site two to three feet from the trunk and work out to three feet beyond the drip line of the branches.

## 3.5 SOIL ENHANCEMENT

A. Soil Enhancement shall consist of drilling holes in the soil throughout the tree root zone of existing trees to remain, and backfilling with porous soil amendments to relieve the problems of poorly oxygenated soils and poor soil structure caused by soil compaction.

B. Vertical holes, 24 inches deep, shall be made in the soil of the tree root zone using a power drill having a 2-inch auger. These holes shall be spaced 3 feet apart in a grid pattern at a point starting 2 feet away from the trunk base to 10 feet beyond the dripline of the tree canopy.

C. The vertical hole shall be filled to the top with a soil mixture consisting of equal parts (1/3 each) of perlite, sand and screened topsoil. This soil mixture shall be placed in the vertical hole by use of a funnel or by hand raking, whichever is more efficient for the contractor. If the latter is the preferred method however, the contractor shall take precaution against storing the soil amendments for long periods of time (6-hour maximum) on the ground surface within the tree root zone before working it into the vertical holes that were previously made.

## 3.6 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to written instructions of the qualified arborist.

B. Remove and replace dead and damaged trees that the qualified arborist determines to be incapable of restoring to a normal growth pattern.

1. Provide new trees of the same size and species as those being replaced; plant and maintain as specified in Division 32 Section "Planting."

C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augured soil and sand.

## 3.7 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property.

END OF SECTION 01 56 39

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# SECTION 01 60 00 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 01 Section "References" for applicable industry standards for products specified.
2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
3. Division 01 Section “Sustainable Design Requirements” for CTHPBS product requirements.
4. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

### 1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise.

    a. Products salvaged or recycled from other projects are not considered new products.
    b. Products manufactured and stored for more than one year prior to the start date of this project are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
4. "Or Equal" Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

    a. An item equal to that named or described in the specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications.

5. Unspecified Products: If an indicated product or item is not specified, the Contractor shall provide the quantity indicated in the Contract Documents. The product or item must be new, of average quality, and fit for the use for which it was intended. If a commercially available manufactured product is not available to fulfill these requirements, the Contractor shall provide a custom fabricated product or item at no additional cost to the Owner. Submit shop drawings in accordance with Division 01 Section "Submittal Procedures."

    a. This does not apply to unspecified products or items that must be provided in accordance with the manufacturer's recommendation for a complete installation of a specified product or item. Such products or items shall be provided in accordance with the manufacturer's recommendation.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification, **or for purposes of evaluating "or equal" products.**

C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 90 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided at end of Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor, through Construction Manager, of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor, through Construction Manager, of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. The Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
3. Warranty Period: All warranty periods are required to commence on the date of Substantial Completion regardless of manufacturer's limitations. The Contractor is responsible to purchase an extended warranty as required.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. List of Warranties: Provide warranties for products and installations as specified, including but not limited to the following:

1. Sheet Waterproofing: Division 07 Section "Self-Adhering Sheet Wateproofing."
2. Membrane Air Barrier: Division 07 Section "Fluid-Applied Membrane Air Barriers."
3. Metal Wall Panels: Division 07 Section "Insulated Metal Wall Panels."
4. Metal Soffits: Division 07 Section "Linear Metal Soffits."
5. Membrane Roofing: Division 07 Section "Thermoplastic Membrane Roofing."
6. Roof Edge: Division 07 Section "Roof Specialties."
7. Roof Hatches: Division 07 Section "Roof Accessories."
8. Sealant: Division 07 Section "Joint Sealants."
9. Solid Core Interior Wood Doors: Division 08 Section "Flush Wood Doors."
10. Aluminum Entrances and Storefront: Division 08 Section "Aluminum-Framed Entrances and Storefront."
11. Fiberglass Sandwich Panels: Division 08 Section "Fiberglass-Sandwich-Panel Assemblies."
12. Aluminum Windows: Division 08 Section "Aluminum Windows."
13. Unit Skylights: Division 08 Section "Unit Skylights."
14. Door Hardware: Division 08 Section "Door Hardware."
15. Insulating Glass: Division 08 Section "Glazing."
16. Acoustical Ceiling Panels and Grid: Division 09 Section "Acoustical Panel Ceilings."
17. Rubber Stair Treads: Division 09 Section "Resilient Base and Accessories."

18. Resilient Flooring: Division 09 Section “Resilient Tile Flooring.”
19. Resinous Flooring: Division 09 Section “Resinous Flooring.”
20. Athletic Flooring: Division 09 Section “Fluid-Applied Athletic Flooring.”
21. Carpeting: Division 09 Section “Tile Carpeting.”
22. Water Vapor Emission Control System: Division 09 Section “Water Vapor Emission Control System.”
23. Markerboards: Division 10 Section “Visual Display Surfaces.”
24. Toilet Compartments: Division 10 Section “Plastic Toilet Compartments.”
25. Panel Signs: Division 10 Section “Signage.”
26. Folding Partitions: Division 10 Section “Operable Partitions.”
27. Glass Partitions: Division 10 Section “Folding Glass-Panel Partitions.”
28. Impact Resistant Wall Coverings: Division 10 Section “Wall Protection.”
29. Mirrors: Division 10 Section “Toilet and Bath Accessories.”
30. Fire Extinguishers: Division 10 Section “Fire Protection Specialties.”
31. Lockers: Division 10 Section “Metal Lockers.”
32. Appliances: Division 11 Section “Residential Appliances.”
33. Foodservice Equipment: Division 11 Section “Food Service Equipment.”
34. Gymnasium Equipment: Division 11 Section “Gymnasium Equipment.”
35. Gymnasium Divider Curtain: Division 11 Section “Gymnasium Dividers.”
36. Roller Window Shades: Division 12 Section “Roller Window Shades.”
37. Elevators: Division 14 Section “Hydraulic Elevators.”

D. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal", comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:

a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed equal product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. Manufacturers:

a. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed equal manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

3. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
4. Basis-of-Design Products: Where Specifications name a product and include a list of manufacturers, provide the specified product, a comparable product, or equal by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

C. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

2.3 PRODUCT SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided.
c. Requested substitution has been evaluated by the Contractor for its impact on CTHPBS points and does not adversely affect the project point total.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    d. Requested substitution provides sustainable design characteristics that specified product provided.
    e. Requested substitution has been evaluated by the Contractor for its impact on CTHPBS points and does not adversely affect the project point total.
    f. Substitution request is fully documented and properly submitted.
    g. Requested substitution will not adversely affect Contractor's construction schedule.
    h. Requested substitution has received necessary approvals of authorities having jurisdiction.
    i. Requested substitution is compatible with other portions of the Work.
    j. Requested substitution has been coordinated with other portions of the Work.
    k. Requested substitution provides specified warranty.
    l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

## PART 3 - EXECUTION

### 3.1 FORMS

A. The following Form is attached:

    1. Substitution Request Form, 2 pages.

END OF SECTION 01 60 00

**SUBSTITUTION REQUEST**
**(After the Bidding Phase)**

DATE: _____



Project: _____
_____
To: _____
_____
Re: _____

Substitution Request Number: _____
From: _____
Date: _____
KBA Project Number:_____
Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No. _____
Installer: _____ Address: _____ Phone: _____
History: [ ] New Product [ ] 2-5 years old [ ] 5-10 years old [ ] More than 10 years old
Differences between proposed substitution and specified product: _____
_____
_____
[ ] Point-by-point comparative data attached – REQUIRED BY ARCHITECT

Reason for not providing specified item: _____
_____
Similar Installation:
Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____
Proposed substitution affects other parts of Work: [ ] No [ ] Yes; Explain: _____
_____

Savings to Owner for accepting substitution: _____ ($ _____)
Proposed substitution changes Contract Time: [ ] No [ ] Yes [Add] [Deduct] _____ days.

Supporting Data Attached: [ ] Drawings [ ] Product Data [ ] Samples [ ] Tests [ ] Reports [ ] _____

**SUBSTITUTION REQUEST** DATE: _____

**(After the Bidding Phase)**



The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for addition costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all aspects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

ARCHITECTS'S REVIEW AND ACTION

[ ] Substitution approved - Make submittals in accordance with Specification Section 01330.
[ ] Substitution approved ad noted - Make submittals in accordance with Specification Section 01330.
[ ] Substitution rejected – Use specified materials.
[ ] Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: [ ] Contractor [ ] Subcontractor [ ] Supplier [ ] Manufacturer [ ] Architect [ ] _____

_____

_____

_____

_____

_____

**SECTION 01 73 00 - EXECUTION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in the State of Connecticut and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

## 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect, Project Manager, Construction Manager promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect, Project Manager, Construction Manager when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect , Project Manager, and Construction Manager.

## 3.4 FIELD ENGINEERING

A. Identification: Identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Project Manager, Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Project Manager, Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey, defined by the State of Connecticut and as required by the Town of Newington, showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, existing improvements (buildings, roads, walks, fences, curbs, etc.) and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. In addition to all physical features, show all utilities including but not limited to water, wells, sewer/septic, stormwater, underdrainage, gas, electricity, telephone, cable, fiber optic, and irrigation mains. Identify locations of all structures, piping, holes, wires and lines in relation to site improvements, including sleeves and empty conduits.
3. Show elevation and inverts for sewer and storm drainage piping and structures, and locations, elevations, and inverts of all other concealed improvements.
4. Show grading and limits of all stormwater retention and detention basins along with grading and limits of all wetland replication areas.
5. Delete subparagraph below if Owner has taken responsibility to record survey.
6. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

    a. Submit final property survey in electronic format compatible with AutoCAD.

## 3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 7’-6” in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

## 3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

## 3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

## 3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

**SECTION 01 73 29 - CUTTING AND PATCHING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
2. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Penetration of in-place construction with an edged tool or drill to facilitate the installation or performance of other Work, including the removal of debris.

B. Coring: Penetration of in-place construction with a drill that is designed to make the penetration in a manner such that the core can be removed to facilitate the installation or performance of other Work, including the removal of debris.

C. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive Architect's right to later require removal and replacement of unsatisfactory work.

## 1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include, but are not limited to the following:

1. Concrete foundation construction.
2. Bearing and retaining walls, including architectural precast panels.
3. Lintels.
4. Structural steel frame.
5. Structural decking.
6. Miscellaneous structural metals.
7. Interior and/or exterior load bearing masonry wall construction.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire-suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Piping, ductwork, vessels, and equipment.
4. Noise- and vibration-control elements and systems.
5. Roofing systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

## 3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. Cutting and Coring Responsibility:

a. Cutting and coring openings less or equal to than 12 inches square or in diameter in all partitions in conjunction with the work of a Trade Contractor, is the responsibility of the Trade Subcontractor.

1) All other cutting of masonry partitions requiring openings greater than 12 inches in any direction is the responsibility of the Masonry Trade Contractor.

b. Cutting and coring concrete slabs, including slab on grade and slab on deck, is the responsibility of the Trade Contractor requiring the penetration.
c. Cutting and coring of structural steel elements for all work is the responsibility of the Miscellaneous and Ornamental Iron Trade Contractor.
d. Cutting and coring of roofing, openings, penetrations and associated patching and flashing is the responsibility of the Roofing and Flashing Trade Contractor.

2. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
3. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
4. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
5. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
7. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Patching Responsibility:

   a. Patching in conjunction with the cutting work of each Trade Contractor is the responsibility of the Trade Contractor. All other patching is the responsibility of the Contractor responsible for the cutting and coring.
   b. If the size of the cut is in excess of that required for the penetrating item, and exceeds the 12- inch dimension for work of the Trade Contractor, the patching is the responsibility of the Trade Contractor.

2. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

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# SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements of the Contractor for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. The Contractor is responsible for all costs associated with construction waste management and disposal.

C. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
2. Division 01 Section "Sustainable Design Requirements."

### 1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Site improvement materials resulting from selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

a. Asphalt paving.
b. Concrete.
c. Concrete reinforcing steel.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 REQUIREMENTS FOR CONSTRUCTION WASTE MANAGEMENT

A. The Contractor shall prepare and submit a Construction Waste Management Plan to the Owner and Architect for approval. The CWM Plan shall outline the provisions to be implemented by the Contractor and Subcontractors to recycle and salvage demolition and construction waste generated during the project.

B. Upon approval of the CWM Plan by the Owner and Architect, it shall be implemented by the Contractor and Subcontractors throughout the duration of the project, and documented in accordance with the Submittal Requirements below.

C. The Construction Waste Management Plan shall include, but not be limited to, the following components:

1. Listing of Targeted Materials: The contractor shall develop a list of the waste materials from the Project that will be targeted for reuse, salvage, or recycling. The following materials, at minimum, shall be accounted for (materials that will not be recycled shall be indicated as such):

    a. Cardboard, paper, packaging
    b. Clean dimensional wood, palette wood
    c. Beverage containers
    d. Concrete and/or Concrete Masonry Units (CMU)
    e. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
    f. Drywall
    g. Carpet and pad
    h. Paint
    i. Rigid Foam
    j. Glass
    k. Plastics

2. Landfill Information: The contractor shall provide the name and location of the landfill(s) where trash will be disposed of.
3. Recycling or Salvaging Facilities: The contractor shall provide the names and locations of the recycling or salvaging facilities where waste materials will be delivered.
4. Sorting Method: The contractor shall provide a description of the proposed means of sorting and transporting the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site for off-site sorting). Waste haulers using off-site sorting operations shall provide a written description of the sorting process used, and their method for calculating project-specific recycling rates.
5. Packaging Waste: The contractor shall note whether suppliers will eliminate or take back packaging for major materials delivered to the site.
6. Implementation and Supervision: The contractor shall include provisions in the Construction Waste Management Plan for addressing conditions in the field that do not adhere to the CWM Plan, including provisions to rectify non-compliant conditions.

7. Additional Information: The contractor shall include any additional information deemed relevant to describe the scope and intent of the CWM Plan to the Owner and Architect.

D. Construction Waste Management and recycling requirements shall be incorporated into all Subcontractors' contracts.

1.6 CTHPBS SUBMITTAL REQUIREMENTS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.

B. Provide a monthly diversion summary and back-up documentation for where debris was taken.

1.7 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

## 1.8 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

## 1.9 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect and Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

## 3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

## 3.3 RECYCLING DEMOLITION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

## 3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4 inch size.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

H. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

I. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

J. Plumbing Fixtures: Separate by type and size.

K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

L. Lighting Fixtures: Separate lamps by type and protect from breakage.

M. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

N. Conduit: Reduce conduit to straight lengths and store by type and size.

## 3.5 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

## 3.6 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

## 3.7 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

# SECTION 01 77 00 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
6. Division 01 Section “Indoor Air Quality Requirements.”
7. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

### 1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 PUNCH LIST REQUIREMENTS

A. Definitions:

1. Contractor's Punch List: Complete list of incomplete and incorrect Work prepared by the Contractor prior to request of Architect's inspection for Certification of Substantial Completion. As a minimum, the List shall include the following information for each work item:

a. Location identification organized by Building, Area, Room Number, or combination thereof as appropriate to project
b. Clear identification of each incomplete work item, including all subcontractors' work.
c. Estimated value of each incomplete work item.
d. A short statement of why work is not complete.
e. Identify subcontract responsibility, as appropriate to each item.

2. Architect's Punch List: A list of Incomplete and incorrect Work prepared by the Architect, which modifies the Contractor's Punch List, following review and acceptance of the Contractor's Punch List.

B. Pre-Closeout requirements: Prior to requesting initial Architect's inspection for Certification of Substantial Completion, submit to the Architect a full and complete list of all incomplete work items (Contractor's Punch List).

C. Punch list procedures at Substantial Completion:

1. Architect will review submitted Contractor's Punch List and determine whether it is suitable to proceed with the Substantial Completion Process.

a. If the Architect determines that the amount of completed work is insufficient to be considered for Substantial Completion, the Architect will not proceed with the Punch lists process until sufficient completion of the Project is achieved.
b. The Architect will review the Contractors Punch List and if the Architect determines that it does not reflect proper identification of the incomplete and

incorrect work, he/she will request revision and resubmission of the Contractor's Punch List.

c. lf the Architect determines that the amount of work indicated on the Contractor's Punch List is excessive, the Architect will suspend its review until the scope of Work identified in the Contractor's Punch is reduced to a level satisfactory to the Architect.

d. When the Architect reviews and accepts the Contractor's Punch List as being an accurate reflection of incomplete and incorrect work; the Architect will prepare and issue to the Contractor the 'Architect's Punch List."

1) The Architect's Punch List will be based on the Contractor's Punch List with modifications and additions as may be required.

2) The Architect's Punch List includes Work which must be completed and corrected prior to Final Completion.

2. Upon receipt of the Architect's Punch List, the Contractor shall immediately distribute the list to all subcontractors.

D. Completion of Punch List Work: Make reasonable efforts to ensure that all "Architect's Punch List" items are completed or corrected within 14 calendar days from the date of the Architect's Punch List" or within the Contract Time, whichever is earlier.

E. Architect's Final Inspection and review of Punch List Work:

1. After Contractor certification that all punch list Work has been properly completed the Architect will then perform the Final Inspection.

a. Incomplete Items: If the Architect discovers any incomplete or incorrect "Architect's Punch List" items or any other deficiency in the work, the Architect will prepare a "Revised Punch List" which may also include other incomplete Contract requirements such as record documents, owner's operation and maintenance manuals, warranties, and other Contract requirements. Architect's site reviews of the Work for this "Revised Punch List" and any subsequent revised Punch Lists shall be performed as additional service to Owner and back-charged to the Contractor.

b. The Architect may assign a dollar value for each item of incomplete or incorrect work remaining.

F. Additional Inspections and related additional services fee: The Architect and the Architect's consultants will provide two site inspections, one at Substantial Completion, and one to confirm that the "Architect's Punch List" has been completed.

1. Revised Punch List: If the Architect prepares and issues a "Revised Punch List" because of the Contractor's failure to complete the Work, then the Owner will compensate the Architect and the Architect's consultants for their additional services and additional inspections. The payment for additional services and inspections will be back-charged to Contractor. The Owner will deduct the amount of the Architect's additional services fee from final payment to the Contractor by Change Order.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 Section "Sustainable Design Requirements" and in individual Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

## 1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect and Construction Manager.
d. Name of Project Manager.
e. Name of Contractor.
f. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: The Construction Manager shall provide final cleaning, unless otherwise indicated to be provided by a Trade Contractor. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. HEPA vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. The HVAC Subcontractor shall replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. The HVAC Subcontractor shall clean ducts, blowers, and coils.
r. The Contractor shall clean light fixtures, lamps, globes, and reflectors to function with full efficiency. The Electrical Subcontractor shall replace burned-out bulbs, those used during construction, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures that have been provided by the Electrical Subcontractor.
s. Leave Project clean and ready for occupancy.

2. Before requesting final inspection for determining date of Final Completion, complete cleaning operations listed above as required following Substantial Completion and completion of all punch list items.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

## 3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired.

Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

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# SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Division 01 Section “Demonstration and Training.”
5. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

### 1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Name and address of Construction Manager.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.

7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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# SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Sections include the following:

1. Division 01 Section "Summary of Multiple Contracts" for coordinating project record documents covering the Work of multiple contracts.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

### 1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Final Submittal:

1) Submit two CD’s with PDF electronic files of scanned record prints.
2) Submit two CD’s with record digital data files.
3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications:

1. Submit two CD’s of annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data:

1. Submit two CD’s with annotated PDF electronic files and directories of each submittal.
2. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

E. Reports: Submit written report bi-weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.

i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect through Construction Manager for resolution.
5. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

a. See Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.
b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect and Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect and Construction Manager.
e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic files of marked-up paper copy of Specifications, or as annotated PDF electronic file.

## 2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data, or as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals, or as annotated PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager’s reference during normal working hours.

END OF SECTION 01 78 39

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# SECTION 01 79 00 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

### 1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name of Architect.
c. Name of Construction Manager.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manuals for Owner's use prepared and bound in format matching operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors and sectional overhead doors.
2. Equipment, including lab equipment, stage equipment, projection screens, food-service equipment, residential appliances and roller shades.
3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators.
6. Heat generation, including boilers, feedwater equipment, pumps, and water distribution piping.
7. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
8. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
9. HVAC instrumentation and controls.
10. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
11. Lighting equipment and controls.
12. Communication systems, including intercommunication, voice and data equipment.
13. General plumbing equipment for usage and maintenance.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.

c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project Record Documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

## 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. DVD Format: Provide high quality DVD+/-R format Digital Video Disc (DVD) either digitally mastered or converted from VHS to DVD format, capable of play on DVD player suitable for home use.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while, or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 01 79 00

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**SECTION 01 81 13 – SUSTAINABLE DESIGN REQUIREMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain Connecticut High Performance Building (CTHPB) Standard Guidelines prerequisites and credits needed for Project to comply with the CTHPB Standard.

1. Other CTHPB prerequisites and credits needed to comply with the regulations depend on material selections and may not be specifically identified as CTHPB requirements. Compliance with requirements needed to obtain CTHPB prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional CTHPB prerequisites and credits needed to obtain the indicated CTHPB credits depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the Connecticut High Performance School Tracing chart – Compliance checklist is attached at the end of this Section for information only.

B. Related Sections:

1. Division 01 Section "Construction Waste Management and Disposal."
2. Division 01 Section "Indoor Air Quality Requirements."
3. Divisions 02 through 33 Sections for Connecticut High Performance Building requirements specific to the work of each of these Sections. Requirements may or may not include reference to CTHPB.

1.3 DEFINITIONS

A. CTHPB Standard: Connecticut High Performance Building Standard.

1. The Credit numbering system follows the numbering system found in the Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings dated September 2011.
http://www.ct.gov/deep/lib/deep/energy/buildingstandards/compliancemanualhighperformancebuildings.pdf

B. Regional Materials: Materials that have been extracted, harvested, recovered, or manufactured within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered or manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
3. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
4. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

D. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-FSC-accredited certification body.

## 1.4 REFERENCE STANDARDS AND REGULATORY REQUIREMENTS

A. Rule 1168 – “Adhesive and Sealant Applications”, effective date of July 1, 2005 and Rule Amendment date of January 7, 2005: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov.

B. Green Seal Standard for Commercial Adhesives GS-36, requirements in effect October 19, 2000.

C. “Green Seal Standard for Architectural Coating” (GS-11), plus “Green Seal Standard for Anti-Corrosive Paints” (GC-03).

D. Rule 1113 – “Architectural Coatings”, amended June 3, 2011: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov.

E. Steel Recycling Institute, Steel Recycling Rates, www.recycle-steel.org.

F. Scientific Certification Systems – Indoor Advantage Gold.

G. GREENGUARD Children & Schools Certification Program.

H. FloorScore Certification.

I. SMACNA- Sheet Metal and Air Conditioning Contractors' National Association

J. ASHRAE- American Society of Heating, Refrigerating and Air-Conditioning Engineers

K. NPDES- National Pollutant Discharge Elimination System- Standard for Erosion and Sedimentation Control SS Prerequisite 1.

L. MERV- Minimum Efficiency Reporting Value -Standard for filtration media.

1.5 SUBMITTALS

A. General: Submit additional CTHPB submittals required by other Specification Sections.

B. CTHPB submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CTHPB requirements.

C. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project, excluding mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment. Include a separate statement indicating total cost for wood-based materials used for Project.

D. CTHPB Action Plans: Provide preliminary submittals within 30 days of date established for commencement of Work indicating how the following requirements will be met:

1. Credit 3e: Construction indoor-air-quality management plan.
2. Credit d4: Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
3. Credit d8: List of proposed materials with recycled content.

    a. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.

4. Credit d10: List of proposed and regionally extracted and/or manufactured materials.

    a. Identify each regionally extracted and/or manufactured material, including its source and cost and the fraction by weight that is considered regional.

5. Credit d13: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.

E. CTHPB Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with CTHPB action plans for the following:

1. Credit d4: Waste reduction progress reports complying with Division 1 Section "Construction Waste Management."

2. Credit d8: Recycled content.
3. Credit d10: Regionally extracted and/or manufactured materials.

F. CTHPB Documentation Submittals:

1. Prerequisite 3e:

   a. Construction indoor-air-quality management plan.
   b. Product data for temporary filtration media.
   c. Product data for filtration media used during occupancy.
   d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

2. Prerequisite 5d: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24) and not exceeding the VOC content limits of:

   a. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168 requirements in effect on January 1, 2003 and rule amendment dated October 3, 2003.
   b. Aerosol Adhesives: Green Seal Standard GC-36 requirements in effect on October 19, 2000.

3. Prerequisite 5d: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24) and meet the limitations and restrictions concerning chemical components set by the following standards:

   a. “Topcoat Paints, Green Seal Standard GS-11, Paints”, First Edition, May 20, 1993.
   b. “Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints”, Second Edition, January 7, 1997. For applications on ferrous metal substrates.
   c. “All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings”, rules in effect on January 1, 2004.

4. Prerequisite 5d: Product data for carpet used inside the weatherproofing system meeting or exceeding Carpet and Rug Institute’s Green Label Plus testing and product requirements. Carpet pad must meet or exceed CRI Green Label testing and product requirements. Carpet adhesive must meet the requirements of EQ Credit 4.1.
5. Credit a11: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over a period of time of not less than one year of post-construction occupancy.
6. Credit b4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain added urea-formaldehyde resin.

7. Credit d4: Comply with Division 01 Section "Construction Waste Management and Disposal."
8. Credit d8: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
9. Credit d10: Product data for regional materials indicating location and distance from Project of material manufacturer and/or point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
10. Credit d13: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

## 1.6 QUALITY ASSURANCE

A. CTHPB Coordinator: Engage an experienced CTHPBS-Accredited Professional to coordinate CTHPB requirements. CTHPB coordinator may also serve as waste management coordinator.

# PART 2 - PRODUCTS

## 2.1 RECYCLED CONTENT OF MATERIALS

A. Credit d8: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 10 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
3. Do not include mechanical and electrical components in the calculation.

## 2.2 REGIONAL MATERIALS

A. Credit d10: Provide 10 percent of building materials (by cost) that are regionally extracted and/or manufactured materials.

2.3 LOW-EMITTING MATERIALS

A. The following materials shall be certified as low-VOC products by either the Scientific Certification Systems – Indoor Advantage Gold system or GREENGUARD Certification Program:

1. Adhesives and Sealants used in the interior of the building
2. Acoustic Ceiling Tiles and Wall Panels
3. Interior Paints
4. Wall Coverings
5. Carpet Systems and Associated Adhesives
6. Composite and Solid Wood Flooring
7. Resilient Flooring and Associated Adhesives

B. Prerequisite 5d: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and not exceeding the VOC content limits of:

1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168 requirements in effect on January 1, 2003 and rule amendment dated October 3, 2003.
2. Aerosol Adhesives: Green Seal Standard GC-36 requirements in effect on October 19, 2000.
3. Wood Glues: 30 g/L.
4. Metal to Metal Adhesives: 30 g/L.
5. Adhesives for Porous Materials (Except Wood): 50 g/L.
6. Plastic Foam Adhesives: 50 g/L.
7. Carpet Adhesives: 50 g/L.
8. Carpet Pad Adhesives: 50 g/L.
9. VCT and Asphalt Tile Adhesives: 50 g/L.
10. Cove Base Adhesives: 50 g/L.
11. Gypsum Board and Panel Adhesives: 50 g/L.
12. Rubber Floor Adhesives: 60 g/L.
13. Ceramic Tile Adhesives: 65 g/L.
14. Multipurpose Construction Adhesives: 70 g/L.
15. Fiberglass Adhesives: 80 g/L.
16. Contact Adhesive: 80 g/L.
17. Structural Glazing Adhesives: 100 g/L.
18. Wood Flooring Adhesive: 100 g/L.
19. Structural Wood Member Adhesive: 140 g/L.
20. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.

27. Sheet Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
30. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Architectural Sealants: 250 g/L.
32. Nonmembrane Roof Sealants: 300 g/L.
33. Single-Ply Roof Membrane Sealants: 450 g/L.
34. Other Sealants: 420 g/L.
35. Sealant Primers for Nonporous Substrates: 250 g/L.
36. Sealant Primers for Porous Substrates: 775 g/L.
37. Other Sealant Primers: 750 g/L.

C. Prerequisite 5d: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and meet the limitations and restrictions concerning chemical components set by the following standards:

1. "Topcoat Paints, Green Seal Standard GS-11, Paints", First Edition, May 20, 1993.
2. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
3. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.

    a. "Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints", Second Edition, January 7, 1997. For applications on ferrous metal substrates.

4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

    a. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on January 1, 2004.

5. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
6. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
7. Floor Coatings: VOC not more than 100 g/L.
8. Stains: VOC not more than 250 g/L.
9. Waterproofing Sealers: VOC not more than 250 g/L.
10. Sanding Sealers: VOC not more than 275 g/L.
11. Other Sealers: VOC not more than 200 g/L.
12. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.

j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Credit b4: Composite wood, agrifiber products, and adhesives shall not contain added urea-formaldehyde resin.

1. Composite wood and agrifiber products (particleboard, medium density fiberboard, plywood, wheatboard, strawboard, panel substrates and door cores) used on the interior of the building shall contain no added urea-formaldehyde resins. Furniture and equipment not part of base building elements are excluded.
2. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

## PART 3 - EXECUTION

### 3.1 REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

A. Prerequisite 3k: Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in Division 23 Sections.

B. Credit f1: Remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons. See Division 23 Section for additional requirements.

### 3.2 MEASUREMENT AND VERIFICATION

A. Credit a11: Implement measurement and verification plan consistent with energy consumption measurement systems as specified in Division 23 Sections.

B. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.

C. Evaluate energy performance and efficiency by comparing actual to predicted performance.

D. Measurement and verification period shall cover at least one year of post-construction occupancy.

## 3.3 CONSTRUCTION WASTE MANAGEMENT

A. Credit d4: Comply with Division 01 Section "Construction Waste Management and Disposal."

## 3.4 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Prerequisite 3e: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls," install filter media having a MERV 13 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

## 3.5 CTHPB CHECKLIST

A. A copy of the following checklist is attached at the end of this Section for information purposes only.

1. CT High Performance School Tracking Chart – Compliance Checklist.

END OF SECTION 01 81 13

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**ANNA REYNOLDS ELEMENTARY SCHOOL RENOVATIONS**
**Compliance Checklist**
**CT High Performance School Tracking Chart**

KAESTLE BOOS associates, inc

***Verify that the project is one of the following and must meet the regulations listed in CGS 16a-38k:***

☐ The new construction of public school buildings costing five million dollars or more of which two million dollars or more is state funding, and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009

**OR**

☑ A school renovation that is projected to cost two million dollars or more of which two million dollars or more is state funding, and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009.

**AND** is defined as a Renovation in accordance to the definition provided in CGS 10-282; "Renovation" means a school building project to totally refurbish an existing building (A) which results in the renovated facility taking on a useful life comparable to that of a new facility and which will cost less than building a new facility as determined by the department, provided the school district may submit a feasibility study and cost analysis of the project prepared by an independent licensed architect to the department prior to final plan approval, (B) which was not renovated in accordance with this subdivision during the twenty-year period ending on the date of application, and (C) of which not less than seventy-five per cent of the facility to be renovated is at least thirty years old.

**LEGEND**

| | |
|---|---|
| | Mandatory requirement for all schools |
| 1 | Point Attempted |
| | Point Not Attempted |

| | 16a-38k- | Mandatory |
|---|---|---|
| | 3a | Building Commissioning |
| | 3b | Integrated Design Process |
| | 3c | Base Energy Performance 21% Better Than Code (Meets current CT State Building Code requirements; see embedded pdf) |
| | 3d | ENERGY STAR Products |
| | 3e | Indoor Air Quality Management Plan |
| | 3f | Water Efficiency |
| | 3g | Recycling of Materials |
| | 3h | Erosion and Sediment Control |
| | 3i | No Smoking Policy |
| | 3j | Integrated Pest Management Plan |
| | 3k | CFC Refrigerant Ban or Phase-out Plan |
| | 3l | Minimum Ventilation |
| | 5a | Acoustical Standards |
| | 5b | Properly Locate Outside Air Intakes |
| | 5c | Electronic Ignition on Natural Gas Equipment |
| | 5d | Use of Low VOC Products |
| | 5e | Environmental Site Assessment |
| | 5f | HEPA Vacuuming |



**ANNA REYNOLDS ELEMENTARY SCHOOL RENOVATIONS**
**Compliance Checklist**
**CT High Performance School Tracking Chart**

KAESTLE BOOS associates, inc

| 2 | 16a-38k-6- | Energy | Possible Points = | 11 |
|---|---|---|---|---|
| | ☑ | A Minimum of 1 credit must be completed from this section | | |
| 1 | a1 | Energy Performance 24.5% Better Than Code (3.5% based on improved energy codes) | | |
| | a2 | Energy Performance 28% Better Than Code (7% based on improved energy codes) | | |
| | a3 | Energy Performance 31.5% Better Than Code (10.5% based on improved energy codes) | | |
| | a4 | Energy Performance 35% Better Than Code (14% based on improved energy codes) | | |
| | a5 | Energy Performance 38.5% Better Than Code (17.5% based on improved energy codes) | | |
| | a6 | Energy Performance 42% Better Than Code (21% based on improved energy codes) | | |
| | a7 | On-Site Renewable Energy - 3% | | |
| | a8 | On-Site Renewable Energy - 7% | | |
| | a9 | On-Site Renewable Energy - 10% | | |
| | a10 | Purchase Renewable Energy | | |
| 1 | a11 | Energy Measurement and Verification Plan | | |

| 9 | 16a-38k-6- | Indoor Environment | Possible Points = | 13 |
|---|---|---|---|---|
| | ☑ | A Minimum of 2 credits must be completed from this section | | |
| 1 | b1 | Install Permanent Indoor Air Monitoring Systems | | |
| | b2 | Provide Increased Outdoor Ventilation | | |
| | b3 | Building Flushout | | |
| 1 | b4 | Composite Wood and Agrifiber Products | | |
| 1 | b5 | Individual Lighting Control | | |
| 1 | b6 | Individual Thermal Comfort Control | | |
| 1 | b7 | Building Occupant Survey | | |
| | b8 | Daylight Contribution | | |
| 1 | b9 | Visual Glazing - Views to the Outdoor Environment | | |
| 1 | b10 | Tools For School: Mold Prevention | | |
| 1 | b11 | Low VOC Furniture | | |
| 1 | b12 | Isolation of Chemical Use Areas | | |
| | b13 | Three part Walk-Off System: Control of Particulates at Pedestrian Entryways | | |

| 1 | 16a-38k-6- | Water Efficiency | Possible Points = | 4 |
|---|---|---|---|---|
| | ☑ | A Minimum of 1 credit must be completed from this section | | |
| 1 | c1 | Reduce Total Potable Water Use by 30% | | |
| | c2 | Reduce Water Consumption for Landscaping 50% | | |
| | c3 | Eliminate Potable Water Usage for Landscaping | | |
| | c4 | Reduce Total Potable Water use by 50% | | |

**ANNA REYNOLDS ELEMENTARY SCHOOL RENOVATIONS**
**Compliance Checklist**
**CT High Performance School Tracking Chart**

KAESTLE BOOS associates, inc

| 7 | 16a-38k-6- | Recycling, Reuse, and Sustainability | Possible Points = | 13 |
|---|---|---|---|---|
| | ☑ | A Minimum of 2 credits must be completed from this section | | |
| 1 | d1 | Maintain 75% of an Existing Building Structure | | |
| 1 | d2 | Maintain 95% of an Existing Building Structure | | |
| | d3 | Re-use Existing Non-Structural Building Elements | | |
| 1 | d4 | Recycle or Salvage 50% of Construction & Demolition Debris | | |
| | d5 | Recycle or Salvage 75% of Construction & Demolition Debris | | |
| | d6 | Use 5% Refurbished, Salvaged or Reused Materials | | |
| | d7 | Use 10% Refurbished, Salvaged or Reused Materials | | |
| 1 | d8 | Use 10% Recycled Content Materials | | |
| | d9 | Use 20% Recycled Content Materials | | |
| 1 | d10 | Use 10% Local Materials | | |
| | d11 | Use 20% Local Materials | | |
| | d12 | Use Building Materials Made from Short Harvest Cycle Plants | | |
| 1 | d13 | Use Forest Stewardship Council (FSC) Certified Wood Products | | |

| 8 | 16a-38k-6- | Site Selection & Development | Possible Points = | 15 |
|---|---|---|---|---|
| | ☑ | A Minimum of 2 credits must be completed from this section | | |
| | e1 | Re-develop a Local Site | | |
| 1 | e2 | Select a Site with Public Transportation Access | | |
| 1 | e3 | Encourage Bicycle Transportation | | |
| 1 | e4 | Encourage Low Emission Vehicle Use with Preferred Parking | | |
| 1 | e5 | Encourage Car and Van-pooling | | |
| | e6 | Protect Natural Areas at the Construction Site | | |
| | e7 | Maximize Open Space | | |
| | e8 | Implement a Storm Water Management Plan Reducing Run-off by 25% | | |
| | e9 | Implement a Storm Water Management Plan that Treats 90% of Annual Rainfall | | |
| | e10 | Reduce Heat Island Effect through Landscaping Strategies | | |
| 1 | e11 | Select Roofing Materials to Reduce Heat Island Effect | | |
| 1 | e12 | Reduce Outdoor Light Pollution | | |
| | e13 | Orient Building for Daylighting and Energy Performance | | |
| 1 | e14 | No Building in Floodplain and Sustainable Site Development | | |
| 1 | e15 | Site Building away from External Sources of Excessive Noise | | |

**ANNA REYNOLDS ELEMENTARY SCHOOL RENOVATIONS**
**Compliance Checklist**
**CT High Performance School Tracking Chart**

KAESTLE BOOS associates, inc

| 1 | 16a-38k-6- | Operations and Procedures/Innovation | Possible Points = | 3 |
|---|---|---|---|---|
| | | There is no minimum for this section. | | |
| 1 | f1 | Eliminate the use of CFCs, HFCs and Halons | | |
| | f2 | Building Innovation | | |
| | f3 | Curriculum on Sustainable Building Features | | |
| | | | | |
| 28 | >28 | Compliant | | |

# SECTION 01 81 19 – INDOOR AIR QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

### 1.2 SUMMARY

A. This Section includes the following:

1. Microbial and fungal contamination control.
2. Indoor air quality and pollution control.
3. Heating, ventilating, and air conditioning.
4. Description of Indoor Air Quality (IAQ) Construction Plan.
5. IAQ Construction requirements.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary facility requirements.
2. Division 01 Section "Closeout Procedures" for final cleaning.
3. Division 01 Section "Sustainable Design Requirements" for CTHPBS requirements.

### 1.3 INDOOR AIR QUALITY

A. Goals: The Owner and Construction Manager have set the following goals to maintain indoor air quality for jobsite operations for this Project, within the limits of the construction schedule, Contract sum, and utilizing available materials, equipment, products, and services.

1. Protect workers on-site from undue health risks during construction.
2. Prevent residual problems with indoor air quality in the completed building.

B. Product Emission Rate Standards: Test to ASTM D 5116 for Maximum Indoor Air Concentration Levels.

1. Formaldehyde:

a. 0.03 parts per million where no other requirements are specified.
b. 0.005 parts per million where products are specified as formaldehyde free.

2. Total VOC Emissions for Carpet Tile, Adhesives, and Sealers: 0.05 mg/m2 per hour.

3. 4 Phenyl Cyclohexene (4-PC) Particulate Emissions for Carpet: 1 part per billion.
4. Total Particulate Emission Rate Levels: 50 ug/m3.
5. Primary and Secondary Regulated Pollutants: Conform to USEPA, Code of Federal Regulations, Title 40, Part 50 National Air Ambient Air Quality Standard. Refer to EPA Web Site: http://www.epa.gov/epahome/rules.html#codified.
6. Other Pollutants not Listed: Not greater than 1/10 of Threshold Limit Value - Time Weighted Average (TLV-TWA) Industrial workplace standard.

C. Architectural Coatings - Volatile Organic Compound (VOC) Content Limits: Conform to US Environmental Protection Agency (EPA) Federal Register 48886/Vol. 63, No. 176 Friday, September 11, 1998/Rules and Regulations. Refer to EPA Web Site: http://www.epa.gov/.

## 1.4 SUBMITTALS

A. Product Data: Comply with Division 01 Section "Sustainable Design Requirements – CTHPBS v4 BD+C: Schools" as follows:

1. Construction indoor-air-quality management plan.
2. Product data for temporary filtration media.
3. Product data for filtration media used during occupancy.
4. Construction Documentation: Six photographs at three different times during the construction period (total of 18), along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

B. Indoor Air Quality Construction Plan: Within fourteen (14) days of Notice to Proceed, prior to any waste removal by the Subcontractor, the Subcontractor shall develop and submit for review an indoor air quality plan, including the following:

1. List of IAQ protective measures to be instituted on the site.
2. Schedule for inspections and maintenance of IAQ measures.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air filtration system discharge.
4. Other dust-control measures.
5. Waste management plan.

E. Substitutions: If the Subcontractor elects to use procedures, materials, equipment or products that are not specified, but meet the intent of these specifications, submit an alternative solution for approval.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Do not use products in combination with or in contact with other products that can be identified as combining to form toxic fumes or sustained odors.

B. Do not use solvents within interior areas that may penetrate and be retained in absorptive materials such as concrete, gypsum board, wood, cellulose products, fibrous material, and textiles.

## PART 3 - EXECUTION

### 3.1 GENERAL

A. Protect construction materials from contamination and pollution from contact with construction dust, debris, fumes, solvents, and other environmentally polluting materials.

B. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.

C. Use low-toxic cleaning supplies for surfaces, equipment, and worker’s personal use. Options include soybean-based solvents and cleaning options and citrus-based cleaners.

D. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the indoor air quality construction plan.

E. Clean spills immediately involving solvents or cleaners.

### 3.2 HEATING, VENTILATING, AND AIR CONDITIONING

A. The Contractor is required to meet or exceed the minimum requirements of the Sheet Metal and Air conditioning National Contractor’s Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, and the following:

1. Do not run HVAC system during course of construction unless the Owner has authorized the use of the permanent heating system. Seal ductwork intake and exhaust vents.

2. Heat, dehumidify and ventilate building during course of Work as necessary to maintain environmental conditions suitable for drying and curing materials and for prevention of conditions suitable for mold and mildew growth.

    a. Ventilate building removing moisture, dust, fumes, and odors.
    b. Temper and dehumidify air as needed to remove excess moisture.
    c. Refer to Division 01 Section “Temporary Facilities and Controls” for temporary heating requirements.

## 3.3 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

E. Perform, schedule, and sequence Work as required to limit conditions supporting formations of microbes, molds, and fungi.

1. Control water penetration, dampness, and humidity to prevent products not treated for exterior use from becoming soaked or damp.

F. When visible formations are observed and when formations completely removed by non-abrasive surface cleaning:

1. Remove and replace materials identified as food sources for microbes, molds, and fungi.
2. Correct conditions supporting microbial, mold, and fungal growth.

G. Remove interior products and finishes, identified as food sources, that have absorbed sufficient moisture to become damp whether or not microbial, mold, or fungal growth is observed. Products may include, but not be limited to, the following:

1. Gypsum board cores.
2. Organic materials composed of cellulose fiber or paper.
3. Materials containing sucrose or other binders identified supporting microbial growth.

H. Remove fibrous insulation materials subject to retaining moisture such as duct liner, insulation, and other materials that are made wet or damp and cannot immediately be made dry.

I. Repair of replace ductwork, pans, and other conditions where moisture condensation, water penetration, or drained water has caused damage to such materials.

1. Remove conditions that have become an environment for microbes, molds, or fungi.
2. Do not permit conditions leading to standing water.

J. Remedial Action: Notify Owner, Construction Manager, and Architect prior to beginning remedial action where continuation by hazardous chemicals, microbes, and fungi is suspected.

## 3.4 DUST CONTROL

A. Levels of airborne respirable dust in excess of 15pg/m3 are considered excessive. Should such levels be reached or exceeded, discontinue activities which are creating dust, clean all surfaces, and take action to reduce the level of dust being created to within acceptable limits.

END OF SECTION 01 81 19

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# SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

### 1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Commissioning is systematic processes to provide documented confirmation that building systems perform according to the criteria set forth in the design intent and satisfy the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

C. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner's operating personnel are adequately trained.

D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

E. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan.* Definitions are found in Section 1.3.

| | | | |
|---|---|---|---|
| A/E- | Architect and design engineers | GC- | General contractor (prime) |
| CxA- | Commissioning authority | MC- | Mechanical contractor |
| CC | Controls contractor | OR- | Owner's Representative |
| CM- | Construction Manager | PC- | Prefunctional checklist |
| Cx- | Commissioning | PM- | Project manager (of the Owner) |
| Cx Plan- | Commissioning Plan document | Subs- | Subcontractors to General |
| EC- | Electrical contractor | TAB- | Test and balance contractor |

FT- Functional performance test

F. Related Sections:

1. Division 21 Section "Commissioning of Fire Suppression" for commissioning process activities for fire-suppression systems, assemblies, equipment, and components.

2. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.

3. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

4. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, integrated automation systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. Acceptance Phase. Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Approval. Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

C. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

D. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

E. CxA: Commissioning Authority. An independent agent, not otherwise associated with the A/E team members or the Contractor, hired by the Owner. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the CM. The CxA is part of the Construction Manager (CM) team or shall report directly to the CM.

F. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process

G. Datalogging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

H. Deferred Functional Tests: FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

I. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent)

J. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

K. Design Narrative or Design Documentation: Sections of either the Design Intent or Basis of Design.

L. Factory Testing: Testing of equipment on-site or at the factory-by-factory personnel with an Owner's representative present.

M. Functional Performance Test (FT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

N. General Contractor (GC): The prime contractor for this project. Generally, refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.

O. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed

P. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Q. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

R. Non-Compliance: See Deficiency.

S. Non-Conformance: See Deficiency.

T. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

U. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

V. Prefunctional Checklist (PC): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

W. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

X. Seasonal Performance Tests: FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Y. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Z. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance, or pressure to the transducer and DDC system to simulate a sensor value.

AA. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

BB. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.

CC. Subs: The subcontractors to the GC who provide and install building components and systems.

DD. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

EE. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents

FF. Trending: Monitoring using the building control system.

GG. Vendor: Supplier of equipment.

HH. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

## 1.4 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the designated representative of the owner's Construction Management firm (CM), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CxA is hired by the Owner directly. The CxA directs and coordinates the commissioning activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling. The CxA will work with the CM and GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CM and GC for scheduling commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan—Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

## 1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan, provided as part of the bid documents, is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures.
4. The CxA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing
6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This may include the CxA witnessing start-up of selected equipment.
7. The CxA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by the CxA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CxA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CxA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

## 1.6 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the Construction Manager (CM) and representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. The Owners Representative.

4. Architect and engineering design professionals.

1.7 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

D. Follow the Commissioning Plan.

E. Attend commissioning scoping meetings and additional meetings as necessary.

1.8 OWNERS REPRESENTATIVE'S RESPONSIBILITIES

A. The Owner's Representative OR shall represent the Owner during the commissioning process as follows:

1. Manage the contract of the A/E, CxA, CM and Contractor.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan – Construction Phase*.
3. Provide final approval for the completion of the commissioning work.
4. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.
5. Follow the Commissioning Plan.
6. Attend commissioning scoping meetings and additional meetings as necessary.

1.9 ARCHITECT/ENGINEERS (AE) RESPONSIBILITIES

A. The AE shall participate in and perform commissioning process activities including, but not limited to, the following:

1. Attend the commissioning scoping meeting and selected commissioning team meetings.
2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
3. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

6. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.
7. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

## 1.10 CONSTRUCTION MANAGER'S (CM) RESPONSIBILITIES

A. The construction manager shall participate in and perform commissioning process activities including, but not limited to the following:

1. Facilitate the coordination of the commissioning work by the CxA, and, with the GC and CxA, ensure that commissioning activities are being scheduled into the master schedule.
2. Review and approve the final *Commissioning Plan—Construction Phase*.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of Contractor submittals.
5. Furnish a copy of all construction documents, addenda, requests for information, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.
6. Review and approve the functional performance test procedures submitted by the CxA, prior to testing.
7. Review commissioning progress and deficiency reports.
8. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
9. Follow the Commissioning Plan.
10. Attend commissioning scoping meetings and additional meetings as necessary.

## 1.11 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a monthly basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review commissioning progress and deficiency reports.
6. Review and accept construction checklists provided by the CxA.
7. Complete paper or electronic construction checklists as Work is completed and provide to the CxA on a weekly basis.
8. Review and accept commissioning process test procedures provided by the Commissioning Authority.
9. Complete commissioning process test procedures.
10. Include the cost of commissioning in the total contract price.
11. Coordinate the training of Owner personnel and provide the times and dates of training to the CxA.

12. Execute seasonal or deferred functional performance testing witnessed by the CxA to facilitate the Cx process.
13. Provide a list of final settings, setpoints, ranges, schedules, and / or trend logs required by the CxA.
14. Follow the Commissioning Plan.
15. Attend commissioning scoping meetings and additional meetings as necessary.
16. From the red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.

## 1.12 SUB CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Prime.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.
4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.
6. Follow the Commissioning Plan.
7. Attend commissioning scoping meetings and additional meetings as necessary.

## 1.13 EQUIPMENT SUPPLIERS RESPONSIBILITIES

A. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CxA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project’s scope and budget.
5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

6. Review test procedures for equipment installed by factory representatives.
7. Follow the Commissioning Plan.
8. Attend commissioning scoping meetings and additional meetings as necessary.

1.14 CxA'S RESPONSIBILITIES

A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.

1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the GC and CM, ensure that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the *Commissioning Plan—Construction Phase*.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and comment on normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's representative of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner’s representative of any deficiencies in results or procedures.
13. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.

15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to CM for review, and for approval if required.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM with written progress reports and test results with recommended actions.
22. Witness performance testing of smoke control systems by others and all other owner contracted tests or tests by manufacturer's personnel over which the CxA may not have direct control. Document these tests and include this documentation in Commissioning Record in O&M manuals.
23. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
24. Oversee and approve the training of the Owner's operating personnel.
25. Compile and maintain a commissioning record and building systems book(s).
26. Review and approve the preparation of the O&M manuals.
27. Provide a final commissioning report.
28. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
29. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

## 1.15 SYSTEMS TO BE COMMISSIONED

A. The following checked systems will be commissioned in this project:
1. Central building automation system
2. All equipment of the heating, ventilating and air conditioning system
3. Scheduled or occupancy sensor lighting controls
4. Emergency power generators and automatic transfer switching
5. Plumbing including domestic hot water and water pumping systems
6. Water using systems
7. Fire Protection Systems
8. Building envelope systems
9. Renewable energy system

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.

C. Datalogging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 60 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

## 3.2 REPORTING

A. The CxA will provide regular reports to the CM and the OR, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan.*

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CxA will be provided to the CM and OR, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

E. The sample reports included in Appendix-B are to provide contractors with an example of a format and an indication of the rigor of the required documentation for various report types. They were not developed for this project.

## 3.3 SUBMITTALS

A. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.

1. Requested Submittals:
    a. Air Handling Units
    b. Automatic Transfer Switch
    c. Building Automation
    d. Blower coil Unit – Cooling / Heating
    e. Computer Room AC Units
    f. Control Systems
    g. Domestic Water Heaters
    h. Domestic Hot Water Piping Insulation
    i. Ductwork Insulation
    j. Emergency Generator
    k. Exhaust Fans

l. Hot Water Heating Coils
m. Lighting Controls
n. Packaged Terminal Air-Conditioning Units
o. Pipe Insulation
p. Pumps
q. Service Water Heaters
r. Testing, Adjusting, and Balancing
s. Terminal Units
t. VAV Terminal Unit Boxes
u. Variable Frequency / Variable Speed Drives
v. Grilles, Registers and Diffusers

2. Requested Shop Drawings:
   a. Building Distribution Piping
   b. Ductwork
   c. Fire Alarm System
   d. Lighting Control System
   e. Security / Intrusion detection System
   f. Sprinkler System
   g. Sub-Slab Venting System

3. Requested Product Samples:
   a. User Adjustable Thermostats
   b. Combination Smoke-Fire Dampers
   c. Air Volume Control Dampers
   d. Water Flow Control Device
   e. Air Flow Measuring Devices

B. The Commissioning authority will review and provide comment on submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the CM, Owner Representative, or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review and approve them.

E. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority's review.

## 3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.13, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in specification Sections.

1. The CxA adapts, if necessary, the representative prefunctional checklists and procedures from required specification Section. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. These checklists and tests are provided by the CxA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:

    a. The CxA's prefunctional checklists.
    b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
    c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CxA for review and approval.
5. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.

D. Sensor and Actuator Calibration.

1. All field-installed temperature, relative humidity, CO, $CO_2$ and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

3. Sensor Calibration Methods.

a. All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.
b. Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
c. Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.
d. Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

| Sensor | Required Tolerance (+/-) | Sensor | Required Tolerance (+/-) |
|---|---|---|---|
| Cooling coil, chilled and condenser water temps | 0.4F | Flow rates, water | 4% of design |
| AHU wet bulb or dew point | 2.0F | Relative humidity | 4% of design |
| | | Combustion flue temps | 5.0F |

| | | | |
|---|---|---|---|
| Hot water coil and boiler water temp | 1.5F | Oxygen or $CO_2$ monitor | 0.1 % pts |
| Outside air, space air, duct air temps | 0.4F | CO monitor | 0.01 % pts |
| Watthour, voltage & amperage | 1% of design | Natural gas and oil flow rate | 1% of design |
| Pressures, air, water and gas | 3% of design | Steam flow rate | 3% of design |
| Flow rates, air | 10% of design | Barometric pressure | 0.1 in. of Hg |

4. Valve and Damper Stroke Setup and Check.

   a. EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
   b. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

5. Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

6. Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

7. Sub-Slab Venting System: Exhaust Fans - The Connecticut Department of Public Health (CT DPH) Radon Program has implemented a policy requirement for radon testing procedures in K-12 Connecticut public school buildings. The guidelines for radon testing procedures in Connecticut schools are as follows:
   a. System testing and guidelines shall be in accordance with *EPA Radon Prevention in the Design and Construction of Schools and Other Large Buildings.* Third printing with Addendum, June 1994.
   b. Evaluation shall be conducted by qualified radon measurement professionals who hold national certification through the National Environmental Health Association (NEHA) or the National Radon Safety Board (NRSB) and must have successfully completed the CT DPH course, *Radon Measurement in CT Schools.*
   c. The evaluation form shall be filled out by the qualified radon measurement professional and signed by a school designee and then submitted to the DPH Radon Program within ten business days of receipt of the written report.

d. Radon re-evaluation shall be conducted using the same protocols, but in a limited number of locations in accordance with the Department of Public Health Environmental Health Section.

E. Execution of Pre-functional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the CM, GC and CxA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the CM). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the CM using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party. Refer to Part 3.7 herein for details.

## 3.5 PHASED COMMISSIONING

A. The project will not require startup and initial checkout to be executed in phases.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.13.

C. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

2. Development of Test Procedures. Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements, the CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested.

3. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.

4. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

5. Representative test formats and examples (not designed for this facility) are found in the appendices to Divisions 21, 22, 23, and 26. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:

   a. System and equipment or component name(s)
   b. Equipment location and ID number
   c. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
   d. Date
   e. Project name
   f. Participating parties
   g. A copy of the specification section describing the test requirements

h. A copy of the specific sequence of operations or other specified parameters being verified
i. Formulas used in any calculations
j. Required pre-test field measurements
k. Instructions for setting up the test.
l. Special cautions, alarm limits, etc.
m. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
n. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
o. A section for comments
p. Signatures and date block for the CxA

D. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. The CxA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the CM. This may require a change order and adjustment in charge to the Owner. The CxA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.

7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. No sampling by Subs is allowed in prefunctional checklist execution.

    a. A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

        xx = the percent of the group of identical equipment to be included in each sample.

        yy = the percent of the sample that if failing, will require another sample to be tested.

    b. The example below describes a 20% Sampling—10% Failure Rule.

        1) Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
        2) If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
        3) If 10% of the units in the second sample fail, test all remaining units in the whole group.
        4) If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

E. Coordination and Scheduling. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the CM, GC and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

1. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

F. Test Equipment. Refer to Section 019113, Part 2 for test equipment requirements.

G. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

## 3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review. The CxA will include the filled-out forms in the O&M manuals.

B. Non-Conformance.

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the CM.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.

    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1) The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the CM for signature, if required. A copy is provided to the Sub and CxA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
        2) The CxA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

        1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the CM and to the Sub representative assumed to be responsible.
        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.

3) The CxA documents the resolution process.
4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

a. The cost for the *Sub* to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA and CM will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CxA's and CM's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
c. The time for the CxA and CM to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.
d. Refer to the sampling section of Section 019113, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CxA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CM or OR. In such case, the Contractor shall provide the Owner with the following:

1. Within one week of notification from the CM or OR, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM or OR within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The CM or OR will determine whether a replacement of all identical units or a repair is acceptable.

4. Two examples of the proposed solution will be installed by the Contractor and the CM will be allowed to test the installations for up to one week, upon which the CM or OR will decide whether to accept the solution.
5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA and by the CM, if necessary. The CxA recommends acceptance of each test to the CM using a standard form. The CM gives final approval on each test using the same form, providing a signed copy to the CxA and the Contractor.

## 3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OR. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

## 3.9 TRAINING OF OWNER PERSONNEL

A. The CM shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the Subs and vendors who have training responsibilities. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Division 21, 22, 23, and 28.

2. Each Sub and vendor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience

c. Location of training
d. Objectives
e. Subjects covered (description, duration of discussion, special methods, etc.)
f. Duration of training on each subject
g. Instructor for each subject
h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
i. Instructor and qualifications
j. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3. The CxA develops an overall training plan and coordinates and schedules, with the CM and GC, the overall training for the commissioned systems. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the CM using a standard form. The CM also signs the approval form at one of the training sessions, the CxA presents a one-hour presentation discussing the use of the blank functional test forms for re-commissioning equipment. Video recording of the training sessions will be provided by the Trade Contractor with media cataloged by the CxA and added to the O&M manuals.

4. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be one to two hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system and outside air strategies.

## 3.10 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Project Specifications.

2. Contractor shall submit two draft copies of the complete operating and maintenance manual to the CM for review by the architect/engineer and CxA within 60 calendar days after review of equipment shop drawings. One copy will be returned to the contractor within 30 days after receipt by the A/E.

3. Contractor shall submit corrected final approved manuals prior to substantial completion. Prior to final submittal, the CxA shall review the O&M manuals (in addition to the initial draft O&M manual), and documentation, with redline as-builts, for systems that were commissioned to verify compliance with the specifications. The CxA will communicate, through the CM, deficiencies in the manuals to the contractor or A/E, as requested. Upon a successful review of the corrections, the CxA will recommend approval and acceptance of these sections of the O&M manuals to the CM. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly

stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

4. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:
   a. The design intent narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.
   b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chillers, water system, condenser water system, heating system, supply air systems, exhaust systems and electrical distribution system. These shall show major pieces of equipment such as pumps, chillers, boilers, control valves, expansion tanks, coils, service valves, switchboards, motor control centers, panel boards, etc.

5. CxA Review and Approval. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* to verify compliance with the *Specifications.* The CxA will communicate deficiencies in the manuals to the CM, OR or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the CM, OR or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CxA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the GC, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

   *Tab I-1* Commissioning Plan
   *Tab I-2* Final Commissioning Report
   *Tab 01* System Type 1 (chiller system, packaged unit, boiler system, etc.)
      *Sub-Tab A* Design narrative and criteria, sequences, approvals for Equipment 1
      *Sub-Tab B* Startup plan and report, approvals, corrections, blank prefunctional checklists
      *Colored Separator Sheets*—for each equipment type (fans, pumps, chiller, etc.)
      *Sub-Tab C* Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.
   *Tab 02* System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the

disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CxA

## 3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase*, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

| Product | Developed By |
|---|---|
| 1. Final commissioning plan | CxA |
| 2. Cx meeting minutes | CxA |
| 3. Commissioning schedules | CxA with GC and CM |
| 4. Equipment documentation submittals | Subs |
| 5. Sequence clarifications | Subs and A/E as needed |
| 5. Prefunctional checklists | CxA |
| 6. Startup and initial checkout plan | Subs and CxA (compilation of existing documents) |
| 7. Startup and initial checkout forms filled out | Subs |
| 8. Final TAB report | TAB |
| 9. Issues log (deficiencies) | CxA |
| 10. Commissioning Progress Record | CxA |
| 11. Deficiency reports | CxA |
| 12. Functional test forms | CxA |
| 13. Filled out functional tests | CxA |
| 14. O&M manuals | Subs |
| 15. Commissioning record book | CxA |
| 16. Overall training plan | CxA and CM |
| 17. Specific training agendas | Subs |
| 18. Final commissioning report | CxA |
| 19. Misc. approvals | CxA |

END OF SECTION 01 91 13

**SECTION 02 41 00 — DEMOLITION**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.02 DESCRIPTION OF WORK

A. All labor, material and equipment necessary to complete all phases of demolition work as shown on the Drawings, as specified, and as can be reasonably implied from Drawings, Specifications, and field conditions.

B. Filling of depressions resulting from demolition activities.

C. Removal of utilities, drainage structures, drainage piping, pavement, handrails, playscapes, sidewalks and curbing.

D. Removal and disposal of resulting demolition materials.

E. Leaving site clean and ready for clearing required to install new construction.

F. Maintaining streets and walks during demolition and the cleaning of them of debris resulting from demolition.

G. Temporary shoring, bracing and framing where necessary for demolition work.

H. Protecting adjoining construction that is to remain.

I. Patching required as a result of demolition.

J. Securing and maintaining in force the required permits and the payment of associated fees.

K. Complying with all regulations for street and walk access and protection and fire access.

1.03 RELATED WORK DESCRIBED ELSEWHERE

A. Section 31 20 00 – Earth Moving;

B. Section 31 25 00 – Erosion and Sedimentation Controls.

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. State of Connecticut Basic Building Code;

2. State of Connecticut Department of Health Services;

3. State of Connecticut Department of Energy & Environmental Protection;

4. Utility companies having jurisdiction;

5. Town of Newington.

1.05 JOB CONDITIONS

A. Traffic:

1. Conduct demolition operations and the removal of debris in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities;

2. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction;

3. Provide alternate, adequately signed, routes around closed or obstructed traffic ways.

4. Ensure the safe passage of persons around the area of demolition;

B. Conduct operations to buildings, to prevent damage or injury to adjacent buildings, structures, other facilities and persons;

C. Provide shoring, underpinning, excavation supports as necessary to protect structures and all adjacent properties;

D. If applicable, provide and maintain fire protection.

E. Promptly repair damages, to adjacent facilities caused by demolition operations. Replace glass breakage immediately.

F. Maintain existing utilities not scheduled to be removed, keep in service, and protect against damage during demolition operations;

1. Repair and, if necessary replace, services damaged as result of demolition;

2. Do not interrupt existing utilities if encountered serving occupied or used facilities, except when authorized in writing by authorities;

3. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities;

4. The contractor shall arrange for any utility shut-offs required. The Contractor shall disconnect and seal utilities before starting demolition operations. Construction related work required by the Utility Companies is included in this Contract. Do not start demolition work until utility disconnections have been completed and verified in writing.

B. Protection:

1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.

## PART 2 – PRODUCTS

2.01 None required by this Section.

## PART 3 – EXECUTION

### 3.01 PREPARATION

A. Review all limits of fencing, sedimentation control and other construction barriers with Owner and Engineer prior to installation.

B. Arrange for, and verify termination of utility services to include removing meters and capping lines, if necessary.

C. Where trafficways will be closed or obstructed the Contractor shall provide alternate routes, including adequate signing and striping.

D. Prior to demolition, removal or abandonment of items within paved areas to remain the Contractor shall sawcut the bituminous concrete pavement.

E. The Contractor shall obtain all necessary permits from agencies having jurisdiction.

### 3.02 DEMOLITION

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit to the lowest practical level the amount of dust and dirt rising and scattering in the air;

1. Comply with governing regulations pertaining to environmental protection and pollution;

2. Do not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove below grade construction completely and fill below-grade areas and voids from resulting from demolition of structures and pavements.

1. Use satisfactory materials consisting of stone, gravel, and sand, free from debris, trash, materials, roots, and other organic matter.

C. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, roots and other organic matter.

D. Place fill materials in horizontal layers generally not exceeding 6" in loose depth. Compact each layer at optimum moisture content of fill material to a density equal to original adjacent ground, unless subsequent excavation for new work is required.

1. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

2. Where indicated on the Drawings demolish and remove foundation walls and retaining walls to an elevation two feet below existing or proposed finish grade, whichever is lower.

3. Filling will be in conformance with the requirements of Section 31 20 00 – Earth Moving.

E. Cap, plug with brick and mortar, or remove, as indicated, pipes and other conduits abandoned due to demolition. Holes left in existing structures left from the removal and/or demolition of piping shall also adequately plugged and capped. Coordinate all utility abandonment with affected utility. Perform utility in accordance with requirements of affected utility. Repair trenches and perform work within R.O.W. in accordance with the Town's and utility company's requirements.

## 3.03 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from the site debris, rubbish, and other materials resulting from demolition operations;

1. Storing or burning of materials on the site will not be permitted.

B. Transport materials of demolished structures and legally dispose of off-site in conformance with regulations of Department of Energy and Environmental Protection, and other regulating agencies as applicable.

C. Remove demolition debris daily.

D. Manner of disposal shall comply with all applicable local, state, and federal regulations.

END OF SECTION 02 41 00

**SECTION 02 41 19 - SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes, but is not limited to the following:

1. Demolition and removal of shed, as indicated.
2. Demolition and removal of exterior wall construction complete, as indicated.
3. Demolition and removal of all exterior steel and aluminum framed glazing systems.
4. Demolition and removal of louvers.
5. Demolition and removal of selected portions of concrete slabs, as indicated.
6. Demolition and removal of wood stairs and railings, as indicated.
7. Demolition and removal of interior partitions, and/or portions of interior partitions, as indicated.
8. Demolition and removal of chain link fencing at interior.
9. Demolition and removal of finish systems, including ceilings and floor finishes.
10. Demolition and removal of all toilet partitions and accessories.
11. Demolition and removal of doors, frames and associated hardware as indicated.
12. Demolition and removal of all built-in casework including cabinets, bookcases, and countertops.
13. Demolition and removal of all appliances.
14. Demolition and removal of all window treatments.
15. Demolition and removal of all fire extinguishers and cabinets.
16. Demolition and removal of all gymnasium equipment.
17. Demolition and removal of all stage curtains and accessories.
18. Demolition and removal of all lockers and associated soffits.
19. Demolition and removal of all markerboards, tackboards, tackstrips, and chalkboards complete.
20. Demolition and removal of all projection screens.
21. Demolition and removal of mechanical, electrical and plumbing equipment.
22. Removal and salvage of the following for reinstallation:

    a. Smartboards, projectors and technology equipment.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.

2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
3. Division 01 Section “Construction Waste Management and Disposal.”
4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
5. Division 01 Section “Sustainable Design Requirements.”
6. Division 02 Abatement sections.
7. Division 04 Section “Maintenance of Unit Masonry” for masonry repairs and repointing.
8. Division 07 Section “Preparation for Re-Roofing” for roof removals.

## 1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

## 1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property.

1. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

## 1.5 PRE-DEMOLITION CONFERENCE

A. Pre-Demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
5. Means of protection for items to remain and items in path of waste removal from building.

D. Predemolition Photographs or Video: Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Construction Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is included in Division 00 Section “Existing Hazardous Materials Information.” Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified in other Division 02 Sections.

2. If unidentified hazardous materials are encountered during the work, do not disturb hazardous materials or items suspected of containing hazardous materials. Stop all work on the project and immediately notify Construction Manager.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

## PART 2 - PRODUCTS

### 2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

## 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Construction Manager will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
c. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

## 3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

## 3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. CTHPB Requirements for Building Reuse:

1. Credit d1: Maintain 75 percent of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

## 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

## 3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section “Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property.

1. Include cost of all transportation and disposal.
2. Provide verification of all disposal trips.
3. Hazardous materials are to be handled and disposed of in accordance with all State, Local, and Federal regulations.

## 3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

**SECTION 02 82 13 - WINDOW ABATEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. This section specifies the procedures for removal and disposal of existing window and door systems at Anna Reynolds School in accordance with Drawings H2.01 & H2.02.

1.3 SUBMITTALS AND NOTICES

A. Prior to Commencement of Work:

1. Submit certification of required insurance evidencing that the required coverages are in effect.
2. Submit proof satisfactory to the Owner that all required permits, site locations, supplies, and the like have been obtained.
3. Submit documentation to the Owner indicating that each employee has instruction on Construction Site Safety, HAZWOPPER training, Asbestos training & license, Lead Paint training, on use and fitting of respirators, on protective dress, on entry and exit from work areas, and on all aspects of work procedures and protective measures and understands this instruction. Also submit verification that all employees have received medical examinations as required by OSHA regulations.
4. Health & Safety Plan (HASP) developed specific to the Work activities. All workers will follow applicable Federal and State regulations regarding the work activities, including but not limited to OSHA regulations, fall protection standards, respiratory protection, ladder/scaffolding safety, personal protective equipment, etc.
5. Remediation Work Plan: The work plan shall include, but not be limited to, a drawing indicating the location of work areas (boundaries, signage, poly sheeting, etc.), location and details of decontamination facilities, sequencing of materials removal, work procedures, types of equipment, crew size, and emergency procedures for fire and medical emergencies.

B. Submit notification and fee to the following agencies at least ten (10) working days before work commences on the project:

1. Department of Public Health
Environmental Health Section
450 Capitol Avenue, MS#51AIR

P.O. Box 340308
Hartford, CT 06134-0308

2. Asbestos Demo/Reno Notifications
US EPA Region 1
5 Post Office Square, Mail Code OES05-4
Boston, MA 02109-3912

C. Project Close-out Submittals:

1. Within 30 days after completion submit the documents listed below:
a. Daily progress log and sign-in sheets
b. Personal air monitoring results.
c. Waste manifests

1.4 QUALITY ASSURANCE

A. Contractor shall provide and assure that the quality of work practices and procedures are consistent with the below listed agencies. Contractor shall utilize the latest edition, including all addenda, revisions and supplements for all regulatory agencies codes, etc., including but not limited to:

1. Environmental Protection Agency (EPA).
2. Occupational Safety and Health Administration.
3. State of Connecticut DEEP and DPH codes and laws.
4. All local codes.

B. Pre-Work Conference: Before the Work of this Section is scheduled to commence, a conference will be held by the Owner's Representative at the Site for the purpose of reviewing the Contract Documents, discussing requirements for the Work, and reviewing the Work procedures.

1. The conference shall be attended by the Owner's Representative, the Contractor, and the testing/monitoring laboratory employed by the Owner.

PART 2 - PRODUCTS

2.1 PROTECTIVE CLOTHING

A. Safety equipment (e.g., hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1- 1967, disposable PVC gloves or other work gloves, and disposable suits), shall be provided to all workers and authorized visitors.

B. All personnel must utilize proper Personal Protective Equipment (PPE) during all work activities. Proper PPE may vary depending on the job task, but may include disposable

gloves, disposable rubber boots, steel-toe boots, disposable suits, respirators, hard hats, hearing protection, and/or eye protection.

C. Provide sufficient quantities of protective clothing to assure that enough complete disposable outfits are available for each individual performing remediation Work each day.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area. No unauthorized visitors will be allowed to enter the Work Area.

## 2.2 RESPIRATORY PROTECTION

A. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and/or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. The Contractor shall maintain fit-test records for each employee using a respirator.

C. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

D. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134.

E. Provide a storage area where respirators will be kept in a clean environment.

F. Provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.

G. Filters shall be removed and discarded during the decontamination process at a frequency at least as often as recommended by the manufacturer's specifications. Filters cannot be reused.

## 2.3 SIGNS, LABELS & CONTAINERS

A. Provide Asbestos and Lead Paint warning signs and barrier tapes at all approaches to Window Removal Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide signage in English and Spanish.

B. Provide 6 mil polyethylene disposal bags.

C. Owner will provide secure, lined, and covered waste container (roll-off or equivalent) and 55-gallon DOT-approved steel containers,

2.4 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

B. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for barriers, fixed objects, walls, floors, ceilings, waste containers) shall be at least 6 mil. Ground tarps shall be 10’ wide canvas with corner tabs. Privacy screen mesh shall be polyethylene with metal perimeter grommets.

C. Tape shall be used that is capable of sealing joints in adjacent plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions.

2.5 TOOLS & EQUIPMENT

A. Tools used for the removal of caulking, paint, or rust shall be used in a manner that minimizes dust generation, as appropriate.

B. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Air (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

C. Any power tools used to drill, cut into, or otherwise disturb caulking material shall be cowled with HEPA filtered local exhaust ventilation.

D. Ladders, lifts, and/or scaffolds are to be of adequate length and sufficient quantity to support work schedule.

E. Other Materials - provide all other materials such as lumber, nails and hardware, which may be required to construct and dismantle the decontamination area and the barriers that isolate the Work Area.

F. Vehicle Storage - No construction vehicles shall be stored, serviced, washed or flushed out in a location where leaks, spillage, waste materials, cleaners or waters will flow or be otherwise introduced into wetlands, reservoirs or watercourses.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The work of this section consists of, but is not limited to:

1. Furnishing of all labor, materials, facilities, equipment, services, and insurance necessary to perform the work;
2. Maintenance of work area/site security;

3. Preparation of work area, including installation of containment and decontamination areas as required;
4. Removal and containerization of window systems;
5. Clean-up and final decontamination of all work areas;
6. Implementation of a worker protection program in compliance with all applicable regulations;
7. Proper storage, wrapping/bagging, and labeling of all waste generated as part of window remediation activities.

B. Maintain the following documentation on-site during remediation activities:

1. Medical approval to wear a respirator for all workers, fit test reports
2. Supervisor 40 hour HAZWOPER training certificate, worker 8 hour HAZWOPER training certificates
3. OSHA 10 hour construction safety training card for all workers dated within 5 years
4. Asbestos Supervisor 40 hour training certificate & current refresher, Asbestos Worker 32 hour training certificates & current refresher
5. Lead Paint 8 hour awareness training certificates for all workers
6. Project documents (remediation plan, work plan, drawings, specifications, etc.)
7. Material Safety Data Sheets
8. List of Emergency Contact information
9. Project logs

## 3.2 WORK AREA PREPARATION

A. Frame interior of window opening with wood 2x4's pressure fitted into opening. Install vertical wood 2x4's at 24" spacing. Join 2x4's together with screwed metal angles so they can be easily reused.

B. Install 1 layer of 6 mil poly sheeting on interior side of 2x4 framing, sealed with 3" duct tape.

C. Install 1 layer of polyethylene privacy screen mesh with metal perimeter grommets on interior side of 2x4 framing. Secure mesh at grommets to 2x4's with plastic ties and metal eyelets screwed to 2x4's.

D. Install 10' wide canvas ground tarps on ground outside window bank being removed. Stake the corner tabs.

E. Create a regulated area around the exterior window removal area with warning tape. Post Lead Paint and Asbestos warning signs at the perimeter of the regulated area.

## 3.3 WORKER HAND WASH STATION

A. Maintain a trailer-mounted worker hand washing facility consisting of running potable water, a wash basin, hand cleaning cream, and towels at the job site.

B. Window removal and cleanup workers shall wash their hands at the hand washing facility prior to breaks, lunch, or leaving site at end of work day.

C. Solidify waste wash water with absorbent and dispose of in the waste trailer.

## 3.4 WINDOW REMOVAL

A. Manually remove windows, panels, and doors from openings with power tools. Do not machine pull windows, panels, and doors out. Except where noted, remove framing surrounding windows, panels, and doors back to masonry or steel opening. Transport removed components to waste trailer.

B. Remove existing caulk on masonry window openings with caulk cutter equipped with cowl and HEPA vacuum collection. Mist caulk with water prior to removal. Completely remove caulk from masonry, leaving no visible caulk residue. Bag and dispose of caulk removed from masonry along with windows in the waste trailer.

C. Manually scrape caulk, loose paint, and loose rust from lintels and structural steel surrounding window openings. Mist caulk with water prior to removal. Completely remove caulk from steel, leaving no visible caulk residue. Containerize removed caulk, loose paint, and loose rust from steel in Owner-supplied 55 gallon drums for disposal.

D. After completion of work, clean up of all surfaces and work areas shall be conducted in accordance with Part 3.6 of this Section.

E. If at any time during window removal, should the Contractor or the Owner's Consultant suspect contamination of areas outside the work area, all abatement work shall cease until the Contractor takes steps to decontaminate these areas and eliminate causes of such contamination.

## 3.5 AIR MONITORING

A. Air monitoring activities shall be conducted by the Owner’s Consultant during remediation work. The air monitoring shall include, at a minimum, hourly readings within a zone perimeter to the Work Area (Support Work Zone or SWZ) so as to assure that work practices are protective of human health to persons outside of the Work Area. Air monitoring shall be conducted with a particulate aerosol monitor capable of displaying real-time concentrations of airborne particulates in a mass per volume ratio to 0.001 milligrams per cubic meter (mg/m3). Prior to the active removal actions and at periodic points during the project, air monitoring readings will be recorded to document background particulate matter concentrations.

B. If total particulate concentrations in the SWZ exceed the action limits (e.g., 0.1 mg/m3 above background) and are sustained (i.e. greater than 5 minutes), then the work will be stopped and additional dust suppression techniques to mitigate fugitive dust shall be initiated.

## 3.6 CLEAN-UP & CLEARANCE TESTING

A. Remove visible accumulations of window caulk and debris. Wet clean or HEPA vacuum all surfaces within the Work Area.

B. Removal of windows and caulk to be considered complete based on results of visual inspection conducted by the Owner's Consultant.

C. A visual inspection of all work areas shall be conducted by the Owner's Consultant following completion of remediation activities. The visual inspection will document incomplete work, damage caused by the abatement activity, and inadequate clean-up of the worksite, as applicable. Additional cleaning, repair work, or remediation work shall be conducted to the satisfaction of the Owner at the Contractor's expense.

3.7 WASTE MANAGEMENT AND DISPOSAL

A. Supply waste containers for removed windows, panels, caulk, and doors. 40 cubic yard closed top containers will be supplied for the bulk of the waste. 30 cubic yard open top bladder bag equipped containers will be supplied for waste that is asbestos-containing.

B. All wastes shall be placed in authorized leak-tight containers and kept closed and locked at all times except for adding or removing waste. All wastes shall be kept in a secure location with proper signage visible at all times.

C. Waste containers shall be used for disposing of removed windows, panels, caulk, and doors only and shall not be used for trash.

D. Temporary Storage of Waste Trailers - Site waste trailers at one paved location on the school property. Contractor shall transport removed windows, panels, caulk, and doors to the waste trailers. Waste trailers will not be provided adjacent to the windows being removed or on grassy areas.

E. All windows, panels, caulk, and doors are to be placed in appropriate waste containers immediately upon removal. No waste shall be left uncontainerized at the end of the working day.

F. Transporter and Disposal Site will be selected by the Owner.

G. Complete the manifests and all other required waste disposal documentation in accordance with all applicable federal and state regulations. All manifests and other waste documentation will be signed by the Owner or a designated representative.

END OF SECTION 02 82 13

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**SECTION 02 82 16 - ASBESTOS ABATEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SCOPE

A. The work specified herein shall be the abatement of asbestos-containing materials by persons who are knowledgeable, qualified, and trained in the removal, treatment, handling, and disposal of asbestos-containing material, and the subsequent cleaning of the affected environment. The Contractor shall have a Competent Person in control on the job site at all times during asbestos abatement work. This person must comply with applicable Federal, State and Local regulations which mandate work practices, and be capable of performing the work of this contract.

B. The Contractor shall be licensed by the State of Connecticut in accordance with State of Connecticut Regulations, Sections 20-440-1 through 9 & 20-441. The asbestos supervisor and workers shall be licensed by the State of Connecticut in accordance with State of Connecticut Regulations, Sections 20-437 and 20-438. Should any portion of the work be subcontracted, the subcontractor must also be licensed in accordance with these regulations. The licensing requirements are available from the Environmental Health Services Division, Department of Public Health, 410 Capitol Avenue, MS#51AIR, P.O. Box 340308, Hartford, CT 06134.

C. The Town of Newington (Owner) will retain the services of a Project Monitor for protection of its interests and those using the building. Pre-abatement, during abatement and post-abatement sampling will be conducted as deemed necessary.

D. Deviations from this Specification require the written approval of the Town of Newington.

E. The Contractor is responsible for restoring all work areas and auxiliary areas utilized during abatement to conditions equal to or better than original. Any damage caused during the performance of abatement activities shall be repaired by the Contractor (e.g., paint peeled off by barrier tape, nail holes, water damage, removal of ceiling tiles or concrete blocks, broken glass, etc.) at no

additional expense to the Owner. The Contractor is responsible for protecting all objects in work areas that are permanent fixtures or too large to remove.

F. The Contractor shall be responsible for the following general requirements:

1. Obtain all approvals and permits, and submit all notifications required.

2. Provide, erect, and maintain all planking, bracing, shoring, barricades, and warning signs.

3. Unless otherwise specified, all equipment, fixtures, piping and debris resulting from demolition shall become the property of the Contractor and shall be removed from the premises.

4. Materials to be reused shall be removed with the utmost care to prevent damage of any kind. All material to be reused shall be stored as directed. The Contractor shall coordinate with the Owner as to the storage location.

5. Materials not scheduled for reuse shall be removed from the site and disposed of in accordance with all applicable Federal, State and Local requirements.

G. It shall be the responsibility of the Contractor to protect and preserve in operating condition, all utilities traversing the building and site. Damage to any utility due to work under this Contract shall be repaired to the satisfaction of the Owner at no cost to the Owner.

## 1.3 DESCRIPTION OF WORK

A. The Contractor shall supply all labor, materials, equipment, services, insurance (with specific coverage for work on asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.

B. The asbestos abatement work shall include the removal of asbestos-containing (ACM) pipe insulation, vinyl floor tile, flooring mastic, glue dots, plaster ceilings, caulking, and waterproofing at Anna Reynolds School as shown on Drawings H1.01 through H1.12 and specified herein.

## 1.4 DEFINITIONS

Adequately Wet - Sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-

containing material, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

AHERA - Asbestos Hazard Emergency Response Act - U. S. EPA regulation 40 CFR Part 763 under Section 203 of Title II of the Toxic Substances Control Act (TSCA), 15 U.S.C. 2643. This rule mandates inspections, accreditations of persons involved with asbestos, and final air clearances following abatement in public and private schools, and public and commercial buildings.

Alternative Work Practice (AWP) - Deviation from Asbestos Standards (Sections 19a-332a-1 to 19a-332a-16 inclusive). Deviation requires a written approval letter from the State of Connecticut Department of Public Health and the Owner.

Asbestos - The term asbestos includes chrysotile, amosite, crocidolite, asbestiform tremolite, asbestos, anthophyllite asbestos, actinolite asbestos and any of these minerals that has been chemically treated and/or altered.

Asbestos Abatement - The removal, encapsulation, enclosure, renovation, repair, demolition or other disturbance of asbestos-containing materials except activities which are related to the removal or repair of asbestos cement pipe and are performed as defined in Section 25-32a of the Connecticut General Statutes.

Asbestos-Containing Material (ACM) - Any material containing greater than or equal to 1.0 percent asbestos.

Asbestos-Containing Waste Materials - Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovations operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

Asbestos Control Area - An area where asbestos abatement operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an Asbestos Control Area are a "full containment" and a "glove-bag."

Asbestos Fiber - A particulate form of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals having a length of five micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

Authorized Asbestos Disposal Facility - A location approved by the Connecticut Department of Environmental Protection for handling and disposing of asbestos waste or by an equivalent regulatory agency if the material is disposed of outside the State of Connecticut.

Category I Non-Friable Asbestos-Containing Material (ACM) -Asbestos-containing packings, gaskets, resilient floor coverings and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

Category II Non-Friable ACM - Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Competent Person - Individual capable of identifying existing asbestos, tremolite, anthophyllite, or actinolite hazards and corrective measures to eliminate them, as specified in 29 CFR 1926.32. The duties of the Competent Person include at least the following: establishing the pressure differential, ensuring its integrity, and controlling entry to and exit from the enclosure; supervising any employee exposure monitoring required by the standard; ensuring that all employees working within such an enclosure wear the appropriate personal protective equipment, are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating condition and are functioning properly.

Concealed Space - Space which is out of sight. Examples of a concealed space include area above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

Critical Barrier - A minimum of two layers of six (6) mil polyethylene sheeting taped securely over windows, doorways, diffusers, grilles and any other openings between the Work Area and uncontaminated areas outside of the Work Area, including the outside of the building.

Decontamination Enclosure System - A series of rooms separated from the Work Area and from each other by air locks, for the decontamination of workers and equipment.

Demolition - The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

DEEP - The Connecticut Department of Energy and Environmental Protection, 79 Elm Street, Hartford, CT 06106.

DPH - The Connecticut Department of Public Health, 410 Capitol Avenue, MS#51AIR, P.O. Box 340308, Hartford, CT 06134.

Differential Pressure - A difference in the static air pressure between the Work Area and occupied areas, and is developed by the use of HEPA filtered exhaust fans. This differential is generally in the range of 0.02 to 0.04 inches of water column.

Encapsulant - Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulant as follows:

a) Removal Encapsulant (can be used as a wetting agent).

b) Bridging Encapsulant (used to provide a tough durable surface coating to asbestos-containing material).

c) Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers).

d) Lock-down Encapsulant (used to seal off "lock-down" minute asbestos fibers left on surfaces from which asbestos containing materials have been removed).

Encapsulation - The application of an encapsulant to asbestos-containing building materials to control the possible release of asbestos fibers into the air.

Engineering Controls - Controls to include, but not be limited to, pressure differential equipment, decontamination enclosures, critical barriers and related procedures.

Equipment Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled transfer of materials and equipment into or out of the Work Area, typically consisting of a Washroom and a Holding Area.

Exposed - Open to view.

Finished Space - Space used for habitation or occupancy where rough surfaces are plastered, paneled or otherwise treated to provide a pleasing appearance.

Fixed Critical Barrier - Barrier constructed of 2" x 4" metal framing 16" O.C., with 1/2" wallboard on the occupied side and ½" wallboard and two layers of six (6) mil polyethylene sheeting on the Work Area side to prevent unauthorized access or air flow.

Fixed Object - A piece of equipment or furniture in the Work Area which cannot be removed from the Work Area, as determined by the Owner.

Friable Asbestos Material - Material containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, Section 1, Polarized Light Microscopy, that when dry can be crumbled, pulverized or reduced to powder by hand pressure. If the asbestos content is less then 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

Glove-Bag - A sealed compartment with attached inner gloves used for the handling of asbestos-containing materials. Properly installed and used glove bags provide a small Work Area enclosure typically used for small scale asbestos stripping operations. Information on glove-bag installation, equipment and supplies, and work practices is contained in the Occupational Safety and Health Administration's (OSHA's) final rule on occupational exposure to asbestos (29 CFR 1926.1101).

Glove-Bag Technique - A method with limited applications for removing small amounts of friable asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other non-planar surfaces in a non-contaminated work area. The glove-bag assembly is a manufactured or fabricated device consisting of a glove-bag (typically constructed of six (6) mil polyethylene or polyvinyl chloride plastic), two inward projecting long sleeves, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glove-bag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the process.

High-efficiency particulate air (HEPA) A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles 0.3 microns in diameter.

Lock-down - The procedure of spraying polyethylene sheeting and building materials with an encapsulant type sealant to seal in non-visible asbestos-containing residue.

Movable Object - A piece of equipment or furniture in the Work Area which can be removed from the Work Area, as determined by the Owner.

Non-Friable Asbestos-containing Material - Material containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy, that when dry cannot be crumbled, pulverized or reduced to powder by hand pressure.

Permissible Exposure Limit (PEL) - An airborne concentration of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals of 0.1 fibers per cubic centimeter (f/cc) of air calculated as an eight (8) hour time-weighted average, as determined by Phase Contrast Microscopy.

Personal Monitoring - Air sampling within the breathing zone of an employee.

Pre-Clean - The process of cleaning an area before asbestos abatement activities begin to ensure all dust and debris in the area considered to be asbestos-containing are properly contained and disposed of. This increases the likelihood the area will pass aggressive air sampling clearance requirements after asbestos-containing materials have been removed.

Regulated Area - Area established by the employer to demarcate areas where airborne concentrations of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals exceed, or can reasonably be expected to exceed, the Permissible Exposure Limit.

Regulated Asbestos-Containing Material (RACM) - (a) Friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component. Operations in which load-supporting members are wrecked or taken out are demolitions.

Repair - Overhauling, rebuilding, reconstructing or reconditioning of structures or substrates where asbestos, tremolite, anthophyllite or actinolite is present.

Unfinished Space - Space used for storage, utilities or work area where appearance is not a factor. Examples of an unfinished space include crawlspace; pipe tunnel and similar spaces.

Visible Emissions - Any emissions, which are visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material or from any asbestos milling, manufacturing, or fabricating operation. This does not include condensed, uncombined water vapor.

Visible Residue - Any debris or dust on surfaces in areas within the Work Area where asbestos abatement has taken place and which is visible to the unaided eye. All visible residue is assumed to contain asbestos.

Waste Generator - Any owner or operator of a source whose act or process produces asbestos-containing waste material.

Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet Cleaning - The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.

Work Area - Specific area or location where the actual work is being performed or such other area of a facility which the Commissioner determines may be hazardous to public health as a result of such asbestos abatement.

Worker Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled passage of workers and authorized visitors, typically consisting of a Clean Room, a Shower Room and an Equipment Room.

## 1.5 REFERENCES

A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.

1. Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1001 - Asbestos, Tremolite, Anthophyllite, and Actinolite.

29 CFR 1910.134 - Respiratory Protection.

29 CFR 1926.21 - Safety Training and Education

29 CFR 1926.32 - Definitions

29 CFR 1926.51 - Sanitation

29 CFR 1910.134 - Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.59 - Hazard Communication.

29 CFR 1926.200 - Accident Prevention Signs and Tags.

29 CFR 1926.417 - Lockout and Tagging of Circuits.

29 CFR 1926.1101 - Asbestos

2. Environmental Protection Agency (EPA)

   40 CFR 61, Subpart M - National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision; Final Rule.

   40 CFR 763, Subpart E - Asbestos Hazard Emergency Response Act (AHERA).

   40 CFR 763, Subpart G - Worker Protection Rule.

3. State of Connecticut, Department of Public Health Regulations (DPH)

   Section 19a-332a-1 through 19a-332a-16 - Standards for Asbestos Abatement.

   Section 20-440-1 through 20-440-9 and 20-441 Licensure and Training.

4. American National Standards Institute (ANSI)

   ANSI Z9.2 - Fundamentals Governing the Design and Operation of Local Exhaust Systems.

   ANSI Z88.2 - Respiratory Protection.

5. American Society of Testing and Materials (ASTM)

ASTM E 84 - Surface Burning Characteristics of Building Materials.

ASTM E 96 - Water Vapor Transmission of Materials.

ASTM E 119 - Fire Tests of Building and Construction Materials.

ASTM E 736 - Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

ASTM E 1368 - Visual Inspection of Asbestos Abatement Projects.

ASTM E 1494 - Encapsulants for Spray- or Trowel-Applied Friable Asbestos-Containing Building Materials.

6. Underwriters Laboratories, Inc. (UL)

UL 586 - High-Efficiency, Particulate, Air Filter Units.

1.6 DOCUMENTATION

A. Submit two copies of the following documentation to ensure compliance with the applicable regulations. An up to date copy shall be retained at the job site at all times.

B. Manufacturer's Catalog Data:

MSDS for All Materials Delivered to the Site

C. Statements:

Connecticut Notification
EPA Notification
Worker Medical Certification
Worker Training Certification
Worker Respirator Fit Testing
Worker Asbestos Licenses
OSHA Laboratory Certification
Landfill Approval
Safety Plan
Respirator Protection Plan
Initial Exposure Assessment

1. Submit notification to the following agencies at least ten (10) working days before work commences on the project:

   a. Department of Public Health
   Environmental Health Section
   450 Capitol Avenue, MS#51AIR
   P.O. Box 340308
   Hartford, CT 06134-0308

   b. Asbestos Demo/Reno Notifications
   US EPA Region 1
   5 Post Office Square, Mail Code OES05-4
   Boston, MA 02109-3912

2. Copies of all required notifications, approvals and permits for the removal, disposal and transport asbestos-containing or contaminated materials.

3. Documentation from a physician certifying that all employees who may be exposed to airborne asbestos in excess of the background level have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health affects. In addition, document that personnel have received medical monitoring required in 29 CFR 1926.1101. They shall also be informed of the specific types of respirators the employee shall be required to wear and the work he/she will be required to perform as well as special work place conditions such as high temperature, high humidity and chemical contaminants which to which he/she may be exposed.

4. Documentation certifying that all employees have received training in the proper handling of materials that contain asbestos; understand the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis.

5. Documentation of respiratory fit testing for all employees who must enter the Work Area. This fit testing shall be in accordance with qualitative procedures as detailed in 29 CFR 1926.1101.

6. Qualifications of the person proposed for air sampling to assure workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Include the name and address of the testing laboratory proposed to perform air sample analysis on behalf of the Contractor, along with their NIOSH PAT Program I.D. number.

7. Establish and supervise in accordance with 29 CFR 1926.21, a program for the education and training of workers in the recognition, avoidance and prevention of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness or injury. Include any site specific information to address health and safety procedures unique to this project.

8. Establish a written Respiratory Protection Plan in accordance with 29 CFR 1910.134. This plan shall establish procedures governing the selection and use of respirators and shall include such information as training in the proper use of respirators; medical examination of workers to determine whether or not they may be assigned an activity where respiratory protection is required; training in proper use and limitations of respirators; respirator fit testing; regular inspection and evaluation of the continued effectiveness of the program; and other elements included in the standard.

9. Demonstrate that employees exposure will be below the PEL's. For Class I asbestos work until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of the PEL's, or otherwise makes a negative exposure assessment, the employer shall presume that employees are exposed in excess of the TWA and excursion limit.

D. Records:

Sign-in/out Logs
Personal Air Sampling Results
Waste Shipment Records
Pressure Differential Recording Data

## 1.7 PERSONNEL PROTECTION

A. Instruct workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

B. Ensure workers are fully protected with respirators and protective clothing during work in the Asbestos Control Area, where there is the possibility of disturbing asbestos-containing or asbestos-contaminated materials.

C. Respiratory protection shall meet the requirements of OSHA as required in 29 CFR 1910.134 and 29 CFR 1926.1101. Provide appropriate respiratory protection for each worker and ensure usage during potential asbestos exposure. As a minimum, workers shall be equipped with powered air-purifying respirators (PAPR) with HEPA filters.

D. Select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11. Provide an adequate supply of filter elements for respirators in use.

E. Minimum respiratory protection shall be as follows:

| Airborne concentration of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals. | Required Respirator |
|---|---|
| Not in excess of 10 f/cc (100 x PEL) | 1. Any powered air purifying respirator equipped with high efficiency filters.<br><br>2. Any supplied-air respirator operated in continuous flow mode. |
| Not in excess of 100 f/cc (1000 x PEL) | 1. Full facepiece supplied supplied air respirator operated in pressure demand mode. |
| Greater than 100 f/cc (>1000 x PEL) or unknown concentration | 1. Full facepiece supplied air respirator operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus. |

Note: Respirators assigned for higher airborne fiber concentrations may be used at lower concentrations.

A high-efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

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F. Provide and require all workers to wear protective clothing in Work Areas where asbestos fiber concentrations exceed permissible limits established by OSHA. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

G. Provide all authorized persons entering contaminated areas with proper respirators and protective clothing.

H. Ensure that all workers and authorized persons enter and leave the Asbestos Control Area through the Worker Decontamination Enclosure System.

I. Ensure all contaminated protective clothing remains in the Equipment Room for reuse or disposal of as contaminated waste.

J. Ensure workers do not eat, drink, smoke or chew gum or tobacco while in the Asbestos Control Area.

## 1.8 EQUIPMENT REMOVAL PROCEDURE

A. Clean surfaces of contaminated containers and equipment thoroughly by vacuuming with HEPA filtered equipment and wet wiping before moving such items into the Equipment Decontamination Enclosure System for final cleaning and removal to uncontaminated areas. Ensure that personnel do not leave the Asbestos Control Area through the Equipment Decontamination Enclosure System.

## 1.9 SEQUENCE OF WORK

A. Proceed in accordance with the sequence of work as mutually agreed upon with the Construction Manager. Work shall be divided into convenient Work Areas, each of which is to be completed as a separate unit.

B. The following sequence of work shall be used for the asbestos abatement work:

1. A visual inspection of the Work Area to determine pre-existing damage to facility components.

2. Release of floor area (Phase) to the Contractor.

3. All temporary utilities required for the project shall be on site and operational prior to the initiation of asbestos work.

4. Abatement of all asbestos-containing materials by the Contractor.

5. Air sampling by the Project Monitor for reoccupancy.

6. Containment tear-down and clean-up.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description. Do not use damaged or deteriorating materials. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire retardant polyethylene sheet in roll size to minimize the frequency of joints, shall be delivered to job site with factory label indicating four (4) or six (6) mil.

B. Polyethylene disposable bags shall be six (6) mil with pre-printed label. Disposable bags shall be opaque.

C. Tape shall be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces. Tape must be capable of adhering under both dry and wet conditions.

D. Surfactant (wetting agent) shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration one (1) ounce surfactant to five (5) gallons of water or as directed by the manufacturer.

E. Containers must be impermeable and shall be both air and watertight. Containers shall be labeled in accordance with OSHA Standard 29 CFR 1926.1101 and EPA 40 CFR Part 61.152 as appropriate.

F. Labels and signs shall conform to OSHA Standard 29 CFR 1926.1101.

G. Encapsulant shall be bridging or penetrating type which has been approved by the Design Consultant. Usage shall be in accordance with manufacturer's printed technical data. Encapsulant must be compatible with new materials being installed. Encapsulant shall dry clear.

H. Glove-bag assembly shall be manufactured of six (6) mil transparent polyethylene or PVC with two (2) inward projecting long sleeve gloves, an internal pouch for tools, and an attached labeled receptacle for waste.

## 2.2 TOOLS AND EQUIPMENT

A. Tools and equipment shall be suitable for asbestos removal.

B. Protective clothing, respirators, filter cartridges, air filters and sample filter cassettes shall be provided in sufficient quantities for the project.

C. Electrical equipment, protective devices and power cables shall conform to all applicable codes.

D. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate. Showers shall be equipped with hot and cold or warm running water. One shower stall shall be provided for each eight workers.

E. Exhaust air filtration units shall be equipped with HEPA filters capable of providing sufficient air exhaust to create a minimum pressure differential of 0.02 inches of water column, and to allow a sufficient flow of air through the area. An automatic warning system shall be incorporated into the equipment to indicate pressure drop or unit failure. No air movement system or air filtering equipment shall discharge unfiltered air outside the Asbestos Control Area.

F. Pressure differential monitoring equipment shall be provided to ensure exhaust air filtration devices provide the minimum pressure differential required between the Work Area and occupied areas of the facility.

G. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Asbestos Control Area.

H. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 microns in diameter or larger.

I. Ladders and/or scaffolds shall be of adequate length, strength and sufficient quantity to support the work schedule.

J. Other materials such as lumber, nails and hardware necessary to construct and dismantle the decontamination enclosures and the barriers that isolate the Work Area shall be provided as appropriate for the work.

PART 3 - EXECUTION

3.1 PREPARATION OF WORK AREA ENCLOSURE SYSTEM

A. Prior to beginning work, the Owner, Design Consultant, and Contractor shall conduct a pre-abatement meeting, perform a visual survey of each Work Area and list all pre-existing damage to building components. The Contractor shall submit to the Owner a list which shall include all damaged areas not scheduled to be repaired under this Contract and include photographs, video tapes as applicable.

B. Post warning signs meeting the specifications of OSHA 29 CFR 1910 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee may read the sign and take the necessary protective steps before entering the area. Additional signs may require posting following construction of work place enclosure barriers.

C. Utilize engineering controls and personnel protective equipment while installing enclosures and supports when asbestos-containing materials may be disturbed.

D. When feasible, shut down and lock out electrical power, including all receptacles and light fixtures. Protect receptacles and light fixtures remaining in the Work Area with six (6) mil polyethylene and seal with tape. Coordinate all power isolation with the Owner.

E. Provide temporary power and lighting and ensure safe installation, including ground fault protection, of temporary power sources and equipment in compliance with applicable electrical code and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

F. Shut down and isolate heating, cooling, and ventilating air systems to prevent contamination and fiber dispersal to other areas of the building. Seal all vents.

G. Pre-clean movable objects within the proposed Work Areas using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate and remove such objects from Work Areas to a temporary location.

H. Pre-clean fixed objects within the proposed Work Areas, using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate, and enclose with two layers of six (6) mil polyethylene sheeting sealed with tape.

I. Clean the proposed Work Areas using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

J. Seal off all windows, doorways, skylights, ducts, grilles, diffusers, and any other openings between the Work Area and the uncontaminated areas outside of the Work Area with critical barriers. Doorways and corridors which will not be used for passage during work must be sealed with fixed critical barriers.

K. Cover floor and wall surfaces with polyethylene sheeting sealed with tape. Polyethylene shall be applied alternately to floors and walls. Cover floors first, with a layer of six (6) mil polyethylene sheeting, so that polyethylene extends at least twelve (12) inches up on walls. Cover walls with a layer of four (4) mil polyethylene sheeting to twelve (12) inches beyond the wall floor intersection, thus overlapping the floor material by a minimum of twenty-four (24) inches. Repeat the process for the second layer of polyethylene. There shall be no seams in the plastic sheet at wall-to-floor joints.

L. Conspicuously label and maintain emergency and fire exits from the Asbestos Control Area satisfactory to fire officials.

## 3.2 WORKER DECONTAMINATION ENCLOSURE SYSTEM

A. Establish contiguous to the Work Area, a Worker Decontamination Enclosure System consisting of Equipment Room, Shower Room and Clean Room in series. Access to the Work Area shall only be through this enclosure.

B. Access between rooms in the Worker Decontamination Enclosure System shall be through double flap curtained openings (air locks). Other effective designs are permissible. The Clean Room, Shower Room and Equipment Room located within the Worker Decontamination Enclosure, shall be completely sealed ensuring sole source of air flow into the Asbestos Control Area originates from the outside uncontaminated areas.

C. The Clean Room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and clothing. Changing areas of the Clean Room shall be suitably screened from areas occupied by the public.

D. The Shower Room shall be of sufficient capacity to accommodate the number of workers. Supply warm water to showers. Provide one shower for each eight workers. No worker or other person shall leave an Asbestos Control Area without showering. Shower water shall be collected and filtered using best available technology and dumped down an approved drain.

E. No personnel or equipment shall be permitted to leave the Asbestos Control Area unless just decontaminated by showering, wet cleaning or HEPA vacuuming to remove all asbestos debris. No asbestos-contaminated materials or persons shall enter the Clean Room.

## 3.3 EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM

A. Establish contiguous to the Work Area an Equipment Decontamination Enclosure System consisting of two (2) totally enclosed chambers divided by a double flap curtained opening. Other effective designs are permissible. This enclosure must be constructed so as to ensure that no personnel enter or exit through this unit.

## 3.4 SEPARATION OF WORK AREAS FROM OCCUPIED AREAS

A. Occupied areas and/or building space not within the Asbestos Control Area shall be separated from asbestos abatement Work Areas by means of airtight barriers. Barriers at openings with dimensions exceeding two (2) feet in both directions shall be blocked with fixed critical barriers.

B. Do not impair required building exits from any occupied building area. Where normal exits have been blocked by the asbestos work, provide temporary exit signs directing building occupants to the nearest available exit location.

C. Visually inspect and smoke test NPE barriers to assure an effective seal. Repair defects immediately.

D. Create a pressure differential in the range of 0.02 to 0.04 inches of water column between the Work Area and occupied areas by the use of acceptable pressure differential equipment. Provide a sufficient quantity of units to exhaust the volume of air within the Asbestos Control Area a minimum of four times per hour. Continuously monitor the pressure differential between the Work Area and occupied areas utilizing recording type equipment to ensure exhaust air filtration equipment maintains a minimum pressure differential of 0.02 inches of water column.

## 3.5 ASBESTOS REMOVAL – INTERIOR ABATEMENT

A. A Competent Person shall be on the job at all times to ensure the establishment and maintenance of the NPE and proper work practices throughout the project. Before beginning work within the NPE and at the beginning of each shift, the NPE shall be inspected for breaches and smoke tested for leaks, and any leaks sealed. Results of NPE inspections shall be logged.

B. Do not begin abatement work until authorized by the Project Monitor.

C. Spray asbestos materials with amended water, using airless spray equipment capable of providing a "mist" application to reduce the release of fibers during the removal operation.

D. In order to maintain indoor asbestos concentrations at a minimum, remove the wet asbestos in manageable sections. Materials shall not be allowed to dry out. Material drop shall not exceed 8 feet. For heights up to 15 feet provide inclined chutes or scaffolding to intercept drop. For heights exceeding 15 feet provide enclosed dust-proof chutes.

E. Fill disposal containers (six (6) mil polyethylene bags or fiber drums) as removal proceeds, seal filled containers, apply caution labels and clean containers before removal to wash area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Bags may be placed in drums for staging and transportation to the disposal site. Bags shall be decontaminated by wet cleaning and HEPA vacuuming before being placed in clean drums and sealed with locking ring tops. Vinyl asbestos floor tile removed shall be placed in polypropylene burlap bags and then double poly bagged. Small components and asbestos containing waste with sharp-edged components (e.g., nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in polypropylene burlap bags and then double poly bagged. Wet clean each container thoroughly before moving to Holding Area. Ensure that workers do not enter from uncontaminated areas into the Washroom or the Work Area. Ensure that contaminated workers do not exit the Work Area through the Equipment Decontamination Enclosure.

F. After completion of stripping work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet.

G. If at any time during asbestos removal, should the Project Monitor suspect contamination of areas outside the Work Area, the Contractor shall stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from

entering contaminated areas until air sampling and visual inspections determine decontamination.

H. Containerize asbestos-containing waste material removed daily. Do not allow ACM to remain on the floor overnight, allowing it to dry out.

## 3.6 ASBESTOS REMOVAL – EXTERIOR ABATEMENT

A. A Competent Person shall be on the job at all times to ensure the establishment and maintenance of control measures and proper work practices throughout the project.

B. Do not begin abatement work until authorized by the Project Monitor.

C. Spray asbestos materials with amended water, using airless spray equipment capable of providing a "mist" application to reduce the release of fibers during the removal operation.

D. Cover ground under exterior removal activity with 10’ wide 6 mil polyethylene sheeting, weighted to withstand wind loading. Create a regulated area around the exterior removal area with warning tape and warning signs.

E. Fill disposal containers (six (6) mil polyethylene bags or fiber drums) as removal proceeds, seal filled containers, apply caution labels and clean containers before removal to wash area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Bags may be placed in drums for staging and transportation to the disposal site.

F. If at any time during asbestos removal, should the Project Monitor suspect contamination of areas outside the Work Area, the Contractor shall stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and visual inspections determine decontamination.

G. Containerize asbestos-containing waste material removed daily. Do not allow ACM to remain on the ground overnight.

## 3.7 ALTERNATIVE WORK PRACTICE (AWP) PROCEDURES

A. The procedures described in this specification are to be utilized as the basis for bidding this project.

B. Alternative procedures require written letters of approval from the following parties:

Department of Public Health – Asbestos Program

The Contractor may not conduct asbestos removal utilizing the Alternative Work Practice until the written Alternative Work Practice approval letter from the Department of Public Health is on the job site. Alternative Work Practice approvals shall be secured prior to implementation.

C. Allow 21 calendar days for the processing of written requests for Alternate Work Practices by the Owner and associated review parties. Alternate Work Practices may not be utilized without Owner approval.

D. Written requests for Alternate Work Practices must be accompanied by a written itemized credit proposal to the Owner detailing the labor and material costs that will be credited to the Contract if the Alternate Work Practice is approved. Written requests for Alternate Work Practices must be accompanied by a written assessment of the schedule impact of utilizing the proposed Alternate Work Practice.

E. The Town of Newington reserves the right to reject any proposed Alternative Work Practice without cause.

F. The Contractor shall be responsible for all fees associated with filing Alternative Work Practice (AWP) applications. Submission of AWP applications requires a Connecticut DPH Asbestos Project Designer license. The Contractor is responsible for retaining a licensed Asbestos Project Designer to prepare the Alternate Work Practice. The licensed Asbestos Project Designer that prepares the Alternate Work Practice may not be an employee of the Contractor or an employee of a Subcontractor under contract with the Contractor.

G. Submit written requests for Alternate Work Practices to the Owner.

## 3.8 CLEAN-UP PROCEDURE

A. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris which may have splattered or collected on the polyethylene wall covering.

B. Remove contamination from the exteriors of the negative air machines, scaffolding, ladders, extension cords, hoses and other equipment inside the Work Area. Cleaning may be accomplished by brushing, HEPA vacuuming and/or wet cleaning.

C. The Project Monitor shall conduct a thorough visual inspection utilizing a high-intensity flashlight, with the containment barriers in place, to detect visible accumulations of dust or bulk asbestos-containing materials remaining in the Work Area. Should dust, debris or residue be detected, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean-up of the work site.

D. Once the area has been recleaned, any equipment, tools or materials not required for completion of the work, shall be removed from the Work Area. Negative air filtration devices shall remain in place and operating for the remainder of the clean-up operation.

E. Apply a lock-down encapsulant to all surfaces within the Work Area from which asbestos has been removed and the cleaned inner layer of polyethylene.

F. Air sampling for reoccupancy clearance shall be undertaken using aggressive sampling techniques. Analysis of clearance samples shall follow State of Connecticut Regulations, Section 19a-332a-12. Areas which do not comply shall continue to be cleaned by and at the Contractors expense, until the specified Standard of Cleaning is achieved as evidenced by results of air testing. When the Work Area passes the reoccupancy clearance, controls established by this specification may be removed.

G. Remove all remaining polyethylene, including critical barriers, and Decontamination Enclosure Systems leaving negative air filtration devices in operation. Dispose of poly sheeting as asbestos-contaminated waste. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process.

## 3.9 REINSTALLATION OF DISPLACED EQUIPMENT

A. After reoccupancy is granted, resecure mounted items removed during the course of the work to their former positions.

## 3.10 DISPOSAL OF ASBESTOS

A. Disposal of asbestos-containing and/or asbestos contaminated material shall occur at an authorized site and must be in compliance with the requirements of, and authorized by the Office of Solid Waste Management, Department of Energy and Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.

B. Disposal approval shall be obtained prior to commencement of asbestos removal.

C. Warning signs must be attached to vehicles used to transport asbestos-containing waste. Warning signs shall be posted during loading and unloading of disposal containers. The signs must be posted so that they are plainly visible.

D. Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be taped into place. Keep dumpsters locked when not in use.

E. Contractor is responsible for signing the asbestos waste shipment record as generator prior to each asbestos waste dumpster leaving site and giving a copy of the signed waste shipment record to the Owner. The completed waste shipment record with landfill sign-offs shall be forwarded to the Owner.

## 3.11 CONTRACTOR RESPONSIBILITY

A. Conduct air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours of receipt of results, and shall be available for review until the job is complete.

## 3.12 AIR SAMPLING SCHEDULE

A. At a minimum, air sampling by the Project Monitor will be conducted in accordance with the following schedule:

| Abatement Activity | Pre-Abatement | During Abatement | Post-Abatement |
|---|---|---|---|
| Greater than 260 l.f. or 160 s.f. | PCM | PCM | TEM |
| Equal to or less than 260 l.f. or 160 s.f. | PCM | PCM | PCM |

B. Frequency and duration of the air sampling during abatement will be representative of the actual conditions during the abatement. The size of the asbestos project will be a factor in the number of samples required to monitor the abatement activities. In addition to OSHA compliance monitoring (personal sampling accomplished by the Contractor) the following minimum schedule of samples will be required:

1. Background Samples:

a) Outside of building - 2.

b) Adjacent Area(s) inside building - 2.

c) Work Area - 3 or if areas are separated (such as rooms) at least one (1) sample per area equalling a minimum of three (3).

2. During Abatement:

a) Outside of building at the exhaust of air filtering device - 2 per shift.

b) Work Area - 2 per shift.

c) Adjacent area inside building - 2 per shift.

d) Outside of the Equipment Decontamination Enclosure System - 1 during removal of ACM waste.

3. Post-Abatement:

a) Work Area - At least five (5) per homogenous work site or one (1) per room, whichever is greater.

C. Post-abatement clearance air monitoring requirements are as follows:

1. Air sampling will not begin until at least 12 hours after wet cleaning has been completed and no visible water or condensation remain.

2. Sampling equipment will be placed at random around the Work Area. If the Work Area contains the number of rooms equivalent to the number of required samples based on floor area, a sampler shall be placed in each room. When the number of rooms is greater than the number of samples a representative number of rooms will be selected.

3. The representative samplers placed outside the Work Area but within the building will be located to avoid any air that might escape through the isolation barriers and will be approximately 50 feet from the entrance to the Work Area, and 25 feet from the isolation barriers.

4. The following aggressive air sampling procedures will be used within the Work Area during all air clearance monitoring:

   a) Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceilings, floors, ledges and other surfaces in the Work Area. This should take at least 5 minutes per 1000 SF of floor area.

   b) Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on slow speed and point it toward the ceiling.

   c) Start the sampling pumps and sample for the required time.

   d) Turn off the pump and then the fan(s) when sampling is complete.

5. Air volumes taken for clearance sampling shall be sufficient to accurately determine (to a 95 percent probability) fiber concentrations to 0.010 f/cc of air.

6. The clearance criteria for work areas cleared by PCM (Phase Contrast Microscopy) is that all 5 clearance samples must register less than or equal to 0.010 f/cc of air.

7. The clearance criteria for work areas cleared by TEM (Transmission Electron Microscopy) is that the average of the 5 clearance samples taken inside the work area must register less than 70 structures per square millimeter of filter area.

8. Each homogeneous Work Area which does not meet the clearance criteria shall be thoroughly recleaned using HEPA vacuuming and/or wet cleaning, with the negative pressure ventilation system in operation. New samples shall be collected in the Work Area as described above. The process shall be repeated until the Work Area passes the test, with the cost of repeat sampling being borne entirely by the Contractor.

9. For an asbestos abatement project with more than one homogeneous Work Area, the release criterion shall be applied independently to each Work Area.

D. TEM clearance turnaround time will be 24 hours after the TEM lab receives the samples by overnight mail.

## 3.13 ACTION CRITERIA

A. If air samples collected outside of the Work Area during abatement activities indicate airborne fiber concentrations greater than original background levels or greater than 0.010 f/cc, as determined by Phase Contrast Microscopy, whichever is larger, an examination of the Work Area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the Work Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

End of Section 02 82 16

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**SECTION 02 82 17 - ASBESTOS ROOFING REMOVAL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SCOPE

A. The work specified herein shall be the removal of asbestos-containing roofing materials by persons who are knowledgeable, qualified, licensed, and trained in the removal, treatment, handling, and disposal of asbestos-containing roofing material, and the subsequent cleaning of the affected environment. The Contractor shall have a Competent Person in control on the job site with authority to take prompt corrective measures at all times during roofing removal work. This person must comply with applicable Federal, State and Local regulations which mandate work practices, and be capable of performing the work of this contract.

B. The Owner will retain the services of a Project Monitor for protection of its interests and those using the building. Area air sampling and a visual inspection to ensure proper clean up of the work area will be conducted as deemed necessary.

C. Deviations from this Specification require the written approval of the Owner.

1.3 DESCRIPTION OF WORK

A. The Contractor shall supply all labor, materials, equipment, services, insurance (with specific coverage for asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.

Contractor shall remove and dispose of the asbestos-containing roofing from the roof of Anna Reynolds School as delineated on Drawing H1.07 in accordance with this specification.

1.4 DEFINITIONS

Asbestos-Containing Material (ACM) - Any material containing more than one percent asbestos.

Competent Person - In addition to the definition in 29 CFR 1926.32(f), one who is in the workplace and selecting the appropriate control strategy for asbestos

exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for Supervisor, or its equivalent.

High-efficiency particulate air (HEPA) A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles 0.3 microns in diameter.

Intact - The ACM has not been crumbled, pulverized, or otherwise deteriorated so that it is no longer likely to be bound with its matrix.

Owner – Town of Newington.

Leak-tight - Solids or liquids cannot escape or spill out. It also means dust-tight.

Regulated Area - Area established by the Competent Person to demarcate areas where airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the Permissable Exposure Limit.

1.5 REFERENCES

A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.

1. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1101 - Asbestos

2. Environmental Protection Agency (EPA) 40 CFR 61, Subpart M - National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision; Final Rule. 40 CFR 763, Appendix C to Subpart E - Asbestos Model Accreditation Plan (MAP)

3. State of Connecticut, Department of Public Health Regulations (DPH) Section 19a-332a-1 through 19a-332a-16 - Standards for Asbestos Abatement. Section 19a-332a-17 through 19a-332a-23 - Licensure and Training.

1.6 SUBMITTALS AND NOTICES

A. Prior to commencement of asbestos abatement work, submit to the A/E and receive approval and/or acknowledgment of following:

1. Asbestos worker medical clearance to wear a respirator documentation
2. Asbestos worker & Competent Person training documentation

3. Asbestos worker respiratory fit testing documentation
4. State & EPA asbestos notifications

B. Submit notification to the following agencies at least ten (10) working days before work commences on the project:

1. Department of Public Health
Environmental Health Section
450 Capitol Avenue, MS#51AIR
P.O. Box 340308
Hartford, CT 06134-0308

2. Asbestos Demo/Reno Notifications
US EPA Region 1
5 Post Office Square, Mail Code OES05-4
Boston, MA 02109-3912

C. Within 35 days following the date the asbestos waste trailer leaves the job site, submit to the A/E and Owner:

1. Waste shipment record for disposal of asbestos roofing material

1.7 PERSONNEL PROTECTION

A. Provide and require all workers to wear protective clothing and half face respirators when removing or handling asbestos-containing roofing material.

B. Provide and require all workers to wear protective clothing and half face respirators when present in the Regulated Area established by the Competent Person.

C. Ensure workers do not eat, drink, smoke or chew gum or tobacco while engaged in asbestos-containing roofing removal.

D. Ensure workers decontaminate themselves at the hand washing facility after engaging in asbestos-containing roofing material removal.

1.8 WORKER TRAINING REQUIREMENTS

A. The Competent Person shall have successfully completed a five day / 40 hour Asbestos Supervisor training course equivalent to the EPA Model Accreditation Plan (MAP).

B. Workers shall have successfully completed an 8 hour roof-specific asbestos training course in compliance with 29 CFR 1926.1101 (k)(9)(iv)(A).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene sheeting and disposal bags shall be six (6) mil.

B. Labels and signs shall conform to applicable regulations.

2.2 TOOLS AND EQUIPMENT

A. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance per OSHA requirements.

B. Protective clothing, respirators, filter cartridges, air filters and sample filter cassettes shall be provided in sufficient quantities for the project.

C. Power tools used to cut asbestos-containing roofing materials shall be equipped with a HEPA filtered dust collector.

PART 3 - EXECUTION

3.1 PREPARATION OF WORK AREA

A. Prior to beginning work, the Building Owner, Design Consultant, and Contractor shall conduct a pre-abatement meeting, perform a visual survey of each Work Area and list all pre-existing damage to building components. The Contractor shall submit to the Building Owner a list which shall include all damaged areas not scheduled to be repaired under this Contract and include photographs, video tapes as applicable.

B. Prior to start of work, and as needed during the job, the Competent Person shall inspect the work site and determine whether the roofing material is intact and will likely stay intact.

C. Post warning signs meeting the specifications of OSHA 29 CFR 1910 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee may read the sign and take the necessary protective steps before entering the area. Post signs at each ladder or hatch leading up to the roof.

D. Asbestos-containing roofing material may not take place with children under age 18 in the school building.

3.2 WORKER HAND WASHING FACILITY

A. Establish immediately adjacent to the roof a worker hand washing facility consisting of running potable water, a wash basin, hand cleaning cream, and towels.

B. No personnel or equipment shall be permitted to leave the regulated area unless first decontaminated by washing to remove all asbestos debris.

## 3.3 ASBESTOS-CONTAINING ROOFING MATERIAL REMOVAL

A. A Competent Person shall be on the job at all times to ensure proper work practices throughout the project.

B. Remove asbestos-containing roofing material in an intact state to the extent feasible.

C. Pick up or HEPA vacuum asbestos-containing roofing debris from non-intact roofs prior to removal of the roofing. Bag debris for disposal.

D. Utilize wet methods to remove asbestos-containing roofing materials unless such wet methods are not feasible or will create safety hazards, as determined by the competent person, in writing.

E. Mist asbestos-containing roofing material prior to removal. This requirement is optional if the competent person determines, in writing, that misting substantially decreases worker safety.

F. Equip power tools with a HEPA dust collector to collect dust generated by cutting asbestos-containing roofing material. Bag dust for disposal.

G. HEPA vacuum asbestos-containing dust and debris left after the removal of asbestos-containing roofing.

H. Remove asbestos-containing flashings and associated cements using manual methods (such as axe, knife, or shovel). Do not sand, abrade, or grind these materials.

I. Asbestos-containing roofing material shall be carried or passed to the ground by hand or lowered to the ground by crane or hoist. Do not drop asbestos-containing roofing material to the ground or into the dumpster.

J. Transfer all intact removed asbestos-containing roofing material to the leak tight disposal dumpster by the end of the work shift. Bag and lower non-intact asbestos-containing roofing material immediately.

K. Transfer lowered asbestos-containing roofing material to the leak tight disposal dumpster carefully so as not to disperse dust.

## 3.4 DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL

A. Disposal of asbestos-containing and/or asbestos contaminated material shall occur at an authorized site and must be in compliance with the requirements of, and authorized by the Office of Solid Waste Management, Department of Energy & Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.

B. Asbestos warning signs must be attached to containers used to transport asbestos-containing waste. Warning signs shall be posted during loading and unloading of disposal containers. The signs must be posted so that they are plainly visible.

C. Label bags of asbestos-containing waste material using warning labels specified by OSHA 29 CFR 1926.1101. Label asbestos-containing waste material destined for off-site transport with the name of the waste generator and the location where the waste was generated.

D. Contractor is responsible for signing the asbestos waste shipment record as generator prior to each asbestos waste dumpster leaving site and giving a copy of the signed waste shipment record to the Town of Newington representative. The completed waste shipment record with landfill sign-offs shall be forwarded to the Owner.

## 3.5 CONTRACTOR PERSONAL AIR MONITORING RESPONSIBILITY

A. Conduct air sampling to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

B. Produce a written initial asbestos exposure assessment prior to starting asbestos roofing removal work in compliance with OSHA Standard 1926.1101. Keep the exposure assessment on site for review by all concerned parties.

END OF SECTION 02 82 17

**SECTION 02 82 33 - LEAD ABATEMENT**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 DEFINITIONS

A. Action Level: Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter (µg/m3) calculated as an eight hour time weighted average.

B. Competent Person: An individual capable of identifying existing lead hazards and taking corrective measures to eliminate them. The duties of the competent person include at least the following: controlling entry to and exit from the lead abatement area, ensuring contract compliance, conducting personal air monitoring, ensuring that all employees working within the lead abatement area have lead awareness training, and ensuring that lead abatement workers use the hand washing facilities.

C. Lead Based Paint: Paint found to contain greater than or equal to 1.0 milligrams of lead per square centimeter of paint area by XRF testing.

D. Permissible Exposure Limit (PEL): Fifty (50) micrograms per cubic meter (µg/m3) of air averaged over an 8 hour period as determined by 29 CFR 1926.62.

E. Personal Monitoring: Sampling of lead concentrations within the breathing zone of a worker to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks.

F. Toxicity Characteristic Leaching Procedure (TCLP): Toxicity characteristic leaching procedure utilizing EPA Test method SW-846, Method 1311.

1.3 GENERAL

A. Scope: - Disturbance and disposal of lead-containing materials at Anna Reynolds School.

B. Intent: The intent of this specification is to assist the Contractor in complying with the OSHA Construction Industry Standard for Lead (29 CFR Part 1926.62) and State DEEP regulations for waste disposal when renovations at Anna Reynolds School.

C. OSHA Compliance: Contractor is responsible for compliance with the OSHA Construction Industry Standard for Lead (29 CFR Part 1926.62) when conducting demolition activities at Anna Reynolds School. Contractor is to maintain a copy of 29 CFR 1926.62 on site.

D. Notification: Contractor shall obtain a small quantity hazardous waste generator ID number from the State DEEP for the site.

1.4 LEAD PAINT IDENTIFICATION

A. Toxic (≥1 mg/cm2) levels of lead have been identified on the following building components at Anna Reynolds School:
• Paint on structural steel in the 1950's construction areas
• Porcelain sinks, toilets, & urinals

1.5 DEBRIS DISPOSAL

A. The following materials shall be disposed of as hazardous lead waste with a TCLP reading >5 mg/l:
• Removed paint from structural steel

B. The following materials shall be disposed of as solid waste with a TCLP reading <5 mg/l:
• Porcelain sinks, toilets, & urinals

C. The following materials shall be disposed of as scrap metal:
• Leaded copper roof flashing

1.6 EMPLOYEE EXPOSURE ASSESSMENT

A. Conduct lead dust air sampling to assure that workers are protected in accordance with all applicable Federal, State, and Local regulations. Documentation of air sampling results must be recorded at the work site within five (5) working days and shall be available for review until the job is complete.

1.7 WORKER HAND WASHING FACILITY

A. Establish a lead abatement worker hand washing facility consisting of running potable water, a wash basin, hand cleaning cream, and towels.

B. All workers shall wash their hands and face prior to taking breaks, going to lunch, and leaving the site at the end of the work day.

1.8 WORKER PROTECTION PROCEDURES

A. Workers shall not eat, drink, smoke, or chew gum or tobacco while in the lead abatement area.

1.9 WORKER TRAINING REQUIREMENT

A. All Contractor employees on the job site are required to be trained regarding any hazardous materials, including lead, they may be exposed to at the work site and health and safety hazards at the work site. Training shall meet the requirements of the Hazard Communication Standard (29 CFR 1926.59) and Safety Training and Education Standard (29 CFR 1926.21).

B. All workers impacting lead-containing building materials shall receive at least 4 hours of lead awareness training meeting the requirements of 29 CFR 1926.62. Documentation of said training is to be kept on-site in a binder for review. The awareness training must be dated within one year of the project. Forward a copy of the training to the A/E.

1.10 COMPETENT PERSON

A. Maintain a competent person on site for the duration of lead abatement.

1.11 LEAD ABATEMENT PLAN

A. Prior to construction, in compliance with the OSHA Lead Standard, prepare a written description of lead abatement activities planned detailing methods, equipment, engineering controls, crew size, employee job responsibilities, operating and maintenance procedures.

B. Submit a copy of the Lead Abatement Plan to the A/E for review. Maintain a copy on site during construction.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION 02 82 33

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# SECTION 02 84 16 – LIGHT TUBES & BALLASTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

### 1.2 SCOPE

Removal and disposal of oil-containing lighting ballasts and mercury-containing fluorescent lamps.

### 1.3 DESCRIPTION OF WORK

A. The Contractor shall supply all labor, materials, equipment, services, insurance, and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.

B. Contractor shall remove and dispose of all fluorescent & HID light ballasts and fluorescent & HID light tubes at Anna Reynolds School in accordance with this specification. Utilize a Connecticut licensed electrician to de-energize and lock & tag-out power to the lights prior to ballast removal.

### 1.4 DEFINITIONS

Mercury-Containing Lamps - As used in this specification shall mean all fluorescent and high-intensity discharge (HID) lamps scheduled for demolition and/or removal as indicated in the Contract documents.

### 1.5 REFERENCES

A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.

Code of Federal Regulations (CFR)
29 CFR 1910.1000 - Air Contaminants
40 CFR 262 - Generators of Hazardous Waste
40 CFR 263 - Transporters of Hazardous Waste
40 CFR 273.5 – Universal Waste Lamps
49 CFR 172 - Hazardous Materials, Table, and Hazardous Materials Communication Program
49 CFR 178 - Shipping Container Specification

### 1.6 QUALITY ASSURANCE

A. Training - Train all persons involved in the removal of mercury-containing lamps. The instruction shall include: The dangers of mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Use disposable gloves (Nitrile), eye protection, and PPE as required when handling light ballasts and light tubes.

PART 3 - EXECUTION

3.1 WORK PROCEDURE

A. Furnish labor, materials, services, and equipment necessary for the removal of oil containing light ballasts and mercury-containing fluorescent lamps in accordance with local, state, and federal regulations. Do not break mercury containing fluorescent lamps.

3.2 REMOVAL

A. Ballasts – Remove ballasts and barrel.

B. Lighting Lamps - Remove lighting tubes / lamps from the lighting fixture and carefully pack into appropriate containers.

3.3 STORAGE FOR DISPOSAL

A. Barrel ballasts in 55 gallon steel drums.

B. Storage Containers for lamps - Store mercury-containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

C. Labeling of Waste Containers - Label with the following:

a. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.4 DISPOSAL

A. Dispose of ballasts and light tubes off project property in accordance with EPA, DOT, and local regulations at a permitted site.

B. Identification Number - Obtain a small quantity hazardous waste generator ID number from the State of Connecticut DEEP for the site.

C. Certificate of Disposal and/or Recycling. Certificate for the ballasts and tubes disposed of shall include:

The identity of the disposal and or recycling facility, by name, address, and EPA identification number.

The identity of the waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.

A statement certifying the fact of disposal and or recycling of the identified waste, including the date(s) of disposal, and identifying the disposal process used.

END OF SECTION 02 84 16

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**SECTION 02 84 33 - PCB ABATEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY:

A. This section specifies the procedures for removal and disposal of existing PCB-containing materials identified at Anna Reynolds School (see Drawings H1.01 through H1.12 for material types and locations).

B. Proper dust control measures such as the use of polyethylene sheeting around work areas/lifts, and wet techniques and HEPA filtration on power tools will be implemented to minimize dust generation. Perimeter air monitoring will be conducted.

C. All PCB remediation workers shall have completed 40 hour OSHA HAZWOPER training with current annual 8 hour HAZWOPER refresher training. All PCB remediation workers shall also have completed an on site training session to be given by the Contractor to review the PCB hazards and proper work practices outlined in this plan.

D. All work shall be conducted in accordance with the requirements of EPA regulations including 40 CFR Part 761, OSHA regulations, and CT DEEP Regulations as well as all other applicable codes, rules, and regulations.

E. The Owner will engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the PCB remediation, provide direction as required throughout the remediation work, collection verification and monitoring samples per EPA's Approval, and general recordkeeping.

F. The Contractor shall ensure cooperation of its personnel with the Consultant for the sampling and Project Monitoring functions. The Contractor shall comply with all direction given by the Consultant during the course of the Project with regard to the PCB remediation work.

G. The material removal dimensions provided on the contract drawings are subject to modification based on the results of verification testing to be conducted following removal of building materials and ground surfaces. The Contractor shall provide unit costs for additional building material and ground surface removal that may be necessary based on results of the verification testing.

1.3 REFERENCES

A. Connecticut Department of Energy and Environmental Protection (DEEP):

1. Sec. 22a-449(c)-11 Transporter Permits
2. Sec. 22a-449(c)-100 through 110 Hazardous Waste Management

## 1.4 SUBMITTALS

A. Prior to Commencement of Work:

1. Submit certification of required insurance evidencing that the required coverages are in effect.
2. Submit proof satisfactory to the Owner that all required permits, site locations, arrangements for transport and disposal of PCB-containing or contaminated materials, supplies, and the like have been obtained.
3. Submit documentation to the Owner indicating that each employee has instruction on the hazards of PCB exposure (40 hour HAZWOPER and site specific training), on use and fitting of respirators, on protective dress, on entry and exit from work areas, and on all aspects of work procedures and protective measures and understands this instruction. Also submit verification that all employees have received medical examinations as required by OSHA regulations.
4. Health & Safety Plan (HASP) developed specific to the Work activities. All workers will follow applicable Federal and State regulations regarding the work activities, including but not limited to OSHA regulations, fall protection standards, respiratory protection, ladder/scaffolding safety, personal protective equipment, etc.
5. Remediation Work Plan: The work plan shall include, but not be limited to, a drawing indicating the location of work areas (boundaries, signage, poly sheeting, etc.), location and details of decontamination facilities, sequencing of PCB materials removal, work procedures, types of equipment, crew size, and emergency procedures for fire and medical emergencies.
6. Waste Transporter and Disposal Facility Permits and other transportation documentation.
7. Project Close-out Submittals: Within 30 days after completion submit the documents listed below:
   a. Originals of all waste disposal manifests, disposal logs, and certificates of disposal.
   b. Daily progress log, including the entry/exit log.
   c. Disposal Site/Landfill Permit from applicable regulatory agency.

## 1.5 QUALITY ASSURANCE

A. Contractor shall provide and assure that the quality of work practices and procedures are consistent with the below listed agencies. Contractor shall utilize the latest edition, including all addenda, revisions and supplements for all regulatory agencies codes, etc., including but not limited to:

1. Environmental Protection Agency (EPA).
2. Occupational Safety and Health Administration.
3. State of Connecticut DEEP codes and laws.
4. All local codes.

B. Pre-Work Conference: Before the Work of this Section is scheduled to commence, a conference will be held by the Owner's Representative at the Site for the purpose of reviewing the Contract Documents, discussing requirements for the Work, and reviewing the Work procedures.

1. The conference shall be attended by the Contractor, the Contractor, and the testing/monitoring laboratory employed by the Owner.

PART 2 - PRODUCTS

2.1 PROTECTIVE CLOTHING

A. Safety equipment (e.g., hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1- 1967, disposable PVC gloves or other work gloves, and disposable suits), shall be provided to all workers and authorized visitors.

B. All personnel must utilize proper Personal Protective Equipment (PPE) during all work activities. Proper PPE may vary depending on the job task, but may include disposable gloves, disposable rubber boots, steel-toe boots, disposable suits, respirators, hard hats, hearing protection, and/or eye protection.

C. Provide sufficient quantities of protective clothing to assure that enough complete disposable outfits are available for each individual performing remediation Work each day.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area. No unauthorized visitors will be allowed to enter the Work Area.

2.2 RESPIRATORY PROTECTION

A. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and/or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. The Contractor shall maintain fit-test records for each employee using a respirator.

C. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

D. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134.

E. Provide a storage area where respirators will be kept in a clean environment.

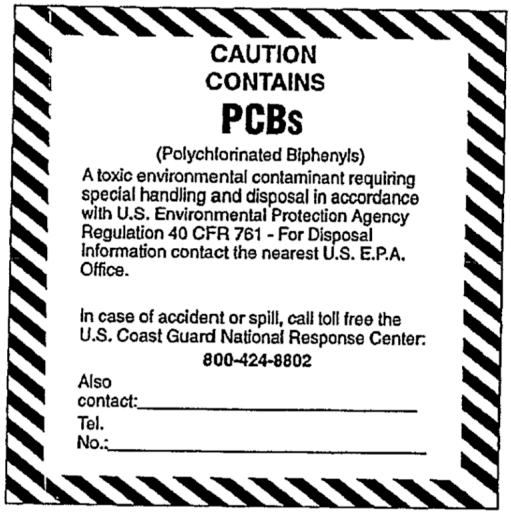
F. Provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.

G. Filters shall be removed and discarded during the decontamination process at a frequency at least as often as recommended by the manufacturer's specifications. Filters cannot be reused. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day.

2.3 SIGNS, LABELS & CONTAINERS

A. Provide warning signs and barrier tapes at all approaches to PCB Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide signage in English and Spanish.

B. Provide the appropriate "Large PCB Marking" or "Small PCB Marking" (ML or MS per 40 CFR 761) as shown below, of sufficient size to be clearly legible, for display on waste containers (bags, boxes, roll-offs or drums) which will be used to contain or transport PCB contaminated material, in accordance with 40 CFR 761. ln addition, U.S. Department of Transportation (DOT) 49 CFR Parts 171 and 172 requires the name and UN number of the material to be on the bags or drums, and, if shipped in bulk (roll-offs, Gaylord boxes, etc) the bulk container must also be labeled: Polychlorinated biphenyl, solid mixture UN 3432, if designated as a hazardous waste.




$M_L$




$M_S$

C. Provide 6 mil polyethylene disposal bags with PCB caution labels.

1. The "Small PCB Label" (MS per 40 CFR 761) may be used as shown above. Bags shall also be labeled with U.S. DOT required markings per 49 CFR 172, Polychlorinated Biphenyl, solid mixture UN 3432.
2. Labeled PCB waste containers or bags shall not be used for non-PCB waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as PCB waste.

D. A secure, lined, and covered waste container (roll-off or equivalent), 55-gallon DOT-approved steel containers, or equivalent will be staged for the collection of PCB wastes generated during the work activities in accordance with 40 CFR 761.65;

E. All containers with PCB materials that are not regulated as Hazardous Waste will be properly labeled and marked in accordance with applicable State requirements and the requirements of the selected disposal facility.

2.4 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with PCBs shall be decontaminated or disposed of as PCB waste.

B. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for barriers, fixed objects, walls, floors, ceilings, waste containers) shall be at least 10 mil for ground and floor application and 6 mil for other applications.

C. Tape will be used that is capable of sealing joints in adjacent plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions.

D. Abrasive used for wet abrasive blasting shall be ground glass, 30 grit or finer.

2.5 TOOLS & EQUIPMENT

A. Tools used for the removal of caulking or other PCB materials shall be used in a manner that minimizes dust generation, as appropriate.

B. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Air (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

C. Any power tools used to drill, cut into, or otherwise disturb PCB material shall be cowled with HEPA filtered local exhaust ventilation.

D. Ladders, lifts, and/or scaffolds are to be of adequate length and sufficient quantity to support work schedule.

E. Other Materials - provide all other materials such as lumber, nails and hardware, which may be required to construct and dismantle the decontamination area and the barriers that isolate the Work Area.

F. Vehicle Storage - No construction vehicles shall be stored, serviced, washed or flushed out in a location where leaks, spillage, waste materials, cleaners or waters will flow or be otherwise introduced into wetlands, reservoirs or watercourses.

G. Wet abrasive blasting equipment shall inject abrasive into a pressurized water stream.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The work of this section consists of, but is not limited to:

1. Furnishing of all labor, materials, facilities, equipment, services, and insurance necessary to perform the work;
2. Maintenance of work area/site security;
3. Preparation of work area, including installation of containment and decontamination areas as required;
4. Removal, segregation, and off-site disposal of PCB-containing materials;
5. Clean-up and final decontamination of all work areas;
6. Implementation of a worker protection program in compliance with all applicable regulations;
7. Proper storage, wrapping/bagging, labeling, transportation and disposal of all waste generated as part of PCB remediation activities.

B. Maintain the following documentation on-site during remediation activities:

1. Medical approval to wear a respirator for all workers, fit test reports, worker 40 hour HAZWOPER training certificates, worker current 8 hour HAZWOPER refresher training certificate
2. Project documents (remediation plan, work plan, drawings, specifications, etc.)
3. Material Safety Data Sheets
4. List of Emergency Contact information
5. Project logs

3.2 WORK AREA PREPARATION

A. Access to the active work areas will be controlled through the use of controlled access points, polyethylene containment, and signage.

B. Separate the PCB work area with 6 mil poly sheeting sealed with duct tape covering doors, operable windows, and vents. Setup a HEPA filtered fan unit, exhausted outdoors, in the PCB work area. Use 6 mil poly drop cloths on floors to facilitate cleanup.

C. Tools, equipment, and material waste receptors are to be staged prior to commencement of work.

D. All areas will be kept free from debris and maintained in a safe condition. At the end of each work day, the work areas will be inspected and all dust and debris cleaned and placed in appropriate disposal containers.

3.3 PCB REMOVAL

A. Removal and off-site disposal of all PCB-containing material in accordance with Drawings H1.01 through H1.12.

B. Following the initial removal, verification samples will be collected by the Environmental Consultant to verify that the cleanup levels have been met. Depending on the results of these samples, either the task will be considered complete (i.e., cleanup levels met) or additional removal or decontamination will be needed (i.e., cleanup levels not met). Contractor shall include plans to store and identify materials represented by each verification sample in order to allow additional removals or segregation depending on verification testing. Following additional removal or decontamination, the verification process will be repeated until the cleanup levels are met. The Contractor shall provide unit pricing for additional removal or decontamination that may be required.

C. After completion of work, clean up of all surfaces and work areas shall be conducted in accordance with Part 3.5 of this Section.

D. If at any time during PCB removal, should the Contractor or the Owner's Consultant suspect contamination of areas outside the work area, all abatement work shall cease until the Contractor takes steps to decontaminate these areas and eliminate causes of such contamination.

## 3.4 WET ABRASIVE BLASTING

A. Where specified on the drawings, use wet abrasive blasting (WAB) to remove PCB-containing paint from substrates.

B. Blasting equipment to utilize abrasive injected into pressurized water stream.

C. Abrasive to be ground glass with grit size of 30 or finer.

D. Blast substrates to remove paint until no visible paint is present.

E. Do not allow blasting stream to dwell on mortar such that mortar is gouged by the stream.

F. Collect waste water from blasting by HEPA vacuuming. Filter waste water by 2 stage 50 micron filtration followed by 5 micron filtration. Recycle water for reuse in blasting. Store in drums. When blasting is complete and remaining filtered water is ready for disposal, Owner’s Consultant to test water in each drum. Do not discharge water until authorized by Owner’s Consultant. For the purposes of bidding, assume that drums of filtered waste water will be discharged to sanitary sewer.

## 3.5 AIR MONITORING

A. Air monitoring activities shall be conducted by the Owner’s Consultant during PCB remediation work. The air monitoring shall include, at a minimum, hourly readings within a zone perimeter to the Work Area (Support Work Zone or SWZ) so as to assure that work practices are protective of human health to persons outside of the Work Area. Air monitoring shall be conducted with a particulate aerosol monitor capable of dis-

playing real-time concentrations of airborne particulates in a mass per volume ratio to 0.001 milligrams per cubic meter (mg/m3). Prior to the active removal actions and at periodic points during the project, air monitoring readings will be recorded to document background particulate matter concentrations.

B. If total particulate concentrations in the SWZ exceed the action limits (e.g., 0.1 mg/m3 above background) and are sustained (i.e. greater than 5 minutes), then the work will be stopped and additional dust suppression techniques to mitigate fugitive dust shall be initiated.

## 3.6 CLEAN-UP & CLEARANCE TESTING

A. Remove visible accumulations of PCB material and debris. Wet clean or HEPA vacuum all surfaces within the Work Area.

B. Removal of PCB-containing paint and caulk to be considered complete based on results of visual inspection and verification wipe and bulk testing conducted by the Owner's Consultant.

C. For verification of task completion through the collection of samples for analytical testing there may be up to a 5-7 business day turn around time prior to receiving the results of the analytical testing. Appropriate project planning and scheduling should be incorporated into the overall project plans including methods for storing and identifying waste materials represented by each verification sample to allow for additional removal if required.

D. A visual inspection of all work areas shall be conducted by the Owner's Consultant following completion of remediation activities. The visual inspection will document incomplete work, damage caused by the abatement activity, and inadequate clean-up of the worksite, as applicable. Additional cleaning, repair work, or remediation work shall be conducted to the satisfaction of the Owner at the Contractor's expense.

## 3.7 WASTE MANAGEMENT AND DISPOSAL

A. All wastes shall be placed in authorized leak-tight containers and kept closed and locked at all times except for adding or removing waste. All wastes shall be kept in a secure location with proper signage visible at all times.

B. Labeled PCB waste containers or bags shall not be used for non-PCB waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as PCB waste.

C. All containers with PCB materials that are not regulated as Hazardous Waste shall be properly labeled and marked in accordance with applicable State requirements and the requirements of the selected disposal facility.

D. Temporary Storage of Waste Trailers - The Owner will make available distinct areas where waste trailers can be stored temporarily on site. The Owner's representative will verify the segregation of the waste going to the waste containers during the work and

will record the number of trailers of PCB waste leaving the site and verify that the amount recorded agrees with the amount listed on the waste disposal manifest at the time of removal from the site.

E. All PCB materials are to be placed in appropriate waste containers immediately upon removal. PCB materials may be stored within the work area until such time as the removal work in that area is complete or until the end of the working day.

F. All PCB waste generated shall be stored on-site in a secure, lined, and covered waste container (roll-off or equivalent), 55-gallon DOT-approved steel containers, or equivalent staged for the collection of PCB wastes generated during the work activities in accordance with 40 CFR 761.65. The staging area for PCB waste will be approved by the Owner prior to beginning the PCB remediation activities.

G. Transporter and Disposal Site shall be approved by the Owner. Selected disposal site shall be in accordance with the requirements of 40 CFR 761.

H. Provide twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor is present and the Owner authorizes the release of the waste as described herein.

I. All waste generated as part of the PCB project shall be removed from the site within 30 calendar days after successful completion of all PCB Remediation work.

J. Upon arrival at the Project Site, the Transporter must possess and present to the Contractor a valid Waste Transporter Permit for the subject waste.

K. The Transporter, with the Contractor shall inspect all material in the transport container prior to taking possession and signing the Manifests.

L. Supply and complete the manifests and all other required waste disposal documentation in accordance with all applicable federal and state regulations. All manifests and other waste documentation shall be signed by the Owner or a designated representative. Allow 1 week processing time for Owner to sign waste documentation. Copies of all waste documentation shall be provided to the Owner and Owner’s Consultant.

END OF SECTION 02 84 33

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# SECTION 03 05 10 – CONCRETE MOISTURE VAPOR REDUCTION ADMIXTURE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes:

1. High performance, concrete Moisture Vapor Reduction Admixture (MVRA) for all new concrete slabs.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 03 Section “Cast-in-Place Concrete” for cast-in-place concrete materials and placement, and vapor retarder.
3. Division 09 Flooring Sections for flooring materials installed over concrete slabs that contain integral waterproofing and for preparation requirements.
4. Division 09 Section “Water Vapor Emission Control System” for topical water vapor reduction system for existing concrete slabs.

### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

### 1.4 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM D 5084: Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
2. ASTM E 1643: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
3. ASTM E 1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

4. ASTM F 710-11 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
5. ASTM C 494/C 494M-08a Chemical Admixtures for Concrete Type S.
6. ASTM C 157/C-08 Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
7. ASTM D 7234-05 Pull Off Adhesion Strength of Coatings on Concrete
8. U.S. Army Corp of Engineers CRD-C48-92 Standard Test Method for Permeability of Concrete.

## 1.5 SUBMITTALS

A. Product Data: Manufacturer's printed data sheets.

1. Include standard slab repair details.
2. Include vapor barrier data showing compliance with this section.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: Documentation including printed statement of VOC content.

C. Product test reports performed by a qualified independent testing agency evidencing compliance of products with specified requirements of water-vapor transmission based on comprehensive testing of current products.

D. Manufacturer's certificate certifying admixture provided meets or exceeds specified requirements.

E. Sample warranties including the following:

1. Manufacturer's standard "life of the concrete" warranty.
2. Manufacturer's standard published adhesion warranty.
3. Manufacturer's standard published moisture letter.

## 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with not less than ten (10) years' experience in the manufacture of the specified concrete moisture vapor reduction admixture, capable of providing test reports indicating compliance with specified performance requirements, and able to provide on-site technical representation should the need arise. Selected product must have certification of compliance with ASTM C494 /C494M testing protocols from an independent AASHTO approved laboratory.

1. The manufacturer shall provide an onsite contracted independent ACI certified technical representative to perform sampling for each day's concrete slab placement. A minimum of one random cylinder per day's concrete placement for independent daily testing to ASTM D 5084.

B. Preinstallation Conference: Conduct at Project site.

1. Verify all are familiar with MVRA project specific quality control procedures, review concrete mix designs and examine procedures for ensuring quality of concrete materials. Each entity directly concerned with MVRA dosed concrete must attend in person, conference call, or provide electronic review of documents, mix designs and procedures. Those required to participate or to review include but are not limited to:

a. Contractor.
b. Independent testing agency responsible for concrete design mixtures, sampling and testing.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Moisture Vapor Reduction Admixture manufacturer.

C. Moisture Vapor Reduction Admixture Collection Agent / Representative Qualifications

1. Personnel conducting field sampling on behalf of the MVRA manufacturer shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Quality Control Protocol shall consist of the concrete water vapor transmission inhibiting admixture representative procuring two random cylinders from every placement of concrete containing the concrete water vapor transmission inhibiting admixture. These cylinders shall be sent to an independent laboratory for hydraulic conductivity (coefficient of permeability) per ASTM D5084. The results of this “project specific” quality control protocol shall form the basis for the issuance of the project specific warranty.

1. Should the Quality Control Protocol deliver results in excess of 6.0 E-08 cm/sec, the concrete water vapor transmission inhibiting admixture manufacturer shall provide, at their expense, an epoxy topical moisture mitigation system for all areas not meeting the stated limit.

a. The moisture mitigation system shall include all labor and material for slab profiling, epoxy material, and application.
b. The moisture mitigation system shall include a warranty meeting or exceeding the terms of the manufacturer’s warranty specified in this Section.

E. Toxicity/Hazardous Materials: Provide products that contain no urea-formaldehyde.

F. Repairs to slabs must be in accordance with concrete industry standards and meeting waterproofing admixture manufacturer’s published details.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturers written instructions for handling prior to adding to concrete batch.

B. Store both components protected from exposure to harmful weather conditions and in a temperature controlled area above 36 deg F. Do not allow product to freeze.

1.8 WARRANTY

A. Special Warranty: Provide manufacturer's standard warranty documents executed by an authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights the owner may have under provisions of the Contract Documents.

1. Warranty Period: Life of the concrete.

a. Warranty requirements: Said product must be installed according to and in compliance with the manufacturer's published data sheet to include but not limited to dosing instructions, onsite representation requirements, and the use of an ASTM E 1745 vapor retarder, installed following ASTM E 1643 and ASTM F 710 guidelines; elevated concrete slabs do not require a vapor retarder.

1) MVRA Manufacturer's warranty shall include:

a) Repair and/or removal of failed flooring.
b) Placement of a topical moisture remediation system.
c) Replacement of flooring materials like original installed to include material and labor.

2) MVRA Manufacturer shall provide an adhesion warranty to match the term of the adhesive manufacturer's warranty in accordance with the MVRA manufacturer's requirements for conveyance of such.

2. Warranty Basis: Follow Quality Control Protocol specified in this Section, achieving a maximum coefficient of permeability of 6.0 E-08 cm/sec on all project test samples.

PART 2 - PRODUCTS

2.1 CONCRETE MOISTURE VAPOR REDUCTION ADMIXTURE

A. Concrete Moisture Vapor Reduction Admixture (MVRA): Concrete moisture vapor reduction admixture for all interior slabs on grade, elevated slabs, and stair treads and landings, shall be a non-toxic, liquid admixture that is specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through the slab by restricting the integral capillary system. The chemical reaction forms a permanent barrier (capillary break) that is integral to the concrete, insoluble and irremovable.

1. Basis of Design Product: Subject to compliance with requirements, provide **Concrete Moisture Solutions, Inc., Barrier One High Performance Concrete Admixture (CMS Admix)**, or one of the following:

a. ISE Logik Industries, Inc.; MVRA 900.
b. Specialty Products Group; Vapor Lock 20/20.

## 2.2 MATERIALS

A. Concrete Water Vapor Transmission Inhibiting Admixture: Non-toxic, liquid admixture for concrete that reacts with water and portlandite filling the capillary system with calcium silicate hydrate (CSH) to eliminate the route for moisture migration. Once the admixture is added to the mix design, the admixture shall react with the water to allow the concrete to be flexible, even at low slump.

1. Product Description: Concrete water vapor transmission inhibiting admixture shall be a complex formula that is free of all volatile organic compounds (VOC). It shall be specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through concrete by closing down the integral capillary system. The chemical reaction shall form a permanent barrier (capillary break) which is integral to the concrete and irremovable.

   a. Water Vapor Transmission: 0.20 US perms per ASTM D 5084
   b. Appearance: Colorless
   c. Odor: None
   d. Toxicity: None
   e. Flammability: None
   f. Ph: 11.3
   g. Shelf Life: Indefinite
   h. Weight: 10.3 lbs per gallon
   i. Freeze Temp: 32°F
   j. Storage Temp: Above 36°F
   k. Solvent: Water
   l. Acid Resistance: Excellent
   m. Hazardous Vapors: None
   n. Capillary Break: Calcium Silicate Hydrate Gel
   o. Installation: All concrete
   p. VOC Levels: Zero

## 2.3 RELATED MATERIALS

A. Sheet Vapor Retarder: ASTM E 1745-09 compliant vapor barrier maintaining a permeance of 0.1 US perms (grains/$ft^2$*hr*inHg) or less after the required product conditioning specified in ASTM E 1745-09, with a minimum thickness of 0.01-inch (10 mils). Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: As specified in Division 03 Section “Cast-in-Place Concrete”, indicating compliance with required perm rating after product conditioning specified in ASTM E 1745-09. Final approval is with moisture vapor reduction admixture manufacturer.

PART 3 - EXECUTION

3.1 APPLICATION

A. Install vapor barrier following ASTM E 1643-98(2005) guidelines and in accordance with Division 03 Section "Cast-in-Place Concrete."

B. Moisture Vapor Reduction Admixture: Add Barrier One Admixture in accordance with manufacturer's recommendations to all ready-mix concrete, at the batch plant or at the job site.

1. A representative or agent of Barrier One Admixture must be present at the jobsite during the placement of all treated concrete. Do not proceed without the Barrier One representative being present for the certification of the mix and placement process. Provide minimum 10 days notice of the placement of the treated concrete.
2. The Quality Control Protocol for Barrier One Admixture shall consist of the Barrier One representative procuring two random cylinders from every placement of concrete containing Barrier One Admixture. These cylinders will be sent to an independent laboratory for hydraulic conductivity (coefficient of permeability) per ASTM D5084. The results of this "project specific" quality control protocol forms the basis for the issuance of the project specific warranty.

C. Dispense Barrier One admixture at a rate of 14 oz. per 100 lbs. of cementitious materials at the tail end of the load, dose to be within plus or minus 3 percent. Additional dosage may be required based on the mix design.

1. Add Barrier One Admixture to ready mix concrete truck, in the require dosage, and mix for 7 (seven) minutes before discharge. Barrier One Admixture is to be used in lieu of designed mix water, not in addition to mix water.
2. Do not alter 0.45 water/cementitious materials ratio without prior approval.
3. The addition of non-chlorinated admixtures is permitted.
4. The addition of Shrink Reducing Admixtures is **not** permitted.

D. Freshening onsite with held back mix water is acceptable so long as the practice is in accordance with published ACI guidelines and does not exceed the original water to cementitious material ratio or instructions of the Architect / Structural Engineer.

E. Other admixtures may be used in the same concrete batch with Barrier One provided that such admixtures are added separately.

1. The water-to-cementitious material ratio (w/cm) is critical and it is imperative to comply with the mix design. Barrier One is used in lieu of that portion of the mix water, not in addition to the mix water.
2. Use of water reducing admixtures is recommended to achieve slumps greater than 4 inches.

3.2 CURING

A. Comply with curing requirements in Division 03 Section “Cast-in-Place Concrete” and as follows:

1. Cure concrete slabs to receive moisture sensitive coatings according to ACI 302.2R-06, by one or a combination of the following methods:

a. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure concrete containing MVRA for not less than 24 hours, longer if ambient conditions are hot, windy, and sunny or subject to periods of very low humidity. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
b. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
c. Removal: After curing period has elapsed, mechanically remove curing compound prior to the installation of final flooring material in accordance with ASTM F-710.

1) Do not chemically remove.

3.3 FIELD QUALITY CONTROL

A. Testing of Slabs Containing MVRA:

1. The moisture vapor reduction admixture (MVRA) manufacturer will perform all moisture testing in accordance with this specification and will issue project specific warranties and adhesion guarantees prior to installation of any slab finishes; no further field slab moisture nor pH testing shall be required.

a. Failure to provide a product that meets or exceeds these requirements will result in all subsequent testing and slab remediation costs being borne by the Contractor.

2. A representative or agent of the moisture vapor reduction admixture (MVRA) manufacturer must be present at the jobsite during placement of all MVRA treated concrete.

a. Do not proceed without this representative being present.
b. A minimum of one business day notification is required.

3. Field testing technician shall, at the expense of the MVRA Manufacturer, procure at least one 4 inch cylinder from every day of placement of MVRA dosed concrete for the purpose of subsequent hydraulic conductivity/coefficient of permeability testing.
4. All cylinders shall be independently lab tested in accordance with ASTM D 5084 at the expense of the MVRA manufacturer.
5. Test results must conform to specified limits.

a. Should any cylinder from any day of placement deliver results in excess of 6.0 E-08 cm/sec, the concrete moisture vapor reduction admixture manufacturer shall procure, at their expense, a core (or cores) from that day of placement. This core (cores) shall be sent to an independent laboratory for hydraulic conductivity (coefficient or permeability) per ASTM D 5084.
b. Should any core deliver results in excess of 6.0 E-08 cm/sec per ASTM D 5084, the concrete moisture vapor reduction admixture manufacturer shall provide, at their expense, a topical moisture mitigation system for all areas not meeting the stated limit.

6. Proceeding with placement of concrete dosed with the MVRA without the required representation will result in the contractor bearing the cost to core and ship appropriate material for testing per ASTM D 5084.

B. Concrete Water Vapor Transmission Inhibiting Tests: If the results of the testing of the original cylinders is inconclusive, additional testing of slabs containing concrete water vapor transmission inhibiting admixture shall be carried out by the concrete water vapor transmission inhibiting admixture manufacturer's technical representative to include: Two random, 4-inch drilled sample cores and/or cylinders on all project slabs.

C. The sample cores and/or cylinders shall be sent to an independent laboratory and tested for permeability in accordance with ASTM D 5084, and shall achieve a minimum 6.0 E-08 cm/sec. The results shall be provided to the Construction Manager and Architect prior to the installation of floor coverings and as part of the warranty closeout documents.

1. The manufacturer's warranty must be in place prior to installation of flooring materials.
2. All adhesives used for flooring installation must be compatible with the MVRA and manufactured for non-porous surfaces. Comply with Division 09 Sections for installation.

D. Additional testing may be required in accordance with the water vapor transmission inhibiting admixture manufacturer's requirements. No other testing shall be required for installation of floor coverings.

## 3.4 REPAIRS

A. Make repairs to slab in accordance with Division 03 Section "Cast-in-Place Concrete" and as shown in manufacturer's published details and remediation program.

END OF SECTION 03 05 10

**SECTION 03 10 00 - CONCRETE FORMWORK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 DESCRIPTION OF WORK

A. Furnish all labor, supervision, materials, tools and equipment necessary for, or incidental to the completion of the formwork for cast-in-place concrete as shown on the Contract Drawings and/or as specified.

B. Built-In Inserts

1. Install built-in anchors, anchor bolts, inserts, sleeves, angles, bolts, etc, as required under other Divisions shall be furnished by such trades.

1.3 RELATED WORK

A. Section 03 20 00 - Concrete Reinforcement

B. Section 03 30 00 - Cast-in-Place Concrete

1.4 QUALITY ASSURANCE

A. Design Criteria

1. Design of formwork shall conform to ACI 318 Chapter 6 and ACI 347, Chapter 2. The design and engineering of the formwork, as well as the construction, shall be the responsibility of the Contractor. Formwork shall be designed to support gravity and wind loads as specified by the State Building Code. Allowable stresses shall meet applicable requirements of the State Building Code.
2. Formwork shall be mortar tight, sufficiently rigid, and strong to prevent sagging or springing between supports and to maintain true position and shape during and after placing of concrete, without waves, bulges, or other defects in finished concrete surfaces.
3. Erection and removal of formwork shall conform to the requirements of ACI 301, Section 2, except as modified herein.

B. Allowable Tolerances

1. Erect and maintain concrete forms so as to ensure completed work within the tolerance limits of ACI-117, unless otherwise noted in the Contract Documents.

1.5 SUBMITTALS

A. Contractor shall submit shop drawing to the Engineer for review of temporary shoring locations and locations of any construction, control, or expansion joints to be used in all walls and slabs, as outlined in Section 03 20 04 Concrete Reinforcement.

B. The Contractor shall submit fully detailed shop drawings for all permanent metal forms to the Engineer for review. Shop drawings shall include form thicknesses, physical dimensions, accessories, coatings, and method of attachment to supporting structure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conform with ACI 347, Chapter 3.

B. Unexposed surfaces may be formed with dressed matched lumber, free from loose knots or major defects.

C. Exposed concrete surfaces shall be formed with three-quarter (3/4") inch thick sound plywood without patches, A.P.A. Plyform Ext. B-B, using a minimum of pieces and placed symmetrically.

D. Chamfer strips shall be new half-inch (1/2") 45-degree wood strips, nailed six (6") inches on center, and installed in inside corners of forms.

E. Form releasing agent shall be a clear, non-staining material the approved equal of Nox-Crete.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Contractor shall notify the Engineer twenty-four (24) hours prior to placing foundation forms for examination of soil bearing material.

3.2 PREPARATION OF WOOD FORM SURFACES

A. All forms shall be coated with a non-staining form release agent compound before the reinforcement is placed.

B. Forms shall be thoroughly cleaned and recoated with form release agent before re-use.

## 3.3 INSTALLATION OF TEMPORARY FORMS

A. Construct forms to shape, grade and dimensions shown, sufficiently tight to prevent leakage. Joints shall be placed on true vertical and horizontal axis.

B. Side forms shall be used for footings and grade beams.

C. Erect formwork and adequately support, brace, and maintain so as to safely support construction loads and to remain in correct position during and after placing concrete without displacement.

D. Forms for external corners of exposed members shall be accurately fitted and securely fastened. Install beveled chamfer strips nailed at six (6") inches on center, in corners of all exposed members to provide a three-quarter (3/4") inch chamfer, measured at the diagonal face.

E. Forms shall be recessed to receive anchor bolts and bearing plates.

F. Formwork shall be pitched as required to meet finished slab elevations as shown on the Contract Drawings, to maintain the depth of any slab or beam. Camber formwork as shown on Contract Drawings to meet tolerances.

G. Attach to formwork as required items such as preformed reglets, and any other anchors, inserts, bolts, or sleeves. Coordinate with requirements of all other Divisions' work for proper lines and spacing.

H. Provide cleanout panels at bottom of walls and columns for cleaning and inspection.

I. Keys shown shall be two (2) inches deep by one-third (1/3) the total thickness and beveled unless otherwise noted.

## 3.4 WALL CONSTRUCTION JOINTS

A. Unless otherwise shown on the Drawings, foundation walls shall have vertical construction joints located no more than sixty-five (65') feet apart. No vertical construction joint shall be within four feet zero inches (4'-0") of any column pier, corner or footing joint.

B. See Section 03 30 04 for Slab Construction Joint Requirements.

## 3.5 TIES

A. Where vertical surfaces are exposed in either exterior or interior areas, use wood cone snap ties with one and one-half (1 1/2") inch break back.

B. Locate form ties for exposed concrete in horizontal rows and vertical tiers. Drill forms to suit ties used. Do not splinter forms by driving ties through improperly prepared holes.

3.6 SHORING OF METAL FORMS

A. Shore metal deck forms at all locations as recommended by metal form supplier and in accordance with the Steel Deck Institute recommendation. Shores shall be supported on the same structural members which support the metal deck and not from the floor below and shall be designed so that deflection of shore at any point is not more than 1/360th of the deck span being shored. Note: Metal deck forms will generally not require shoring; however, some areas with long spans and/or thicker concrete slabs may require shoring.

3.7 REMOVAL OF FORMWORK

A. The Contractor shall be solely responsible for construction during and after form removal.

B. Formwork for footings may be removed twenty-four (24) hours after placing of concrete.

C. Formwork not supporting the weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may not be removed in less than seventy-two (72) hours after placing the concrete, and provided that curing and protection operations are maintained.

D. Formwork supporting the weight of concrete, such as beam soffits, joists, slabs, and other structural elements of work, may not be removed in less than fourteen (14) days or until the concrete has attained a minimum strength to carry its own weight and any approved superimposed load, which at no time shall exceed the design live load of that floor.

E. No construction loads exceeding the dead load plus live load shall be supported on any unshored portion of the structure under construction. No construction loads shall be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure in combination with the remaining forming and shoring system has sufficient strength to support safely its weight and the loads placed thereon.

F. Exercise care in form removal to prevent chipping of corners or other damage to concrete. Any damage to concrete shall be patched as per Section 03 30 04 Cast-in-Place Concrete.

END OF SECTION 03 10 00

**SECTION 03 20 00 - CONCRETE REINFORCEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 DESCRIPTION OF WORK

A. Furnish all labor, supervision, materials, tools and equipment necessary for, or incidental to completion of the concrete reinforcement for cast-in-place concrete as shown on the Contract Drawings and/or specified.

1.3 RELATED WORK

A. Section 03 10 00 - Concrete Formwork

B. Section 03 30 00 - Cast-in-Place Concrete

1.4 QUALITY ASSURANCE

A. Allowable tolerances: Fabricating and placing tolerances as outlined in ACI 301, Section 3, except as modified by these specifications.

1.5 SUBMITTALS

A. Shop Drawings

1. The Contractor shall submit detailed drawings which clearly show location, splicing, cover, sizes, and spacing of all reinforcing and wire fabric. Schedules and diagrams shall indicate bends, sizes, and lengths of reinforcing members. All reinforcement in concrete walls and grade beams shall be shown in elevation one eighth inch equals one foot zero inch (1/8" = 1'-0") scale. All construction joints, as required on the Contract Drawings or requested by the Contractor, shall be shown with any additional reinforcement required. Show and locate all concrete openings, including those required for other Divisions. Any drawings submitted without showing construction joints and openings will be rejected and will not be reviewed.

B. No reinforcing shall be cut, fabricated, shipped on the job site or placed before shop drawings are reviewed. Only shop drawings bearing the Engineer's stamp marked "Furnish as Submitted" or "Furnish as Corrected" shall be used in the field.

C. Certificate

1. The manufacturer shall submit to the Engineer certified test results stating that the reinforcing steel and welded wire fabric conform to the chemical composition and tensile and bending requirements as outlined in ASTM A615 and ASTM A185.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to the project site in bundles, marked with metal tags indicating bar size, grade and length.

B. Store reinforcing on skids or other supports above ground and protect from any damage or surface contamination, which would impair its bonding qualities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All reinforcing bars shall conform to the requirements of ASTM A615, Grade 60.

B. Welded wire fabric shall conform to the requirements of ASTM A185.

C. Metal Accessories

1. Provide all spacers, chairs, ties, clips, and other devices required for proper placement.

D. Epoxy adhesive shall be HIT HY 200 as furnished by Hilti, Inc., Tulsa, Oklahoma.

2.2 FABRICATION

A. Bar reinforcing shall be fabricated cold to dimensions given on the Contract Drawings. Conform to ACI standards 318 and 315 for forming hooks and bends and for detailing, fabricating, and erecting reinforcement.

B. Reinforcing shall be accurately formed to dimensions on drawings, details, and schedules within the following tolerances:

Sheared Length .....±1 inch
Stirrups, Ties and Spirals .....±1/2 inch
All Other Bends .....±1/2 inch

C. Reinforcing shall be bent cold and shall not be straightened or bent in a manner that will injure the materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Contractor shall notify the Engineer twenty-four (24) hours prior to placing concrete to inspect secured reinforcing. No concrete shall be placed until reinforcing has been inspected.

3.2 INSTALLATION

A. Placement

1. Reinforcement shall be free of paint, dirt, oil, or excessive scale or rust that might reduce its bond strength with concrete.
2. Reinforcement shall be accurately placed and secured against displacement before and during the placing of concrete. Provide metal chairs, supports, and spacers to secure steel in correct horizontal and vertical position. Conform to "Recommended Practice for Placing Reinforcing Bars" (CRSI) in spacing of bolsters for slab and beam bottom reinforcing and in spacing of support bars on continuous high chairs for top slab reinforcement. The use of individual high chairs is prohibited.
3. No welding of bars will be allowed.
4. For exposed concrete in soffits or ceilings, bar supports shall be stainless steel, plastic, or have plastic ends of an approved type in contact with forms.
5. Reinforcement shall stop at expansion joints and continue through construction joints.
6. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete beyond the tolerances specified below. On ground, solid concrete blocks, made of 3000 psi concrete, shall be used to support any reinforcing bars in slabs. Surfaces of blocks shall be sufficiently rough to insure proper bond with cast-in-place concrete. Reinforcement shall be secured against displacement with annealed iron wire ties or suitable clips at all intersections, except reinforcing for footings may be wired at alternate intersections.

B. Cast-in-Place Concrete Reinforcing Cover

1. Footing and grade beams cast against and permanently exposed to earth .....3"
2. Walls, #6 bars and larger.....2"
3. Piers, #5 bars, 5/8 in., wire and smaller ..... 1 1/2"
4. Structural Slabs:

    a. Not exposed to weather or in contact with the ground ..... 3/4"
    b. Exposed to weather or in contact with the ground.....1"

5. Beams, girders, columns: Principal reinforcement, ties, stirrups or spirals ..... 1 1/2"

C. Reinforcing Placing Tolerances

1. Place reinforcing as shown on drawings and schedules within the following tolerances:

Cast-in-Place Concrete Cover
to Formed Surfaces..... + 1/4 inch

Depth to Steel Reinforcing of:
24" or Less..... + 1/4 inch
More than 24"..... + 1/2 inch

Longitudinal Location of Bends
and Ends of Bars, Except at
Ends of Members..... + 2 inches

D. Splicing

1. Lap splices - tie securely with wire to prevent displacement during placement of concrete.
2. Splice bars only at the locations and to the lengths shown on the Contract Drawings or as accepted on the Shop Drawings.

E. Welded Wire Fabric

1. Fabric shall be shipped in flat sheets.
2. Wire fabric end and side laps shall be even multiple of wiring spacing and shall be not less than six (6") inches.
3. Wire fabric reinforcement for structural slabs shall be supported on continuous high chairs at all slab support member locations.
4. Wire fabric reinforcement for slabs on grade shall be placed in the upper third of slab depth.
5. Wire fabric for slabs on grade shall be supported on masonry blocks or other suitable supports at a spacing not to exceed four feet zero inch (4'-0") on center.
6. All exterior slabs on grade shall contain welded wire fabric unless otherwise noted.

END OF SECTION 03 20 00

**SECTION 03 30 00 - CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 DESCRIPTION OF WORK

A. Furnish all labor, supervision, materials, tools and equipment necessary for or reasonably incidental to completion of all cast-in-place concrete as shown on the Contract Drawings and/or specified herein.

B. Work shall include all footings, piers, walls, slabs on grade, retaining walls, grade beams, structural slabs, concrete stairs and platforms and beams shown on the Contract Drawings.

C. Pads and miscellaneous concrete as required for Mechanical and Electrical Divisions.

D. Set anchor bolts and leveling plates specified in Division 5, Structural Steel.

E. Place all anchors, inserts, dovetail slots, hangers, sleeves, and etc. which must be encased in concrete for other Divisions.

1.3 RELATED WORK

A. Section 03 10 00 – Concrete Formwork

B. Section 03 20 00 – Concrete Reinforcement

1.4 QUALITY ASSURANCE

A. Standards

1. Concrete work shall conform to all requirements of ACI-301 "Specifications for Structural Concrete" latest edition.
2. Design of concrete shall conform to all requirements of ACI-318 "Building Code Requirements for Structural Concrete" latest edition.

B. Testing Agency

1. The Owner will engage and pay for an independent commercial testing laboratory to test concrete used on this project.
2. Testing required under Section 2.2, Proportions, shall be by an independent commercial laboratory as approved by the Engineer, and at the Contractor's expense.

C. Quality Control

1. Compression Tests

a. Tests shall be made in conformance with ASTM C39. Each test shall consist of four (4) cylinders made and tested by the laboratory during the progress of the project, testing as follows:

i. One (1) - after curing seven (7) days in the field.
ii. Three (3) - after curing twenty-eight (28) days in the laboratory.

b. At least one (1) test shall be made every one hundred (100 cy) cubic yards of concrete or fraction thereof, placed in any one concreting operation on any given day.
c. Concrete for each set of cylinders shall be from any one (1) sample, representative of the entire batch.
d. Specimens shall be made, cured and tested in accordance with ASTM C31.
e. When concrete is pumped, test cylinders shall be made from concrete taken at the discharge end of the pumping train.

2. Additional tests as follows shall be made from the concrete taken to mold the cylinders.

a. Slump test: in accordance with ASM C143.
b. Air-entrainment test: in accordance with ASTM C173 or ASTM C231.

3. The Contractor shall notify the Engineer and the testing laboratory twenty-four (24) hours before concrete placement and shall cooperate in making of cylinders by the testing laboratory.

1.5 SUBMITTALS

A. Test Reports

1. Report of tests shall be submitted to the Engineer and shall include: name of job, date and location of placement, class of concrete, mix data, and slump, air content, compressive strength, age and condition of test cylinders, weight of each cylinder tested for 7 day break, type of fracture, and method of curing.
2. One (1) copy of all test reports shall be promptly forwarded by the testing laboratory to the Engineer, plus one (1) copy each to the Architect, Contractor and Concrete Supplier.

B. Test Results

1. The average of the tests for any portion of the structure shall equal or exceed the specified twenty-eight (28) day compressive strength (fc).
2. No single strength test shall have a value less than 90% of the specified compressive strength (fc).
3. Where the concrete does not comply with these requirements, the Engineer may require other tests, such as cored cylinders (in conformance with ASTM C42) or load tests, all at the Contractor's expense. Should the concrete fail to pass such tests, it shall be removed and replaced at no additional cost to the Owner. In addition, the Contractor may be required to remove and replace sound portions of structure as necessary to insure safety, appearance, and durability of the structure. Additional load tests strengthening or removal and replacement of parts of structure and any costs associated with delay of projects shall be at Contractor's expense.

C. Concrete Proportions

1. See Section 2.2A thru 2.2J for additional requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement: domestic portland cement conforming to ASTM C150, Type I or Type II.

B. Fine aggregate: natural sand conforming to ASTM C33.

C. Coarse aggregate: crushed stone or crushed washed gravel conforming to ASTM C33.

D. Water: clean, potable.

E. Admixtures: Each admixture shall be approved by the Engineer. No admixtures containing calcium chloride or other water soluble chlorides will be allowed. Each manufacturer shall submit a written notarized statement to the Engineer of the chloride content of each admixture. Formulate admixtures to avoid an increase in water-cement ratio or loss of strength.

1. Air entraining agent: ASTM C-260.
2. Retarder - Densifier: ASTM C-494, Type D.
3. Accelerator: ASTM C-494 Type C.
4. Water-reducing agent: ASTM C-494, Type A.

F. Non-shrink non-metallic grout: CE CRD C-621.

G. Curing and sealing compound: Fed. Spec. TT-C-800A Type I, ASTM C-309.

H. Polyethylene film: white opaque, reinforced six (6) mils thick.

I. Curing paper shall be the approved equal of Sisalkraft Paper "Orange Label" that conforms with ASTM C171, Type I.

J. Dampproofing specified on concrete walls below grade shall be the approved equal of Sonneborn Building Products' Hydrocide 700B that complies to ASTM D-1227, Type I.

K. Premolded joint filler shall be a preformed bituminous expansion type that conforms to ASTM D-994. Joint material thickness shall be one-half (1/2") inch thick, except as otherwise indicated on the drawings.

L. Waterstop shall be bentonite waterstop Rx101, one inch by three-quarter (1"x3/4") inch as manufactured by Colloid Environmental Technologies Company or approved equal.

2.2 PROPORTIONS

A. Concrete mix proportions shall be selected to produce an average compressive strength exceeding the required twenty-eight (28) day compressive strength (fc) in accordance with ACI 318 Chapter 5.3, proportioning on basis of field experience or trial mixtures, or both. The Contractor shall submit to the Engineer the concrete strength to which the materials were proportioned, and copies of any records that the concrete supplier may have showing standard deviations in previous mixes.

B. Mix proportions shall be as outlined in ACI 301 Section 4 by the testing laboratory.

C. Where a concrete production facility has a record, based on at least thirty (30) consecutive strength tests that represent similar materials and conditions to those expected, required average compressive strength used as the basis for selecting concrete proportions shall exceed required fc at designated test age by at least:

400 psi if standard deviation is less than 300 psi
550 psi if standard deviation is 300 to 400 psi
700 psi if standard deviation is 400 to 500 psi
900 psi if standard deviation is 500 to 600 psi

1. If standard deviation exceeds 600 psi, concrete proportions shall be selected to produce an average strength at least 1200 psi greater than required fc.

D. Strength test data for determining standard deviation shall be considered to comply with Section 2.2C, if data represents either a group of at least thirty (30) consecutive tests or a statistical average for two (2) groups totaling thirty (30) or more tests.

E. Strength tests used to establish standard deviation shall represent concrete produced to meet a specified strength or strengths within 1000 psi of that specified for the proposed work.

F. Changes in materials and proportions within the population of background tests used to establish standard deviation shall not have been more closely restricted than for the proposed work.

G. After sufficient experience and test data become available from the job, using ACI 211 methods of evaluation, the standard deviation may be reduced when the probable frequency of tests more than 500 psi below required compressive strength will not exceed one in one hundred (1 in 100), and that probable frequency of an average of three (3) consecutive tests below required compressive strength will not exceed one in one hundred (1 in 100).

H. If it is intended to place any concrete by pumping, a corresponding mix shall be designed for such placement and so designated.

I. No concrete shall be placed until tests of design mixes show a twenty-eight (28) day average compressive strength at least equal to the specified design compressive strength or until the concrete design mix proportions have been accepted by the Engineer.

J. Contractor shall submit the following data:

1. Fine aggregate - organic content, sieve analysis, fineness modulus and specific gravity.
2. Coarse aggregate - sieve analysis and average weight loss in accordance with ASTM C-33.
3. Mix design, including cement brand, proportions of aggregate by weight, slump, water-cement ratio, percentage of air.
4. Thirty (30) twenty-eight (28) day compressive test results on proposed mix that comply with Section 2.2C.
5. Admixture-types, brand and quantity.

## 2.3 SPECIFIC REQUIREMENTS

A. Concrete for all the parts of the work shall be 3,000 psi at twenty-eight (28) days and meet the values shown in the following Table:

| | |
|---|---|
| Min. compressive strength @ 28 days (psi) | 3,000 |
| Slump (inches) | 2 1/2 - 4 |
| Max. size coarse aggregate (inches) | 1 1/2 |
| Max. size coarse aggregate for suspended slabs and pumped concrete (inches) | 3/4 |
| Max. size coarse aggregate for minimum 5 inch thick slab on grade (inches) | 1 1/2 |
| Min. cement factor (sacks per cy) | 5 1/2 |

1. Water content shall include surface water in aggregates.

B. Concrete for Interior Slabs shall also conform to the following requirements:

| | |
|---|---|
| Min. compressive strength @ 28 days (psi) | 3,000 |
| Maximum water cement ratio shall be | 0.48 |
| Min. cement factor (sacks per C.Y.) | 5 1/2 |

1. Mix shall include a mid-range water reducer such as Polyheed 997 as manufactured by Master Builders, Inc. or equivalent.
2. Mix shall be proportioned to provide a maximum 5" slump at point of discharge.
3. Interior concrete slabs-on-grade shall not be air entrained.

C. Concrete for exterior flatwork shall be 5,000 psi at twenty-eight (28) days and meet the values shown in the following Table:

| | |
|---|---|
| Min. compressive strength @ 28 days (psi) | 5,000 |
| Slump (inches) | 2 1/2 - 4 |
| Max. size coarse aggregate (inches) | 1 1/2 |
| Max. size coarse aggregate for suspended slabs and pumped concrete (inches) | 1 |
| Max. size coarse aggregate for minimum 5 inch thick slab on grade (inches) | 1 1/2 |
| Min. cement factor (sacks per cy) | 6 1/2 |

1. Water content shall include surface water in aggregates.

D. All concrete exposed to the weather, including site work, shall be air-entrained as follows:

| Maximum Size Aggregate | Air Content % by Volume |
|---|---|
| 1 1/2 inch | 4 - 7 |
| 1 inch | 4.5 - 7.5 |
| 3/4 inch | 4.5 - 7.5 |
| 1/2 inch | 5.5 - 8.5 |
| 3/8 inch | 6 – 9 |

E. Variations of proportions may be permitted to produce more workable materials on approval by the Engineer.

PART 3 - EXECUTION

3.1 PRIOR TO PLACING CONCRETE

A. Soil bottoms for footings and slabs shall be accepted by the Engineer before placing concrete. The subgrade shall be free of frost before concrete placing begins.

B. All debris, sawdust, ice, etc., is to be cleaned from place of deposit before concrete is placed.

C. All water is to be removed from place of deposit before concrete is placed. Provide drainage or pumping as required to maintain dry excavation until concrete has taken initial set.

D. All conduits and piping are to be dug into subgrade sufficiently so as to provide uniform slab thickness.

E. Prior to placing any concrete, the Contractor shall notify the Engineer twenty-four (24) hours in advance so that formwork and reinforcing may be inspected. Do not place concrete until inspection has been made or waived.

F. All dowels, anchor bolts, sleeves, inserts and other embedded items shall be set with the aid of templates and shall be securely positioned in place prior to the placement of concrete.

3.2 MIXING

A. Concrete shall be ready-mixed in conformance with the requirements of ASTM C94 for measurement of materials, batching, mixing and delivery, and shall be discharged within one and one-half (1 1/2) hours after water is first added to the mix, except that in unusually hot weather, this maximum time may be reduced.

B. Mixing and conveying equipment shall be thoroughly clean and free from hardened concrete and foreign materials before concrete operation is started.

C. All materials including water shall be added to ready-mixed concrete at the batching plant. Water shall not be added to the mix on the project site. Mixing shall be continued for at least one and one-half (1 1/2) minutes prior to its use.

D. Mixer shall produce thoroughly mixed, uniform mass, and discharge mixture without segregation. Entire batch shall be discharged before mixer is recharged.

E. Partially hardened concrete shall not be retempered or used.

F. Delivery Tickets

1. One (1) copy of all concrete delivery tickets shall be furnished to the Engineer on request. Contractor shall note on tickets location of placement. Delivery tickets shall provide the following information:

    a. Date and truck number
    b. Name of ready-mix batch plant
    c. Contractor and job location
    d. Cement brand, type mix number and weight in pounds
    e. Fine aggregate weight in pounds
    f. Maximum size of aggregate
    g. Coarse aggregate weight in pounds
    h. Water in gallons
    i. Admixture, name and amount in concrete, if any
    j. Amount of concrete in cubic yards
    k. Time mix left plant

3.3 DEPOSITING CONCRETE

A. Depositing of all concrete shall be in accordance with ACI 304.

B. Concreting shall conform to the requirements of ACI 305 or ACI 306 in hot or cold weather as required. See Section 3.8.

C. All Contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.

D. Unless adequate protection is provided, and approved by the Engineer, concrete shall not be placed during rain, sleet, or snow.

E. Concrete shall be conveyed from the mixer to the place of final deposit in a practically continuous flow by methods which will prevent the separation or loss of the ingredients. It shall be placed in the forms or on grade as nearly as practicable to its final position and shall be thoroughly vibrated around all reinforcing bars and mesh to assure complete absence of voids. Under no circumstances shall partially hardened concrete be placed in the work. Concrete shall be prohibited from free-falling in excess of four (4) feet.

F. Concrete may be pumped. Use of aluminum alloys in the pumping train is prohibited.

G. Concrete shall be thoroughly compacted and worked into the forms and around the reinforcing by means of suitable mechanical vibrators. Sufficient vibrators shall be on hand to allow for breakdowns. Vibrators shall be run deep into the concrete and shall remain in one position until the concrete is thoroughly compacted, but not long enough to cause segregation of the aggregates.

H. Vertical lifts shall not exceed eighteen (18") inches. Vibrate through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, honeycomb, and segregation.

I. Concrete shall be deposited continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Engineer shall be notified in any such case.

J. Unless otherwise permitted, the work shall be so executed that a section begun on any day shall be completed in daylight on the same day.

K. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Engineer may require that entire section in which blemish occurs be removed and replaced with new materials at Contractor's expense.

## 3.4 CONSTRUCTION AND CONTROL JOINTS

A. Walls, Columns, Beams, and Slab on Grade, and Structural Slab

1. No additional construction joints, except those shown on the Contract Drawings, accepted on the shop drawings, or accepted by the Engineer will be allowed.
2. The surface of the concrete at all joints shall be hard and thoroughly cleaned prior to placing adjoining concrete.
3. The cured or partially cured concrete of construction joints, except at locations noted below, shall be dampened (but not saturated) immediately prior to the placing of fresh concrete.
4. The face of hardened concrete joints in exposed work and joints in the middle of beams, girders and slabs shall be dampened (but not saturated) and then thoroughly covered with a coat of neat cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least one-quarter (1/4") inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.

5. Construction joints shall be constructed with reinforcing continuous through joint unless otherwise shown. All key bulkhead joints shall be constructed with a key depth of one-third (1/3) the total thickness unless otherwise shown.
6. Sawcut control joints in slabs shall be saw cut within twenty-four (24) hours of concrete placement. Control joint shall be sawed to depth of one-quarter (1/4) of the slab thickness.
7. Unless otherwise shown on the Drawings, slabs on grade shall be broken down into sections with control and/or construction joints that do not exceed six hundred fifty (650 sf) square feet area and whose dimensions do not exceed a one and one half to one (1 1/2 to 1) ratio.

## 3.5 FINISHED CONCRETE SURFACES

A. Walls

1. It is the intent of this Specification that forming operations be performed in a manner which will produce sound concrete surfaces, free of bulges and offsets, with a minimum of fins, blemishes due to form defects and honeycomb areas.
2. Any exposed concrete which is not formed as shown on the Plans, or for any reason is out of alignment or level beyond tolerance specified, or shows a defective surface, shall be considered as not conforming with the intent of these Specifications; and shall be removed from the job by the Contractor, at his expense, unless the Engineer grants permission to patch the defective area.
3. Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, pockets, or other surface defects shall be repaired at once, before the concrete is thoroughly dry.
4. Cut out surface defects which do not impair structural strength to one (1") inch depth and refill with fresh concrete. Thoroughly wet cuts immediately prior to filling with stiff concrete of approximately the same mix as the adjoining work. After a partial set, compress and rub to produce a finish similar in texture and color to adjoining work.
5. Clean all exposed surfaces, concrete and adjoining work stained by the leakage of concrete.
6. Remove wood cones remaining after the rods are snapped off, and fill holes with a concrete mortar finished to the same color and texture of surrounding concrete.
7. All surfaces on both the interior and exterior, which are exposed or are within six (6") inches of being exposed in the completed building, shall have a "rubbed finish" (i.e., smooth rubbed finish, or grout cleaned finish). Parging will not be accepted. Finish all rubbed concrete surfaces in accordance with ACI 301, Section 5.3.3.4.
8. Do not clean, rub or patch in freezing temperatures, or when frost is on concrete surface.
9. Permission to patch does not imply waiver of Engineer's right to require complete removal and replacement of said work if, in Engineer's opinion, said patching does not satisfactorily restore quality and appearance of work.

B. Slabs Finishing

1. All interior concrete slabs shall be finished by screeding floating, floated finish, and steel troweled to a smooth even surface in accordance with ACI 301, Section 5.3.4, unless otherwise noted.
2. All exterior steps and slabs and interior slab scheduled for toppings shall be finished by screed floating, floated finish and broom finish in accordance with ACI 301, Section 5.3.4.
3. Any slab surface finish not specified shall be finished in accordance with ACI 301, Section 5.3.4.2.j.

4. No dry cement or other materials shall be applied to surface of any concrete slab to absorb moisture prior to finishing.
5. Provide a positive pitch to all floor drains as shown. Pitch exterior slabs away from the building as shown on the Drawings.
6. Provide one-eighth (1/8") inch radius tooled edging at all exposed slabs and/or sidewalk edges.
7. Provide proper depression in concrete to accept specified finish floor materials.

C. Stairs

1. Stair treads, landing slabs, and platforms shall be floated and given a troweled finish, as outlined above.

3.6 CONCRETE AND STEEL DECKING

A. Concrete cast on steel deck shall be finished to elevations indicated on Drawings and to specified tolerances, with consideration given to deflection of steel deck and beams. No additional payment will be made for concrete required to maintain these specified elevations.

3.7 CURING

A. All concrete shall be kept constantly moist and protected against any drying action for not less than seven (7) days after placing of the concrete, and shall be accomplished in the following manner:

1. Walls, Beams and Columns

   a. Formwork shall not be removed for a minimum of three (3) days.
   b. For the remainder of the curing period, the concrete shall be kept moist by the application of absorptive mats or other moisture retaining covering as accepted by the Engineer, kept continuously wet or curing compounds. Application of curing compound is to follow immediately behind form removal to prevent surface from drying out.

2. All slabs, either slab on grade or suspended slabs, shall be cured using curing paper.
3. Where concrete is cured by curing paper, cover surface immediately after finishing. Joints shall be lapped five (5") inches, and squeegee curing paper to remove wrinkles. Repair all rips and tears until end of curing period.
4. The use of curing compounds on exterior slab on grade construction (sidewalks) is not permitted.

## 3.8 CONCRETING PRECAUTION FOR WEATHER EXTREME

A. Cold weather: Precautions shall be taken when the temperature is at or below 40 degrees F, or at 45 degrees F and falling, in accordance with "Guide to Cold Weather Concreting", ACI 306.

1. Set up a proper enclosure and heat to 50 degrees F for at least four (4) hours before starting any pour.
2. Use a water-reducing admixture with an accelerated set, but do not use or rely upon any materials as an "antifreeze".
3. Use vented heaters with blowers so placed that they do not produce localized hot spots which may dry out the concrete.
4. Maintain the temperature of the concrete at not less than 50 degrees F for seventy-two (72) hours and at above freezing for an additional seven (7) days. The temperature shall then be allowed to drop gradually to the exterior air temperature before the enclosure is removed at the rate of not more than 5 degrees F per hour nor 50 degrees F in any twenty-four (24) hour period before discontinuing.
5. All frozen concrete shall be removed from the job and replaced.

B. Hot weather: Precautions shall be taken when the temperature is at or above 75 degrees F, or at 70 degrees F and rising, in accordance with "Guide to Hot Weather Concreting", ACI 305. No concrete shall be placed when the air temperature is above 90 degrees F, unless the air is still and relative humidity is above eighty (80%) percent.

1. Set up proper windbreakers for concrete surfaces wherever the relative humidity is less than 70% for slight air motion or 80% for light breezes.
2. Provide shade for placements otherwise exposed to the sun.
3. Concrete is to be at a temperature of 80 degrees F, or less when placed. If necessary, the batching plant shall cool the aggregate by spraying or by using chilled water or ice. All such water shall be accounted for as part of the mixing water.
4. Use an admixture with a retarded set.
5. All forms shall be thoroughly wetted at least daily, and more often when the relative humidity is low.
6. For slabs, maintain the required materials for curing at hand so they may be placed immediately upon steel troweling. When the concrete temperature of any slab goes above 100 degrees F, place a layer of sand on it and keep it continuously wet until the temperature is below 90 degrees F.

## 3.9 CONCRETE MOUNTS FOR MECHANICAL EQUIPMENT

A. Furnish and place all concrete platforms, curbs, piers, etc., required for mechanical equipment as called for in the Mechanical Drawings. Set all anchor bolts, etc., as required.

## 3.10 BEAM POCKETS

A. Fill all recessed beam bearing pockets full height and flush to cast concrete walls with concrete.

3.11 GROUTING

A. Install non-shrink grout under all structural steel column base plates, leveling plates and bearing plates.

B. Non-shrink grout shall be mixed in accordance with the manufacturer's printed instructions. Bedding grout shall be placed solidly between the bearing surface and base or plate to ensure that no voids remain. Finish edges at 45 degree bevel and properly cure grout.

3.12 SLAB FLATNESS\LEVELNESS TOLERANCES

A. Finished surfaces shall be smooth, free from blemishes and trowel marks, with a maximum variation in finish elevation as defined by ACI FF/FL requirements.

B. All floor slabs shall conform to the following ACI F-number requirements:

1. Specified overall value..... FF-35/FL-25
2. Minimum local value ..... FF-25/FL-20

C. Floor slab flatness and levels tests on the slabs shall be conducted in accordance with the provisions set forth in ASTM E 1155. Floor tolerance measurement shall be made using a Dipstick Floor Profiler as manufactured by The Edward W. Face Company, Inc. of Norfolk, VA or approved alternate method.

3.13 WATERSTOP INSTALLATION

A. Provide continuous waterstop at all locations shown on the Plans.

B. Apply adhesive primer to vertical surfaces prior to applying bentonite strip. Nail bentonite strip using concrete cut nails at one foot zero inch (1'-0") on center.

C. Install waterstop in accordance with manufacturer's instructions with a minimum two and one-half (2 1/2") inch concrete cover.

END OF SECTION 03 30 00

# SECTION 03 45 00 – ARCHITECTURAL PRECAST CONCRETE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Architectural precast concrete cladding and load-bearing units.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 05 Section "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
3. Division 05 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
4. Division 07 Section “Joint Sealants.”

### 1.3 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

### 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

### 1.5 REFERENCES

A. American Concrete Institute.

1. ACI 318 – Building Code Requirements for Reinforced Concrete.

B. Precast/Prestressed Concrete Institute.

1. PCI Manual 117: Manual for Quality Control Plants and Production of Architectural Precast Concrete Products.
2. PCI Manual 120: PCI Design Handbook – Precast and Prestressed Concrete.

## 1.6 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated. Calculate structural properties of units in accordance with ACI 318 and as follows:

1. Dead and Live Loads: As indicated on Structural Drawings.
2. Wind Loads: Comply with requirements in the Connecticut State Building Code, and with the following:

    a. Ultimate Design Wind Speed: 135 mph.
    b. Exposure Category: B.
    c. Risk Category: III.
    d. Pressure Coefficient: Refer to Structural Drawings for components and cladding wind pressures.

3. Seismic Loads: Comply with requirements in the Connecticut State Building Code and seismic loading as indicated on Structural Drawings.
4. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:

    a. Upward and downward movement of 3/4 inch

5. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 80 deg F

## 1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

D. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.

1. Indicate separate face and backup mixture locations and thicknesses.
2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
5. Include plans and elevations showing unit location and sequence of erection for special conditions.
6. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
7. Indicate relationship of architectural precast concrete units to adjacent materials.
8. Indicate locations of electrical conduit and receptacle boxes.
9. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
10. Comprehensive engineering analysis signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

E. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches

1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

F. Delegated-Design Submittal: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

1. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

1.8 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Qualification Data: For Installer.

C. Material Test Reports: For aggregates.

D. Material Certificates: For the following items, signed by manufacturers:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.

E. Source quality-control test reports.

F. Field quality-control test and special inspection reports.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load and S2 (Complex Structural Systems) for load-bearing members.

B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of NAME.

1. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or participates in APA's "Plant Certification Program for Production of Architectural Precast Concrete Products" and is designated an APA-certified plant.
2. Firms shall have a minimum of five years experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delay.
3. Fabricator is located within 500 milesof Project site.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with ACI 318and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

G. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 2 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Construction Manager.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

H. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup as directed by Construction Manager, including architectural precast concrete panels complete with anchors, connections, flashings, and joint fillers.

    a. Comply with requirements in Division 04 Section “Unit Masonry” for architectural precast concrete units to be installed in exterior wall mockup.

2. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

## 1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

F. Lift and support units only at designated points shown on Shop Drawings.

G. Mark units with date of production in location not visible to view when set in final position in structure.

1.11 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Coreslab Structures, (Conn) Inc.
2. Oldcastle Precast, Building Systems Division.
3. Precast Specialties Corp.

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.3 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 40 or 60 deformed, unless otherwise required to meet structural requirements.

1. Provide standard reinforcing bars at all interior wythes.

C. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized, for use where concrete cover is less than 1-1/2 inches.

1. Provide galvanized reinforcing bars at all exterior wythes.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from cold-drawn steel wire into flat sheets.

E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

## 2.4 CONCRETE MATERIALS

A. Regional Materials: Precast architectural concrete shall be manufactured from aggregates and cement that have been extracted or recovered, as well as manufactured, within 500 milesof Project site.

B. Portland Cement: ASTM C 150, Type I or Type III, white or gray to achieve desired finish colors.

1. Gray cement may be used for non-exposed backup mixes.

C. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.

D. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

E. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C 330, with absorption less than 11 percent.

F. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

I. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.3M, Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable Iron Castings: ASTM A 47/A 47M.

E. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

F. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

G. Deformed-Steel Wire or Bar Anchors: ASTM A 496.

H. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 and flat, unhardened steel washers, ASTM F 844.

I. High-Strength Bolts and Nuts: ASTM A 325 Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 and hardened carbon-steel washers, ASTM F 436

J. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

K. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in SSPC-Paint 25 according to SSPC-PA 1.

L. Welding Electrodes: Comply with AWS standards.

## 2.6 BEARING PADS

A. Provide the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:

1. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

## 2.7 ACCESSORIES

A. Reglets: Specified in Division 07 Section "Sheet Metal Flashing And Trim."

B. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

## 2.8 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

## 2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psiminimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi
2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. plus or minus 3 lb/cu. ft. according to ASTM C 567.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

## 2.10 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

## 2.11 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inchesin any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4-inchminimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inchminimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 incheswhen units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

1. Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.

H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inchor 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

## 2.12 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:

a. 10 feet or under, plus or minus 1/8 inch.

b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
c. 20 to 40 feet, plus or minus 1/4 inch.
d. Each additional 10 feet, plus or minus 1/16 inch.

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:

a. 10 feet or under, plus or minus 1/4 inch.
b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
c. 20 to 40 feet, plus or minus 3/8 inch.
d. Each additional 10 feet, plus or minus 1/8 inch.

3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
4. Rib Thickness: Plus or minus 1/8 inch.
5. Rib to Edge of Flange: Plus or minus 1/8 inch.
6. Distance between Ribs: Plus or minus 1/8 inch.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.
10. Dimensions of Haunches: Plus or minus 1/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch per 10 feet.
15. Warping: 1/16 inch per 12 inches of distance from nearest adjacent corner.
16. Tipping and Flushness of Plates: Plus or minus 1/4 inch.
17. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch.

C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Location of Flashing Reglets: Plus or minus 1/4 inch.
10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.

14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch.

## 2.13 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows:

1. Textured-Surface Finish: Impart by form liners or inserts to provide surfaces free of pockets, streaks, and honeycombs, with uniform color and texture.
2. Color and Texture: Match Architect’s sample.

B. Finish exposed surfaces of architectural precast concrete units by smooth, steel-trowel finish.

C. Finish unexposed surfaces of architectural precast concrete units by float finish.

## 2.14 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.

4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Project Manager, Construction Manager, and precast concrete fabricator. Test reports will include the following:

    a. Project identification name and number.
    b. Date when tests were performed.
    c. Name of precast concrete fabricator.
    d. Name of concrete testing agency.
    e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

### 3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
5. Remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

## 3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Erect architectural precast concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
3. Top Elevation from Nominal Top Elevation: As follows:

a. Exposed Individual Panel: Plus or minus 1/4 inch.
b. Non-Exposed Individual Panel: Plus or minus 1/2 inch.

c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
d. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch.

4. Support Elevation from Nominal Support Elevation: As follows:

a. Maximum Low: 1/2 inch.
b. Maximum High: 1/4 inch.

5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch.
6. Plumb in Any 10 Feet of Element Height: 1/4 inch.
7. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
9. Maximum Joint Taper: 3/8 inch.
10. Joint Taper in 10 Feet: 1/4 inch.
11. Maximum Jog in Alignment of Matching Faces: 1/4 inch.
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.

## 3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of precast concrete members.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

## 3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00

# SECTION 03 54 16 – HYDRAULIC CEMENT UNDERLAYMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes hydraulic-cement-based, polymer-modified, self-leveling underlayment for infilling slab depressions below interior floor coverings.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 02 Section “Selective Demolition.”
3. Division 09 Flooring Sections for flooring materials.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: Documentation including printed statement of VOC content.

C. Shop Drawings: Plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

### 1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.

B. Qualification Data: For Installer.

C. Minutes of preinstallation conference.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.

C. Mockups: Apply hydraulic-cement-based underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard of workmanship.

1. Apply mockups approximately 100 sq. ft. in area in location indicated or, if not indicated, as directed by Construction Manager.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

## 1.8 COORDINATION

A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

# PART 2 - PRODUCTS

## 2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Ardex; K-15 Self-Leveling Underlayment Concrete.
    b. Laticrete International, Inc.; NXT Level Plus.
    c. Koster; LevelStrong SLU.
    d. Mapei; Novoplan 2 Plus.

2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

## 3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to produce surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

## 3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 16

**SECTION 04 01 20 – MAINTENANCE OF UNIT MASONRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. This Section includes the following:

1. Maintenance of unit masonry consisting of brick masonry restoration and cleaning as follows:

a. Replacing brick masonry.
b. Repointing joints.
c. Cleaning exposed unit masonry surfaces.

2. Repointing of limited areas of brick masonry at the 1954 and 1999 construction areas.
3. Cleaning of brick masonry at the 1954 and 1999 construction areas.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section "Unit Masonry" for new brick masonry.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Division 01 Section "Unit Prices."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For the following:

1. Provisions for expansion joints or other sealant joints.
2. Provisions for flashing and weep holes as required.
3. Replacement and repair anchors. Include details of anchors within individual masonry units, with locations of anchors and dimensions of holes and recesses in units required for anchors.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4-inch-wide, set in aluminum or plastic channels.

    a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
    b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.

2. Sealant Materials: See Division 07 Section "Joint Sealants."
3. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.

    a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

2. Each type of sand used for pointing mortar; minimum 1 lb of each in plastic screw-top jars.

    a. For blended sands, provide Samples of each component and blend.
    b. Identify sources, both supplier and quarry, of each type of sand.

3. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4-inch-wide, set in aluminum or plastic channels.

a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

4. Sealant Materials: See Division 07 Section "Joint Sealants."
5. Accessories: Each type of anchor, accessory, and miscellaneous support.

E. Qualification Data: For restoration specialists, including field supervisors and restoration workers.

F. Preconstruction Test Reports: For existing and replacement masonry units.

G. Quality-Control Program.

H. Restoration Program.

I. Cleaning Program.

## 1.6 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of 5 years of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.

1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
3. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

D. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. Provide a cleaning program for red brick.
2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:

    a. Replacement:

        1) Twenty (20) red brick (rebuild) units replaced.

2. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
3. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.

    a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
    b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:

a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store lime putty covered with water in sealed containers.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

## 1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Masonry restoration is not permitted when the air temperature falls below 40 deg F.

D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

F. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

## 1.9 COORDINATION

A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

## 1.10 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
2. Repair masonry, including replacing existing masonry with new masonry materials.
3. Rake out mortar from joints to be repointed.
4. Point mortar joints.
5. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
6. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
7. Clean masonry surfaces.

# PART 2 - PRODUCTS

## 2.1 MASONRY MATERIALS

A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work, ASTM C 216, Grade SW, Type FBS:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
4. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
5. Application: Use where brick is exposed, unless otherwise indicated.
6. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
7. Tolerances as Fabricated: Comply with tolerance requirements in ASTM C 216, Type FBS.

## 2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Sand: ASTM C 144 unless otherwise indicated.

1. Color: Provide natural sand of color necessary to produce required mortar color.
2. For pointing mortar, provide sand with rounded edges.
3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

E. Water: Potable.

## 2.3 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

D. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Diedrich Technologies Inc.; Envirorestore 100.
    b. Dominion Restoration Products, Inc.; DR-60 Stone and Masonry Cleaner.
    c. PROSOCO; Enviro Klean BioWash.

## 2.4 ACCESSORY MATERIALS

A. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants."
2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.

B. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where acceptable.

C. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

D. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

E. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABR Products, Inc.; Rubber Mask.
    b. Price Research, Ltd.; Price Mask.
    c. PROSOCO; Sure Klean Strippable Masking.

F. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.

2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

    a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
    b. Leave a residue on surfaces.

## 2.5 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

    1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

    1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mortar Proportions: Mix mortar materials in the following proportions:

    1. Pointing Mortar for Red Brick: Type O by proportion; 1 part white Portland cement, 2 parts lime, and 8 parts sand.

        a. Add mortar pigments to produce mortar colors required.

    2. Rebuilding (Setting) Mortar: Same as pointing mortar, except mortar pigments are not required.

## 2.6 CHEMICAL CLEANING SOLUTIONS

A. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.
3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar in contact with exposed masonry and other surfaces.
4. Clean mortar splatters from scaffolding at end of each day.

D. Remove gutters and downspouts adjacent to masonry during masonry restoration and cleaning.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 UNUSED ANCHOR REMOVAL

A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.

1. Remove items carefully to avoid spalling or cracking masonry.

2. Where directed, if an item cannot be removed without damaging surrounding masonry, do the following:

    a. Cut or grind off item approximately 3/4 inch beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.
    b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.

3. Patch the hole where each item was removed unless directed to remove and replace the masonry unit.

## 3.3 ANCHORING EXISTING MASONRY WALLS

A. Install helical wall ties in existing brick veneer in areas indicated and in accordance with details indicated on Structural Drawings.

## 3.4 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, loose, displaced, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. At locations indicated for installation of new through wall flashing, remove bricks as follows:

1. Remove middle course of bricks first, then remove courses above and below without damaging courses to remain in place.
2. Remove a maximum width of 3 feet, leave 2 feet in place and remove 3 more feet. Install through wall flashing.
3. Replace remaining 2 feet and remove remaining brick after mortar has set.

C. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.

4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

G. Replace removed damaged brick with other removed brick and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

I. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

## 3.5 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

1. Cleaning of masonry must be accomplished with the gentlest of materials and lowest concentration which provides acceptable results.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.

a. Equip units with pressure gages.

3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:

1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

## 3.6 PRELIMINARY CLEANING

A. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and caulking with alkaline paint remover.

a. Comply with requirements in "Paint Removal" Article.
b. Repeat application up to two times if needed.

3. Remove asphalt and tar with solvent-type paint remover.

a. Comply with requirements in "Paint Removal" Article.
b. Apply paint remover only to asphalt and tar by brush without prewetting.
c. Allow paint remover to remain on surface for 10 to 30 minutes.
d. Repeat application if needed.

## 3.7 CLEANING BRICKWORK

A. Cold-Water Wash: Use cold water applied by medium-pressure spray.

B. Detergent Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
3. Rinse with cold water applied by medium-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

C. Mild Acidic Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply cleaner to masonry by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:

a. As recommended by chemical-cleaner manufacturer.

3. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use a steam cleaning.

## 3.8 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Deteriorated joints, under Allowance, as directed by the Architect in the field.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2-1/2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.

    a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
    b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 48 consecutive hours including weekends and holidays.

    a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
    b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant:

1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces according to Division 7 Section "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant according to Division 7 Section "Joint Sealants" and the following:

    a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that will ensure that sealant will be deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
    c. Install sealant as recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:

        1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

    d. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.
    e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

4. Cure sealant according to Division 07 Section "Joint Sealants."

G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

## 3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

## 3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

## 3.11 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors, Architect, and Project Manager in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors, Project Manager, and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 04 01 20

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# SECTION 04 20 00 - UNIT MASONRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.
10. Patching and repair of existing masonry for new and/or modified openings, including toothing-in of new CMU and brick.
11. All hoisting and scaffolding for completion of masonry work.
12. Masonry waste disposal.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section “Maintenance of Unit Masonry.”
3. Division 07 Section "Fluid-Applied Membrane Air Barriers" for waterproofing applied to cavity face of backup wythes of cavity walls.
4. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
5. Division 07 Section "Penetration Firestopping" for firestopping at openings in masonry walls.
6. Division 07 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems at heads of masonry walls.
7. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products furnished, but not installed, under this Section include the following:

1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 05 Section "Structural Steel."

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels for unit masonry, furnished under Division 05 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."
3. Access doors and frames, furnished by Fire Protection, Plumbing, Mechanical, and Electrical Subcontractors in accordance with Division 08 Section “Access Doors and Frames.”

## 1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

## 1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths ($f'_m$) at 28 days.

B. Determine net-area compressive strength ($f'_m$) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

## 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
3. Control/Expansion Joints: Provide layout indicating locations of all control/expansion joints. Provide details for all conditions.

D. Samples for Initial Selection: For the following:

1. Face brick, in the form of straps of five or more bricks.
2. Colored mortar.
3. Weep holes/vents.

E. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Special brick shapes.
3. Colored-mortar. Make Samples using same sand and mortar ingredients to be used on Project**.** Label Samples to indicate types and amounts of pigments used.
4. Weep holes/vents.
5. Accessories embedded in masonry.

## 1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements in ACI 530.1.

G. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements in ACI 530.1.

## 1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
2. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as directed by Construction Manager.

2. Build mockups for typical exterior wall construction in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.

    a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.
    b. Include lower corner of window opening with cast stone sill. Make opening approximately 12 inches wide by 16 inches high.
    c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include CMU backup, and/or metal studs, sheathing, air and vapor barrier, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.

3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

6. Demolish and remove mockups when directed by the Construction Manager.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602/1.8C whenever the following conditions exist:

1. The ambient temperature falls below 40 deg F.
2. The temperature of masonry units is below 40 deg F.
3. Implement the following minimum procedures:

a. The temperature of masonry units shall not be less than 20 deg F when laid in the masonry. Remove visible ice on masonry units prior to installation.
b. Heat the mortar sand or mixing water to produce mortar temperatures between 40 deg F and 120 deg F at the time of mixing. Maintain mortar above 32 deg F until used in masonry.
c. Use heat sources where ambient temperatures are between 20 deg F and 25 deg F on both sides of the masonry under construction. Install wind breaks when wind velocity is in excess of 15 mph.
d. Where ambient temperature is below 20 deg F, provide an enclosure for the masonry under construction and use heat sources to maintain temperature above 32 deg F within the enclosure.
e. Where mean daily temperatures are between 32 deg F and 40 deg F, protect completed masonry from rain and snow by covering with a weather resistive membrane for 24 hours after construction.

f. Where mean daily temperatures are between 25 deg F and 32 deg F, completely cover completed masonry with a weather resistive membrane for 24 hours after construction.
g. Where mean daily temperatures are between 20 deg F and 25 deg F, completely cover completed masonry with insulating blankets, or equal protection, for 24 hours after construction.
h. Where mean daily temperatures are below 20 deg F, maintain masonry temperature above 32 deg F for 24 hours after construction by enclosure with supplementary heat, by electric blankets, by infrared heat lamps, or other acceptable methods.

4. Do not lay masonry units that are wet or frozen.
5. Remove masonry damaged by freezing conditions.
6. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602/1.8D, whenever the ambient air temperature exceeds the following:

1. 100 deg F, or 90 deg F with a wind velocity greater than 8 mph.
2. Implement hot weather protection in accordance with Article 2.1.2.1(d).
3. Do not spread mortar beds more than 4 feet ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

### 2.2 CONCRETE MASONRY UNITS (CMUs)

A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions where indicated.
2. Provide factory fabricated bullnose units for outside corners, except for the following locations:

a. Exterior window openings.
b. Walls to receive ceramic tile.
c. Top course of masonry wall where gypsum board soffit is flush with masonry surface.

C. Concrete Masonry Units: ASTM C 90.

1. Products: Subject to compliance with requirements, provide products by one of the following:

a. A. Jandris & Sons.
b. Nitterhouse Masonry Products, LLC.
c. Westbrook Block, Inc.

2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
3. Weight Classification: Lightweight.
4. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
5. Exposed Faces: Manufacturer's standard color and texture.
6. Fire Rated Concrete Masonry: In accordance with test procedures set forth in ASTM E 199 or alternative methods as follows:

a. U.L. Design Assemblies: Provide a U.L. Certificate for design of composite wall assembly for each hourly rating required.
b. In accordance with the Connecticut State Building Code:

1) Fire-resistance designs documented in approved sources.
2) Prescriptive designs of fire-resistant rated building elements as prescribed in Section 72 0. 0.
3) Calculations in accordance with Section 72 1. 0.
4) Engineering analysis based on a comparison of building element designs having fire resistance ratings as determined by test procedures set forth in ASTM E 119.

c. Fire rated wall construction includes reinforcement, facing or finish materials, load bearing and non-load bearing walls; and requirements for members framed into walls.

## 2.3 MASONRY LINTELS

A. General: Provide masonry lintels as indicated, complying with requirements below.

B. Masonry Lintels: Built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

## 2.4 BRICK

A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: ASTM C 216, Grade SW, Type FBS and FBX as indicated:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
4. Size (Actual Dimensions): Modular, 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
5. Application: Use where brick is exposed, unless otherwise indicated.
6. Basis of Design Products: Subject to compliance with requirements, provide the following, or equal:

    a. Brick Type:

## 2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

E. Masonry Cement: The use of masonry cement is not permitted.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Products: Subject to compliance with requirements, provide one of the following:

a. Colored Portland Cement-Lime Mix:

1) Flamingo Brixment; Portland & Lime Blend.
2) Lafarge North America Inc.; Eaglebond.
3) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

4. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors for each masonry type indicated.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. GCP Applied Technologies; Morset.
c. RussTech; Mortarset-NC.

J. Water: Potable.

## 2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar Mixes: At Contractor’s option, provide job-mixed mortar or preblended dry mortar mix. Provide colors required for each application indicated.

C. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

a. Spec Mix; Portland Lime & Sand and Portland Lime and Sand/Color.

D. Pigmented Mortar: Use colored cement product.

1. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Face brick.
b. Precast units.

E. Mortar Types for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated:

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type M or S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
4. For exterior masonry veneer, use Type N.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

a. Use fine grout for 6 inch thick concrete masonry wythes.
b. Use course grout for 8-inch thick or greater concrete masonry wythes.

2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

## 2.7 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

## 2.8 MASONRY JOINT REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.

2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter (9 gauge).
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter (9 gauge).
5. Wire Size for Veneer Ties: W2.8 or 0.188-inch diameter (3/16-inch).
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

B. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Heckmann Building Products; Ladder Type 1100.
b. Hohmann & Barnard, Inc.; #220 Ladder Mesh.
c. Wire-Bond; Series 200 Core Clear Ladder Type.

C. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Heckmann Building Products; Ladder Pintle Eye 1300
b. Hohmann & Barnard, Inc.; #270 Ladder Eye-Wire.
c. Wire-Bond; Series 800 Cavity Ladder Double Hook and Eye.

2. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe, 1-1/2-inch minimum, but with at least 5/8-inch cover on outside face. Ties have hooks to engage a continuous horizontal wire in the facing wythe.
3. Pintle ties: Units consisting of wire tie section with 1-1/4-inch vertical adjustment, with wire tie length as required to extend 1-1/2-inch into veneer.

## 2.9 TIES AND ANCHORS, GENERAL

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with the following:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
2. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

## 2.10 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

C. Partition Top anchors: 12 gauge metal channel with anchor holes sized to suit masonry partition, including neoprene sponge to allow for vertical expansion and contraction. Fabricate from steel, hot-dip galvanized after fabrication.

1. Product: Subject to compliance with requirements, provide the following, or equal:

a. Hohmann & Barnard, Inc.; PTA #422.

D. Alternatively, at Contractor's option, provide Top of Partition Anchors consisting of pairs of ¼"x8" long bent plate clips spaced at 4'-0" on centers maximum. Bent plates shall be formed with a 4" horizontal leg and a vertical leg length to engage 3" of the face of the block wall. Arrange bent plates in pairs on each face of partition requiring bracing.

1. Fasten angles to concrete filled metal floor deck by welding or by other submitted and approved method. Fasten to metal roof deck with two 1/4" self-drilling screws.
2. Provide these anchors at all locations where the length of a partition between lateral supports (buttresses, crosswalls, columns with ties), exceeds 36 times its thickness.
3. Provide these anchors at all partitions interrupted horizontally by vertical control joints.
4. Submit proposed layout of anchor locations and attachment procedures for review marked on a copy of the Architectural Floor Plans.

E. Postinstalled Anchors: Provide torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.11 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim" and as follows:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Heckmann Building Products Inc.; #1007 Hemmed Drip Edge Flashing.
b. Hohmann & Barnard, Inc.; Standard Drip Plate DP.
c. Wire-Bond; Drip Edge.

2. Stainless Steel: ASTM A 240/A 240M, Type 304, 26 gauge.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing. Provide preformed inside and outside corners to match size and gauge of drip edge flashing.
4. Metal Drip Edges: Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed 3/8-inch.

B. Metal Flashing (Base of Wall): Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim" and as follows:

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

a. Hohmann & Barnard, Inc.; Flat Drip Plate DP.

2. Stainless Steel: ASTM A 240/A 240M, Type 304, 26 gauge.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing. Provide preformed inside and outside corners to match size and gauge of drip edge flashing.
4. Metal Drip Edges: Extend at least 3 inches into wall and flush end with wall, with outer edge bent 180 degrees and hemmed 3/8-inch.

C. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc; CCW-705-TWF Thru-Wall Flashing.
b. GCP Applied Technologies; Perm-A-Barrier Wall Flashing.
c. Henry; Blueskin TWF.
d. Tremco Incorporated; ExoAir TWF.

2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.

D. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

## 2.12 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

1. Control Joints and Brick Expansion Joints: Provide compressible filler, 3/8-inch thick and 3 inches wide.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Heckmann Building Products; Neoprene Expansion Joints 354.
2) Hohmann & Barnard, Inc.; NS Closed Cell Neoprene Sponge.
3) Wire-Bond; #3300 Expansion Joint.

2. Premolded Joint Filler at Steel Columns: Provide compressible filler as indicated for Control Joints.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Blok-Lok; VS Series PVC Control Joint.
b. Hohmann & Barnard, Inc.; #VS Series – PVC Control Joint.
c. Wire-Bond; PVC Control Joint.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

2. Products: Subject to compliance with requirements, provide one of the following:

    a. Advanced Building Products Inc.; Mortar Maze Cell Vent.
    b. Heckmann Building Products, Inc.; No. 85 Cell Vent.
    c. Hohmann & Barnard, Inc; QV Quadro-Vent.
    d. Wire-Bond; Cell Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Advanced Building Products Inc.; Mortar Break DT.
    b. CavClear/Archovations, Inc.; CavClear Masonry Mat.
    c. Hohmann & Barnard, Inc.; Mortar Trap.
    d. Keene Building Products; KeeneStone.
    e. Mortar Net USA, Ltd.; Mortar Net.

2. Configuration: Provide one of the following:

    a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
    b. Strips, not less than 3/4 inch thick and 10 inches wide for full-depth of cavity, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

F. Grout Screen: Fabricated from monofilament polypropylene mesh to prevent grout falling through; without interfering with mortar bond.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Advanced Building Products Inc.; Grout Catch.
    b. Heckman Building Products, Inc.; Grout Stop.
    c. Hohmann & Barnard, Inc.; MGS.
    d. Wire-Bond; Grout Stop 3612.

G. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.148-inch (9 gauge) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.13 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation with Increased R-Value: ASTM C 578, Type IV, but with an aged thermal resistance (R-value) for 1-inch thickness of 5.6 deg F x h x sq. ft./Btu at 75 deg F at 5 years; closed-cell product with a carbon-black filler and extruded with an integral skin; with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Chemical Company; CavityMate Ultra.
    b. Owens Corning; High R CW Plus.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## 2.14 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Diedrich Technologies, Inc.
    b. ProSoCo, Inc.

B. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

## 3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

## 3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in the following bond patterns; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. CMU and Face Brick: Running bond.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

## 3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

## 3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using the following method:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement, with continuous horizontal wire in facing wythe attached to ties at concrete masonry veneer.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Apply air barrier to face of backup wythe to comply with Division 07 Section "Fluid-Applied Membrane Air Barriers."

E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

## 3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.

## 3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Embed pintle tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of rigid insulation or sheathing. Use ties of sufficient length to extend 2 inches into the back of the masonry veneer, and no closer than 1 inch to the exterior face.
2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

## 3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install control joints in interior concrete masonry partitions where indicated, and as follows. During wall layout, verify locations of all control joints with Architect.

    a. Spacing of control joints in straight walls not to exceed 20 feet horizontally.
    b. Install control joints at intersections of walls and column enclosures.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build in compressible joint fillers where indicated.
2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
3. Spacing in brick veneer not to exceed 24 feet.

## 3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

## 3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of air and vapor barrier at least 16 inches or 6 inches above cavity drainage material, whichever is greater.
3. At lintels and shelf angles, extend flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
4. Install termination bar at top edge of flashing and apply manufacturer’s rubberized asphalt based termination mastic continuously at the top edge of the termination bar.
5. At heads and sills, extend flashing as specified above unless otherwise indicated but turn up ends not less than 2 inches to form a pan.
6. Install metal drip edges beneath flexible flashing at exterior face of wall at all openings, at base of cavity walls, and all horizontal relieving angles. Adhere flexible flashing to top of metal drip edge. Install prefabricated inside and outside corners as required at inside and outside corners of wall conditions.

    a. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing, at the top of wall in the first exposed course of veneer immediately below the roof fascia, where indicated at window heads, and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c., unless otherwise indicated.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout.

a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2", pour height of 12".
b. For minimum widths of grout spaces of 2" or for minimum grout space of hollow unit cells of 2 by 3", pour height of 60".
c. For minimum widths of grout spaces of 2-1/2" or for minimum grout space of hollow unit cells of 2-1/2 by 3", pour height of 12 feet.
d. For minimum widths of grout spaces of 3" or for minimum grout space of hollow unit cells of 3 by 3" pour height of 24 feet.

2. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 1-1/2" or for minimum grout space of hollow unit cells of 1-1/2 by 3", pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3", pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2" or for minimum grout space of hollow unit cells of 3 by 3", pour height of 12 feet.
d. For minimum widths of grout spaces of 3" or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

3. Provide cleanout holes at least 3" in least dimension for grout pours over 60 inches in height.

a. Provide cleanout holes at each vertical reinforcing bar.
b. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

## 3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to the Connecticut State Building Code.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

C. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

G. Weep Vents: Test function of weep vents located at base of wall, heads of openings, and relieving angle locations. Verify that water passes through all weeps.

1. Perform testing of weep vents only upon completion of entire wall construction.

## 3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

## 3.15 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 20 00

**SECTION 05 12 00 - STRUCTURAL STEEL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SCOPE OF WORK

A. The work under this Section consists of furnishing all labor, materials and equipment required to complete the structural steel as shown on the Drawings and/or as herein specified.

B. Work Includes

1. Beams, Girders, Angles, and Columns
2. Hangers, Bracing, and Girts
3. Base Plates, Bearing Plates, and Leveling Plates
4. Anchor Bolts
5. Connections
6. Masonry Anchors
7. Roof Drain Angle Frames

1.3 RELATED WORK

A. Section 05 30 04 - Metal Decking

1.4 QUALITY ASSURANCE

A. Standards

1. Quality control, fabrication and erection shall be in accordance with the 2010 Edition of AISC Specification for the "Specification for Structural Steel Buildings" and the 2016 Edition of AISC" Code of Standard Practice for Steel Buildings and Bridges", except as amended herein.
2. Welding shall be in accordance with the AWS Structural Welding Code as modified by AISC Section J2 "Welds".
3. Surface preparation for structural steel painting shall conform with " SSPC Painting Manual, Vol. 2, Systems and Specifications".

B. Qualified Welders

1. All welding, shop, and field shall be done by certified welders.

C. Testing

1. The Owner may retain and pay for an approved testing laboratory to inspect field welds, bolting, decking, and erection.
2. The cost of retesting shall be paid by the Contractor.

1.5 COORDINATION AND MEASUREMENTS

A. Prior to submitting Shop Drawings, the Contractor shall field verify all dimensions and elevations to assure proper fabrication and erection.

B. The work of this Section shall be closely coordinated with work of other trades by the General Contractor.

1.6 SUBMITTALS

A. Shop Drawings

1. The Contractor shall submit two (2) prints and one (1) reproducible of Shop and Erection Drawings showing all structural steel members and connections including anchor bolts to the Engineer for review. Any work begun before drawings are reviewed by the Engineer will be at the Contractor's own risk.
2. Erection drawings shall clearly show the following: sizes, locations and elevations of all members; grades of steel; standard connections per AISC Manual fully identified for all beam support points; details of non-standard and eccentric connections indicated on Structural Drawings; notes on connectors and fasteners; shop painting instruction, erection notes, and field painting instruction.
3. Detail Shop Drawings showing all members shall be submitted for review. Such drawings shall show size, length, connections, and connection locations.
4. Acceptance will be for size and arrangement for principal and auxiliary members. Any error in dimensions will be the responsibility of the Contractor.
5. Connections shall be selected by an experienced steel detailer subject to shop drawing review.

B. Certificates

1. Mill certificates covering any portion of the steel shall be furnished.
2. AWS welding certificates for shop or field welders shall be furnished.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All structural steel wide flange shapes shall conform to the requirements of ASTM A572, Grade 50 or ASTM A992. Plates, channels, angles, and other miscellaneous steel shall conform to the requirements of ASTM A36.

B. All structural steel tubing shall conform to requirements of ASTM A500, Grade "B", manufactured by seamless or continuous weld process with rounded corners and outside sizes shown.

C. All structural steel pipe shall conform to requirements of ASTM A53.

D. Welding electrode types for A36, A572, and A992 steel shall conform to AISC Specifications using E-70XX electrodes.

E. Shop paint shall be Tnemec Co. No. 88HS-559 gray metal modified alkyd primer or approved equal.

F. Bolts shall conform to high strength ASTM-325.

G. Anchor bolts and rods shall conform to ASTM F1554, Grade 36. Use Grade 55 where specifically noted on Documents.

H. Zinc-rich urethane primer shall conform to the following:

1. Zinc dust content shall be 83% by weight in dried film.
2. Conform to SSPC-PS 12.01.
3. Zinc shall be classed as "non-lead".
4. Compatible with field coat application of high build epoxy paint and finish.
5. Acceptable product shall be Tnemec Series 90-97 or approved equivalent.

2.2 HOT-DIP GALVANIZING

A. Hot-Dip Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dip process. The galvanizing bath shall contain .05-.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A123 for fabricated products and ASTM A153 for hardware. Provide thickness of galvanizing specified in referenced standards.

2.3 FACTORY-APPLIED PRIMER OVER HOT-DIP GALVANIZING

A. Factory-Applied Universal Primer: Provide factory-applied polyamide epoxy primer, two (2.0) mils dry film thickness minimum. Apply primer within twelve (12) hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer.

2.4 FACTORY-APPLIED ARCHITECTURAL FINISH OVER PRIMER AND HOT-DIP GALVANIZING

A. Factory-Applied High-Performance Architectural Finish: Provide factory-applied polyurethane color coating, two and one-half (2.5) mils dry film thickness minimum. Apply coating at the galvanizer's plant, immediately after application of the prime coat, in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Engage the services of a galvanizing facility which will assume single-source responsibility for galvanizing, priming and finish coating.

PART 3 - EXECUTION

3.1 FABRICATION AND ERECTION

A. Connections of structural steel members, not otherwise noted or shown, shall be framed using connections which will develop the full strength of the beam. All composite beam end connections shall be increased by fifty (50%) percent. Design of end connections shall be in accordance with the AISC "Manual of Steel Construction". Field connections may be bolted using three-quarter (3/4") inch bolts, except where noted welded. A minimum of two (2) bolts per member connection is required.

B. Connections shall be consistent with "Type 2" construction as described in the AISC Specifications, unless otherwise indicated on the Structural Drawings.

C. All column ends scheduled to receive cap and base plates shall be milled or sawn to insure full bearing. All surfaces to be welded shall be free from loose scale, rust, grease, paint or other foreign material, except that mill scale which resists vigorous brushing may remain. Joint surfaces shall be free from fins or tears.

D. Fillet weld shall be one-quarter (1/4") inch minimum, unless otherwise noted.

E. Technique of welding employed, the appearance and quality of welds and the methods of correcting defective work shall conform to American Welding Society's latest edition of "Structural Welding Code". All welding shall be by AWS certified welders.

F. Provide one-half (1/2") inch diameter bolts at two feet six inches (2'-6") on center, staggered where the attachment of wood blocking and/or nailers are indicated on the Drawings.

G. Provide flexible masonry anchors as required in Division 4.

H. The Contractor shall accept full responsibility for design strength, safety and adequacy of all temporary bracing and sequencing of structural steel erection to brace the structure. Provide all temporary braces, guys, connections and work platforms required to safely resist all loads to which the structure may be subjected, including storms.

I. The Contractor shall guy, plumb and align framing in accordance with limits defined in the "Code of Standard Practice" of AISC.

J. Any corrections required in field to make members fit shall be brought to the attention of the Engineer for approval.

K. Provide angle frames for all openings in steel roof deck larger than twelve (12") inches.

L. Provide angle frame to support all roof drain sump pans.

3.2 PAINTING

A. All structural steel not concrete encased or to which spray fireproofing will not be applied shall receive one (1) coat of shop paint applied only after all fabrication is completed and as specified by the paint manufacturer's recommendations. Prior to painting, steel shall be thoroughly cleaned of dirt, mud, loose rust or other foreign matter which may have accumulated. Shop coat dry film thickness shall be two (2.0) mils minimum.

B. Do not shop paint areas adjacent [two (2") inches either side] to field welds.

C. Dried shop paint shall be free of abrasions, runs, sags, cracking, delaminations, skipped, and missed areas. All deficiencies shall be corrected at no additional cost to the Owner.

D. On structural steel beams scheduled to receive shear connectors the top flange surface shall not be painted.

3.3 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

A. Fabrication and tolerances shall conform to the requirements of Section 10 (AESS) of the AISC Code of Standard Practice.

B. All members shall be straight and true.

C. Welds shall be smooth and uniform.

D. Field modifications to AESS members are not permitted.

E. All AESS members shall receive zinc-rich urethane primer.

F. All exterior structural steel exposed to view shall be fabricated as AESS.

3.4 ZINC-RICH URETHANE PRIMING SYSTEM

A. All steel shall be properly cleaned prior to paint in accordance with manufacturer's recommendations.

B. All steel shall be blast cleaned in accordance with SSPC-6 "Commercial Blast Cleaning".

C. Minimum dry film thickness shall exceed two and one-half (2.5) mils.

D. Touch-up all damaged areas after erection.

## 3.5 GALVANIZING

A. Where galvanizing is indicated for all ferrous metals exposed to the weather, moisture or corrosive environments and specified for exterior use including lintels, relieving angles, railings and all items noted on the plans to be galvanized.

B. Galvanizing shall comply with applicable portions of the latest editions of the following reference standards:

1. ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A143 Safeguarding Against Embrittlement.
3. ASTM A153 Standard Specification for Zinc (Hot Dip Galvanizing) on Iron and Steel Hardware.
4. ASTM A384 Safeguarding Against Warpage.
5. ASTM A385 Providing High Quality Zinc Coatings.
6. ASTM A780 Repair of Hot Dip Galvanizing.

    a. All hot dip galvanized steel shall be stamped to indicate ASTM designation and ounces per square foot of nickel-zinc coating

C. Provide coating for iron and steel fabrications applied by the hot-dip process. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain .05-09% nickel and other earthly materials.

D. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material. Prior to galvanizing, the steel shall be immersed in a pre flux solution (zinc ammonium chloride). The pre flux tank must be 12 degrees to 14 degrees Baumé and contain less than .4% iron. The wet kettle process shall be prohibited.

E. All hot dip galvanizing shall be done after fabrication.

F. Where the galvanized steel is indicated to be shop primed for field painting, or to receive a factory topcoat, it shall be primed by the galvanizer, in his own facility, within twelve (12) hours of galvanizing and then force cured in a booth capable of maintaining 130 degrees F.

G. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program and an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks acceptable to the Engineer which has been in effect for a minimum of five (5) years and shall provide the Engineer with process and final inspection documentation.

H. Submit notarized Certificate of Compliance with application for payment for galvanizing, signed by galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.

END OF SECTION 05 12 00

**SECTION 05 30 00 - METAL DECKING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SCOPE OF WORK

A. The work under this Section shall consist of furnishing all labor, material, accessories, tools, transportation, etc., necessary to furnish, fabricate and erect all the metal decking required by the Drawings and/or herein specified, generally as follows:

1. All metal roof decking, including roof drain pans and closure accessories.
2. All metal floor decking and centering with closure accessories.

1.3 RELATED WORK

A. Section 05 12 04 - Structural Steel

1.4 QUALITY ASSURANCE

A. Applicable Codes

1. All work shall conform to the following codes (latest edition) except as modified in the Specifications.

a. Steel Deck Institute
b. American Iron and Steel Institute
c. American Institute for Steel Construction "Design, Fabrication and Erection of Structural Steel for Buildings".

1.5 SUBMITTALS

A. Shop Drawings

1. Submit two (2) prints and one (1) reproducible showing all dimensions, details, layout, accessories, and physical properties necessary for a complete installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Roof Deck

1. Metal roof deck shall be 1 1/2 inch deep, 20 gauge galvanized, Type B steel deck, wide rib, manufactured by a member firm of the Steel Deck Institute. Deck shall be made of steel conforming to ASTM A653, Grade 33, coating Class G60, having a minimum yield strength of 33,000 psi with minimum physical properties of (I = 0.213 in.|4|) and (S = 0.235 in.|3|).
2. Roof drain pans shall be flat 14-gauge galvanized steel.
3. All steel deck and accessories shall be thoroughly cleaned of all grease, oil, and dirt after fabrication. Finish shall be galvanized in conformance to ASTM A653, coating Class G60. Underside of deck shall be painted white.

B. Composite Metal Floor

1. Composite metal floor deck shall be 1 1/2-inch deep, galvanized coating class G60. Deck gauge shall be as required for slab loads and spans with a minimum of 20 gauge. Deck shall conform to ASTM A653, Grade 40, having a minimum yield strength of 40,000 psi, with a minimum section modulus of Sp = 0.23 in.|3| and a minimum moment of inertia of Ip = 0.19 in. |4| as manufactured a member company of the Steel Deck Institute.
2. All closures, pour stops, and finish strip gauges shall be manufacturer's standard as required for span and loading. Finish shall be galvanized.

C. Metal Centering

1. Metal centering shall be 9/16-inch deep, galvanized coating class G60, 26 gauge. Deck shall conform to ASTM A653 SS Grade 80, with a minimum section modulus of Sp = 0.046 in |3| and minimum moment of inertia of I = 0.015 in |4| as manufactured by United Steel Deck or approved equal.
2. All closures, pour stops and finish strip gauges shall be manufacturer's standard as required for span and height. Finish shall be galvanized.
3. Provide 16-gauge welding washers.

PART 3 - EXECUTION

3.1 DECK PROTECTION

A. Deck shall be protected during transit to prevent contamination from road salts.

B. Reasonable care and protection shall be given to all steel deck units during handling. If steel deck units are to be stored prior to being placed, they shall not be in contact with the ground and shall be protected from the weather.

## 3.2 INSTALLATION OF METAL ROOF DECK

A. Steel deck units shall be erected and adjusted to final position with proper end bearing, and side laps in accordance with manufacturer's specifications and approved shop drawings.

B. Secure deck units in place with five-eighths (5/8") inch diameter fusion welds without causing blow holes. Welds shall not exceed six (6") inches on center at all intermediate supports and six (6") inches at end laps. Six (6") inch ribs of each unit shall be interlocked with the adjacent unit and side laps shall be fastened with self-tapping screws at mid-span and twenty-four (24") inches on center maximum. Secure steel plate accessories to deck with self-tapping screws or blind rivets. Sides of sheet bearing on perimeter steel supports shall be welded to supporting steel at six (6") inches on center.

C. Field cutting of deck units for openings shall be done in workmanlike fashion with shears, saw or other approved equipment. All openings cut in deck units for pipe sleeves, ducts, etc., shall be reinforced as shown on the Drawings. Openings exceeding six (6") inches in width shall not be cut in deck units unless shown on structural drawings or approved by the Structural Engineer.

D. Any warped or twisted panels will not be accepted or approved.

E. Deck shall be continuous over three (3) or more supports and shall have end laps of at least two (2") inches over supports. Side laps shall be lapped a minimum of one-half (1/2) corrugation.

F. All welds and adjacent surfaces on which protective coating was damaged shall be cleaned and painted within twenty-four (24) hours after welding is complete. Paint shall be manufacturer's standard product, subject to the Engineer's approval.

## 3.3 INSTALLATION OF COMPOSITE METAL FLOOR DECK

A. Reasonable care and protection shall be given to all deck units during handling. If units are to be sorted prior to being installed, they shall not be in contact with the ground and shall be protected to prevent water access to the units. Any bent or otherwise damaged units shall be removed and replaced.

B. Composite deck shall be accurately installed in contact with supporting steel in accordance with the manufacturer's approved installation drawings and specifications. Deck units shall have a minimum bearing of two (2") inches on frame members, and shall be edge lapped one-half (1/2) corrugation, and fastened with one-half (1/2") inch diameter puddle welds spaced not more than twelve (12") inches on center or shear connectors to all supporting members. Side laps of sheets shall be fastened at mid-span and at thirty-six (36”) inches on center maximum by welding or self-tapping screws.

C. Field cutting of deck units for columns or openings shall be done in a workmanlike fashion with shears, saw or other approved equipment. Openings larger than twelve (12") inches in width parallel to permanent support shall not be cut in deck unless shown on the Structural Drawings or approved by the Structural Engineer.

D. Any warped, bent, or twisted deck panels will not be accepted or approved.

3.4 INSTALLATION OF METAL CENTERING

A. Steel deck units shall be erected and adjusted to final position with proper end bearing, and side laps in accordance with manufacturer's specifications and approved shop drawings.

B. Secure deck units in place with welding washers without causing blow holes. Welds shall not exceed twelve (12") inches on center at all supports. Secure steel plate accessories to deck with self-tapping screws or blind rivets. Sides of sheet bearing on perimeter steel supports shall be welded to supporting steel at twelve (12") inches on center.

C. Field cutting of deck units for openings shall be done in workmanlike fashion with shears, saw or other approved equipment. All openings exceeding six (6") inches in width shall not be cut in deck units unless shown on Structural Drawings or approved by the Structural Engineer.

D. Any warped or twisted panels will not be accepted or approved.

E. Deck shall be continuous over three (3) or more supports and shall have overlapping end laps of at least two (2") inches over supports. Side laps shall be lapped a minimum of one-half (1/2) corrugation.

F. All welds and adjacent surfaces on which protective coating was damaged shall be cleaned and painted within twenty-four (24) hours after welding is complete. Paint shall be manufacturer's standard product, subject to the product, subject to the Engineer's approval.

END OF SECTION 05 30 00

# SECTION 05 50 00 - METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Support angles for elevator door sills.
5. Elevator pit sump covers.
6. Miscellaneous steel trim including steel angle corner guards.
7. Metal ladders.
8. Ladder safety cages.
9. Steel bollards.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
3. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
4. Division 05 Section “Pipe and Tube Railings.”
5. Division 09 Section “Painting.”
6. Division 10 Section “Operable Partitions.”
7. Division 14 Section "Hydraulic Elevators.”

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.
4. Provide Shop Drawings for the following:

a. Steel framing and supports for operable partitions.
b. Steel framing and supports for mechanical and electrical equipment.

c. Steel framing and supports for applications where framing and supports are not specified in other Sections.
d. Steel shapes for supporting elevator door sills.
e. Elevator pit sump covers.
f. Metal ladders.
g. Miscellaneous steel trim including steel angle corner guards.
h. Aluminum ladders and cages.
i. Loose steel lintels.
j. Steel bollards.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

B. Welding certificates.

C. Qualification Data: For professional engineer.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Provide allowance for trimming and fitting at site.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design ladders.

B. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3.

G. Lag Bolts: ASME B18.2.1.

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1.

J. Lock Washers: Helical, spring type, ASME B18.21.1.

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

## 2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

## 2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

## 2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

## 2.10 ELEVATOR PIT SUMP COVERS

A. Fabricate from 1/8-inch rolled-steel floor plate with four 1-inch- diameter holes for water drainage and for lifting.

B. Provide steel angle supports as indicated.

## 2.11 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Space siderails 18 inches apart, unless otherwise indicated.
4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.

B. Steel Ladders:

1. Siderails: Continuous, 1-1/2-inch diameter steel pipe.
2. Rungs: 3/4-inch- diameter steel bars.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) IKG Industries, a Harsco company; Mebac.
        2) W. S. Molnar Company; SlipNOT.

5. Galvanize interior elevator pit ladders, including brackets and fasteners.

## 2.12 ALUMINUM LADDERS

A. General: Provide fixed metal ladders to comply with OSHA fall protection regulation 29 CFR 1910.27.

B. Aluminum Ladders:

1. Product: Subject to compliance with requirements, provide the following, or equal:

    **a. O'Keeffe's, Inc.; Heavy Duty Tubular Rail Aluminum Cage Ladder Model 532.**

2. Space siderails 24 inches apart.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
7. Provide minimum 72-inch- high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

## 2.13 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.

B. Aluminum Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 1/4-by-2-inch flat bars secured to each hoop.

## 2.14 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Size: 6-inch diameter, 48 inches high above grade.
2. Finish: Field painted.

B. Fabricate sleeves for bollard anchorage from steel pipe. Make sleeves not less than 3/4 inch larger than OD of bollard.

## 2.15 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

## 2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.17 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

## 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

## 3.3 INSTALLING METAL BOLLARDS

A. Fill bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with sand.

## 3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

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**SECTION 05 52 13 - PIPE AND TUBE RAILINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Steel pipe railings at interior ramps and stairs.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 09 Section “Painting” for field finishing of interior steel railings.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Grout, anchoring cement, and paint products.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer, licensed in the State of Connecticut.

B. Welding certificates.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

## 2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form changes in direction as follows:

1. By bending.

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. Wall Brackets: Steel. Provide minimum clearance of 1-1/2- inches from bottom of handrail to top of horizontal projection of the bracket, and minimum 1-1/2- inches clear from wall to edge of handrail.

a. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

1) The Wagner Companies; Handrail Bracket, No. RB14025.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

## 2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.7 STEEL AND IRON FINISHES

A. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:

1. Railings: SSPC-SP 3, "Power Tool Cleaning."

C. Primer Application: Apply shop primer to prepared surfaces of railings. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer.
2. Do not apply primer to galvanized surfaces.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

## 3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

## 3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

## 3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

## 3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

## 3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

## 3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13

# SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Wood blocking, nailers, and plywood sheathing associated with membrane roofing.
2. Wood blocking in partition framing.
3. Plywood backing panels.
4. Door hardware installation.
5. Hardboard (flooring).

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section “Thermoplastic Membrane Roofing” for furnishing and installation of wood blocking, nailers and plywood associated with roofing.
3. Division 08 Section "Door Hardware" for door hardware and additional installation requirements.

### 1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.

### 1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives, documentation including printed statement of VOC content.
2. Product Data for Credit b4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

# PART 2 - PRODUCTS

## 2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Plywood: DOC PS 1.

1. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
2. Factory mark panels to indicate compliance with applicable standard.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic, chromium or chromated copper arsenate (CCA).

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat miscellaneous carpentry, including the following:

1. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.

E. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Georgia Pacific.
2. Hoover Treated Wood Products, Inc.
3. Koppers Performance Chemicals.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

E. Application: Treat the following:

1. Concealed blocking in wall framing and window opening framing.
2. Concealed blocking in exterior wall and soffit assemblies.
3. Plywood backing panels.

F. Products: Subject to compliance with requirements, provide products by one of the following:

1. Dricon.
2. Hoover Treated Wood Products, Inc.
3. Koppers Performance Chemicals.

## 2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. For items of dimension lumber size, provide Construction or No. 2 lumber with 15 percent maximum moisture content and the following species:

1. Hem-fir (north); NLGA.

C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

F. Application: Provide kiln dried lumber in the following locations:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing.

## 2.5 ROOF SHEATHING AND BLOCKING

A. Plywood Roof Sheathing: Exposure I, Structural I sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 3/4 inch.

## 2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.7 HARDBOARD FLOORING

A. Hardboard: AHA A135.4, Class 4 (Service), Surface S2S; oil tempered.

1. Product: Subject to compliance with requirements, provide the following, or equal:

a. Decorative Panels International; Tempered Premium Hardboard.

2. Thickness: 1/4-inch.
3. Flame Spread Rating: Class C.

## 2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, fire retardant treated, or in area of high relative humidity, provide fasteners of with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Do not splice structural members between supports, unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

H. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

## 3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

## 3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood: Install 1-by-3-inch nominal- size furring vertically 24 inches o.c.

## 3.4 HARDBOARD FLOORING INSTALLATION

A. Hardboard: Orient finish panels running parallel to apron edge. Center downstage panel along apron edge on centerline of proscenium opening. Offset rows moving upstage with seams at midpoint of adjacent panels.

1. Install panels over existing wood flooring.
2. Install finish layer with 1-1/2” wood screws only, no adhesive. Countersink screw heads at 12 inches on center at perimeter and staggered 24 inches on center along three rows at interior. No raised heads, burrs, or sharp edges on fasteners shall be permitted.

## 3.5 FIRE-RETARDANT-TREATED (FRT) MATERIALS INSTALLATION

A. Cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating.

1. Ripping, milling, and surfacing of FRT lumber is not permitted.
2. FRT plywood can be cut in either direction without loss of fire protection.

## 3.6 FINISH HARDWARE INSTALLATION

A. General: Comply with requirements indicated below and in Division 08 Section “Door Hardware.”

B. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

D. Thresholds: Set thresholds for exterior doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

## 3.7 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

# SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Interior standing and running wood trim.
2. Plastic-laminate-clad cabinets.
3. Plastic-laminate-clad countertops.
4. Cabinet hardware and accessories.
5. Closet shelving.
6. Wood wall panels.

B. Section also includes:

1. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork, unless concealed within other construction before cabinet installation.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, fire retardant treated plywood, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
3. Division 06 Section “Wood Stairs” for wood treads and risers.
4. Division 09 Section “Painting” for field finishing wood trim and veneer panels.
5. Division 11 Section “Residential Appliances” for appliances indicated to be built-in to casework.
6. Division 12 Section “Simulated Stone Countertops” for solid-surface countertops installed with custom interior architectural woodwork, and for solid-surface window stools.

### 1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. Exposed Exterior Surfaces of Cabinets: All exterior surfaces exposed to view as follows:

1. All surfaces visible when door and drawers are closed, including knee spaces.
2. Underside of cabinet bottoms over 42 inches above finish floor, including cabinet bottoms behind light valances and the bottom edge of light valances.
3. Cabinet tops under 80 inches above finish floor, or if over 80 inches and visible from an upper level.
4. Visible front edges of stretchers, ends, divisions, tops, bottoms, shelves and nailers.
5. Sloping tops of cabinets that are visible.

C. Exposed Interior Surfaces of Cabinets: All interior surfaces exposed to view in open casework or behind glass doors as follows:

1. Shelves, including edgebanding.
2. Divisions and partitions.
3. Interior face of ends (sides), backs, and bottoms (including pull-outs).
4. Interior surfaces of cabinet top members 36 inches or more above finished floor.
5. Interior face of door and applied drawer fronts.

D. Semi-exposed Surfaces of Cabinets: Interior surfaces exposed to view only when doors or drawers are opened as follows:

1. Shelves, including edgebanding.
2. Divisions and partitions.
3. Interior face of ends (sides), backs, and bottoms (including pull-outs).
4. Interior surfaces of cabinet top members 36 inches or more above finished floor.
5. Drawer sides, sub-fronts, backs, and bottoms.
6. Underside of cabinet bottoms between 24 and 42 inches above finished floor.
7. Security and dust panels or drawer stretchers.

E. Concealed Surfaces of Cabinets: Exterior or interior surfaces that are covered or not normally exposed to view, as follows:

1. Toe space, unless otherwise specified.
2. Sleepers, stretchers, and solid sub-tops.
3. Underside of cabinet bottoms less than 24 inches above finished floor.
4. Flat tops of cabinets 80 inches or more above finished floor, except if visible from an upper level.
5. The three non-visible sides of adjustable shelves.
6. The underside of countertops, knee spaces, and drawer aprons.
7. The faces of cabinet ends of adjoining units that butt together.

## 1.4 SUBMITTALS

A. Product Data: For each type of product, including panel products, cabinet hardware and accessories and finishing materials and processes.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
4. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
5. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Indicate AWI/QCP Number assigned to this Project on all pages of shop drawings.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for plumbing fixtures and faucets installed in architectural woodwork.

D. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.

E. Samples for Verification:

1. Lumber for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
2. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
3. Corner pieces as follows:

    a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.

4. Exposed cabinet hardware and accessories, one unit for each type.
5. Full size cabinet samples, including all mounting hardware and fasteners.

    a. One full size base cabinet with drawer and all hardware.
    b. One full size upper cabinet.

F. Product Certificates: For each type of product, signed by product manufacturer.

G. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

H. Qualification Data: For Fabricator.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products, or installer approved by fabricator and a certified participant in AWI's Quality Certification Program.

C. Accessibility: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Contractor shall register the work of this Section with the AWI Quality Certification Program.
2. Provide AWI Quality Certification labels and certificates indicating that interior architectural woodwork, including installation, complies with requirements of grades specified.
3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical plastic-laminate-clad cabinets, including the following:

    a. A minimum of two base cabinets, with countertop.
    b. One upper cabinet.
    c. One tall cabinet.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

## 1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Certified Wood: Interior architectural woodwork shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

D. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 10 percent.
2. Hardboard: AHA A135.4.
3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
4. Particleboard: ANSI A208.1, Grade M-2.
5. Softwood Plywood: DOC PS 1.

E. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Basis of Design Products (**PL-1,2,3**): Subject to compliance with requirements, provide high-pressure decorative laminates as indicated on the Finish Legend, or comparable product by one of the following:

a. Formica.
b. Nevamar.

2. Colors: As indicated on Finish Legend.

## 2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Door Restraint: Steel cabinet door restraint with nickel-plated finish, with mounting plates for screw fixing at each end.

1. Provide restraint at cabinet doors where cabinet is located adjacent to a wall or where an adjacent counter extends beyond the face of the cabinet.

D. Bumper Cushions: Round polyurethane clear self-adhering door bumper cushions, 5/16-inch diameter, 1/16-inch thick.

1. Provide door cushions on all cabinet doors.

E. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

F. Shelf Rests: BHMA A156.9, B04013; plastic, two-pin type with shelf hold-down clip.

G. Catches: Heavy duty, metal magnetic catch with 13 lb. pull force, 592 aluminum finish.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

a. EPCO Engineered Products Co.; Magnetic Catch.

H. Drawer Slides: BHMA A156.9, B05091.

1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type with positive in-stop, soft-close; zinc-plated-steel ball-bearing slides.

a. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
b. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.

2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.

I. Locks: Furnish cam type locks on all cabinet doors and drawers, keyed alike per room, with one master key.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

a. CompX National; Cam Lock.

2. Type: Pin tumbler cylinder cam lock, brass construction with chrome finish complying with BHMA A156.11.

J. Grommets for Cable Passage through Countertops: 3-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide **Doug Mockett & Company, Inc.; OG Series**, or comparable product by one of the following:

a. Richelieu Hardware.
b. Rockler Woodworking and Hardware.

2. Color: As selected by Architect from manufacturer's full range.

K. Counter Support Brackets: Extruded aluminum, 0.25-inch thick, "T"-shaped bracket, welded along 45 degree mitered sides and back, with 5/16-inch holes to accept 1/4-inch screws.

1. Product: Subject to compliance with requirements, provide **Rakks; Counter Bracket** or comparable product by one of the following:

a. Federal Brace.
b. Outwater Plastics Industries, Inc. & Architectural Products.

2. Load Capacity: Minimum 450 lbs.
3. Finish: Clear anodized.
4. Sizes:

a. Model EH-1209 for up to 13-inch deep counters: 12" vertical leg, 9" horizontal leg, 2 inches deep.
b. Model EH-1818 for up to 24-inch deep counters: 18" vertical leg, 18"horizontal leg, 2 inches deep.
c. Model EH-1824 for up to 30-inch deep counters: 18" vertical leg, 24"horizontal leg, 3 inches deep.

L. Wardrobe Hooks: Wall mounted, stainless steel with satin finish, with matching cover plate; 2 inch base diameter with 13/32-inch hook diameter, 1-19/32 inch projection.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Doug Mockett & Company, Inc.; CH17-94.**

M. Label Holders: Satin aluminum tag holder, overall size 3-3/8-inches by 1-3/8-inches.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Doug Mockett & Company, Inc.; CF1-94.**

N. Closet Rods: 1-1/2-inch- diameter, hardwood.

O. Rod Flanges: Zinc, with two pins for 5 mm holes, matt nickel finish.

1. Basis of Design Product: Subject to compliance with requirements, provide **Hafele; Wardrobe Tube Support**, or comparable product by the following, or equal:

a. Knape and Vogt.

P. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

Q. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.3 ACCESSORIES

A. Display Rail: Surface mounted aluminum rail with a system of interlocking rollers to hold various thicknesses of paper and other items up to 0.125 inch thick.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

**a. Advantus; Grip-A-Strip.**

2. Length: 12 inches.

## 2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

E. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Contact Adhesive: 250 g/L.

## 2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.

D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

## 2.6 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH (FIELD FINISHED)

A. Grade: Premium.

B. Wood Species and Cut: White maple, plain sliced.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.7 PLASTIC-LAMINATE-CLAD CABINETS

A. Grade: Custom.

B. Type of Construction: Frameless.

C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

D. Cabinet Fabrication: 3/4-inch particleboard.

E. Shelving: Fabricated from particleboard with surfaces indicated, in the following thicknesses:

1. Shelving up to 36- inches wide: 1-inch thick.
2. Shelving 36- inches to 48- inches wide: 1-1/4-inch thick.

F. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: PVC edge banding, 0.12 inch (3 mm) thick, in color selected by Architect from manufacturer's full range.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Materials for Semiexposed Surfaces:

1. Horizontal Surfaces, Shelves: Grade HGS.
2. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, in color as selected by Architect from manufacturer's full range.
    b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.

3. Drawer Subfronts, Sides and Backs: Solid-hardwood lumber.
4. Drawer Bottoms: Hardwood plywood.

H. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

## 2.8 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on Finish Legend.

D. Edge Treatment: PVC edge banding, 0.12 inch (3 mm) thick, in color as selected by Architect from manufacturer's full range.

E. Core Material: Particleboard or medium-density fiberboard.

F. Core Material at Sinks: Particleboard made with exterior glue or exterior-grade plywood.

## 2.9 CLOSET SHELVING

A. Closet Shelving: Made from the following material.

1. Melamine-faced particleboard with applied PVC front edge.
2. Shelving up to 36- inches wide: 1-inch thick.
3. Shelving 36- inches to 48- inches wide: 1-1/4-inch thick.

B. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.

C. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.

## 2.10 WOOD WALL PANELS

A. Wood Wall Panels:

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Armstrong; WoodWorks Standard Wall Panels.**

2. Panel Sizes: Custom sizes as indicated on Drawings.
3. Thickness: 3/4 inch.
4. Wood Veneer: Maple (NMP).

5. Perforation: W1, unperforated.
6. Installation: Z-bar with Z-clip.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to walls with adhesive.
3. Caulk space between backsplash and wall, and between backsplash and countertop with sealant specified in Division 07 Section "Joint Sealants."

I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

J. Refer to Division 09 Section “Painting” for final finishing of installed architectural woodwork.

## 3.3 SHELVING INSTALLATION

A. Install shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

B. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

1. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.

## 3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

**SECTION 06 43 00 – WOOD STAIRS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. Section Includes:

1. Wood stair treads and risers.

B. Related Section:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section "Pipe and Tube Railings" for metal railings installed with wood stairs.
3. Division 06 Section "Interior Architectural Woodwork" for wood trim.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver wood stairs until painting and similar operations that could damage woodwork have been completed in installation areas. If wood stairs must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wood stairs until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where wood stairs are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood stairs can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOOD STAIRS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. Wood for Transparent Finish:

1. White maple, plain sliced.

D. Finishes for Stair Parts: As follows:

1. Treads and Risers: Transparent, shop or field finished by this Section.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 8 to 13 percent.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.

2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.

E. Abrasive Metal Nosing: Solid, non-slip abrasive bar for recessed adhesive installation in wood treads.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

a. Balco Inc.; Model AS-2.

2. Material: Two-part epoxy and aluminum oxide abrasive.
3. Color: As selected by Architect from manufacturer's full range.
4. Size: 1/4 inch wide by 1/2 inch deep, set 1/16 inch above stair tread surface.

a. Provide in length required for full width of stair tread.

## 2.4 FABRICATION

A. Fabricate wood stairs to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

## 2.5 STAIR TREAD FINISH

A. All products shall comply with the VOC content regulations of the Ozone Transportation Commission (OTC) effective in the State of Connecticut, for interior paints and coatings applied at Project site.

B. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.

1. Basis of Design Product: Subject to compliance with requirements, provide **Bona; Bona Traffic HD** or comparable product by one of the following:

a. Dura Seal, Sherwin-Williams Company (The).
b. Hillyard, Inc.

2. VOC Content: When calculated according to 40 CFR 59, Subpart D (EPA Method 24), as follows:

a. Finish Coats and Floor Sealers: Not more than 350 g/L.

3. Floor Sealer: Pliable, penetrating type.
4. Finish Coats: Formulated for multicoat application on wood flooring.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Before installation, condition wood stairs to average prevailing humidity conditions in installation areas.

B. Before installing wood stairs, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

A. Grade: Install wood stairs to comply with same grade as item to be installed.

B. Assemble wood stairs and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Touch up finishing work specified in this Section after installation of wood stairs. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

### 3.3 FIELD FINISHING STAIR TREADS

A. Machine-sand flooring to remove offsets, ridges, cups, raised grain and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish. Keep sanding to a minimum.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Fill and repair wood flooring seams and defects.

C. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

1. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

D. Cover wood flooring before finishing.

E. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

## 3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective wood stairs, where possible, to eliminate functional and visual defects; where not possible to repair, replace wood stairs. Adjust joinery for uniform appearance.

B. Clean wood stairs on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 43 00

**SECTION 07 01 50.19 - PREPARATION FOR RE-ROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Roof tear-off.
2. Removal of damaged or deteriorated curbs and blocking.
3. Roof re-cover preparation.
4. Removal of base flashings.
5. Temporary roof protection.
6. All hoisting and scaffolding for completion of masonry work.
7. Waste disposal.

B. Related Sections:

1. Division 01 Section "Summary" for use of the premises and phasing requirements.
2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
3. Division 01 Section "Sustainable Design Requirements."
4. Division 02 Section “Selective Demolition.”
5. Division 02 Abatement sections.
6. Division 07 Section "Thermoplastic Membrane Roofing” for new roofing installation over prepared decks.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System: Roofing membrane, roof insulation, and components and accessories between deck and roofing membrane.

C. Roof Tear-Off: Removal of existing membrane roofing system from deck.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

E. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes, such as asbestos-containing material, by a landfill facility licensed to accept hazardous wastes.

D. Qualification Data: For Installer, including certificate that Installer is licensed to perform asbestos abatement.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of new membrane roofing system, licensed to perform asbestos abatement in the State of Connecticut.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Reroofing Conference: Conduct conference at Project site.

1. Meet with Owner; Architect, Construction Manager, Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:

    a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.
    b. Existing roof drains and roof drainage during each stage of reroofing, and roof drain plugging and plug removal requirements.

c. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Existing deck removal procedures and Owner notifications.
e. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
f. Structural loading limitations of deck during reroofing.
g. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
h. HVAC shutdown and sealing of air intakes.
i. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
j. Asbestos removal and discovery of asbestos-containing materials.
k. Governing regulations and requirements for insurance and certificates if applicable.
l. Existing conditions that may require notification of Architect before proceeding.

## 1.7 PROJECT CONDITIONS

A. Existing Roofing Systems: Membrane roofing and standing seam metal roofing.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

1. The results of an analysis of test cores from existing membrane roofing system are available from the Construction Manager for Contractor's reference.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

F. Hazardous Materials: Present in building to be reroofed. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified in the Contract Documents.
3. Coordinate with hazardous material remediation subcontractor to prevent water from entering existing roofing system or building.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.

B. Plywood: DOC PS1, Grade CD Exposure 1.

C. OSB: DOC PS2, Exposure 1.

2.2 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to removal operations, examine all interior and exterior conditions. Identify and accommodate existing assemblies anchored to existing substrates and/or impacted by removal operations.

B. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

C. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

D. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

A. General: Notify Construction Manager each day of extent of roof tear-off proposed for that day.

B. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.

1. Remove cover boards, roof insulation and substrate boards as occurs.
2. Remove fasteners from deck.
3. Remove all existing roofing materials down to existing deck.

    a. Ensure substrate is dry and free of loose debris prior to installation of new roofing materials.

## 3.3 DECK PREPARATION

A. Inspect deck after tear-off of membrane roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.

C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

## 3.4 EXISTING BASE FLASHINGS

A. Remove existing base flashings around parapets, curbs, walls, and penetrations.

1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Division 07 Section "Sheet Metal Flashing and Trim."

## 3.5 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 07 01 50.19

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# SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes:

1. Modified bituminous sheet waterproofing (elevator pit).
2. Blindside sheet waterproofing (elevator pit).
3. Molded-sheet drainage panels.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 03 Section “Cast-in-Place Concrete.”
3. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, installation of waterstops in foundation, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

### 1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: Documentation including printed statement of VOC content.

C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

D. Samples: For the following products:

1. 12-by-12-inch square of waterproofing and flashing sheet.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

C. Warranties: Special warranties specified in this Section.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials, including molded sheet drainage panels, through one source from a single manufacturer.

C. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.

1. If Architect determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

C. Installed membrane shall not be left exposed to direct sunlight for longer than 14 days.

1.9 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Five years from date of Substantial Completion.
3. Warranty Period for Material Only: 10 years from date of Substantial Completion.

B. Installer Warranty: Written warranty, signed by Installer agreeing to repair or replace materials installed according to manufacturer’s written recommendations, that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period (Leak Free): Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with federal requirements controlling the use of volatile organic compounds (VOC).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
b. GCP Applied Technologies; Bituthene 3000.
c. Henry Company; Blueskin WP 200.
d. Meadows, W. R., Inc.; SealTight Mel-Rol.

2. Physical Properties:

a. Tensile Strength: 325 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
e. Puncture Resistance: 50 lbf minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
g. Water Absorption: 0.10 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

## 2.2 BLINDSIDE SHEET WATERPROOFING

A. Bonded HDPE for Blindside Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil thickness, with the following physical properties:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW MiraPly-H.
b. GCP Applied Technologies; Grace Preprufe 300R Plus.
c. Henry Company; Blueskin PreSeal 435.
d. Meadows, W. R., Inc.; PRECON.

2. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
3. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
4. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
5. Lap Adhesion: 8 lbf/in. minimum; ASTM D 1876, modified.
6. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.
7. Puncture Resistance: 200 lbf minimum; ASTM E 154.
8. Water Vapor Permeance: 0.01 perms maximum; ASTM E 96/E 96M, Water Method.

## 2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDrain 6200.
b. GCP Applied Technologies; Hydroduct 220.
c. Henry Company; Henry DB 220.
d. Meadows, W. R., Inc.; Mel-Drain 5035.

2. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively conduct water to foundation drainage system under maximum soil pressures.

    a. Minimum Compressive Strength: 15,000 psi when tested according to ASTM D-1621.
    b. Maximum Flow Rate: 16 gpm/foot at 1 hydraulic gradient and 3,600 psf normal pressure when tested according to ASTM D 4716.
    c. Film Backing: Plastic, protective-film, backing sheet attached to surface facing building wall.

3. Filter Fabric: Nonwoven geotextile fabric of polypropylene (PP) or polyester fibers, or combination of both.

    a. Weight: 4.0 oz./sq. yd., per ASTM D3776.
    b. Water Flow Rate: 150 gpm/sq.ft. minimum, per ASTM D4491.
    c. Grab Tensile Strength: 80 lbs. minimum, per ASTM D4632.

## 2.4 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with State of Connecticut VOC limits.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

F. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

G. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

H. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer, not less than 7 days.
2. Verify that concrete is visibly dry and free of moisture.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

## 3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 5-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

I. Install protection course with butted joints over waterproofing membrane immediately.

J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

## 3.4 BLINDSIDE SHEET-WATERPROOFING APPLICATION

A. Install bonded blindside sheet waterproofing according to manufacturer's written instructions.

B. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

C. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

D. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

E. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

## 3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

## 3.6 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

## 3.7 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Do not leave waterproofing membrane exposed to direct sunlight longer than 14 days.

D. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

E. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

F. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

**SECTION 07 21 00 - THERMAL INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Perimeter wall insulation (supporting backfill).
3. Thermal insulation.
4. Sound attenuation insulation.
5. Fire safing insulation.
6. Closed-cell spray polyurethane foam.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section "Unit Masonry" for insulation installed in cavity walls.
3. Division 07 Section "Thermoplastic Membrane Roofing” for insulation specified as part of roofing construction.
4. Division 09 Section "Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.
5. Division 23 Section for mechanical insulation.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Samples for Verification: Full-size units for each type of exposed insulation indicated.

D. Low-emitting product certification.

## 1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Research/Evaluation Reports: For foam-plastic and spray foam insulation, from ICC-ES.

## 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
3. Low Emitting: Complies with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Recycled Content: Provide glass and slag-wool-fiber/rock-wool-fiber insulation with recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 10 percent.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

C. Indoor Air Quality Requirements: The following practices shall be implemented in accordance with Division 01 Section “Indoor Air Quality Requirements.”

1. Insulations are to be stored per manufacturer’s recommendations for allowable temperature and humidity range. Insulations shall not be allowed to become damp.
2. Where feasible, fiberglass, mineral wool, and other fibrous insulations shall be stored separately from materials which have high short-term emissions. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.
3. Where feasible, exposed fiberglass or mineral wool insulations shall not be stored in occupied spaces, near HVAC diffusers (supply or return), or near fresh air intakes.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation (Perimeter Wall): ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company; Styrofoam Brand Square Edge.
b. GreenGuard; XPS Type IV.
c. Owens Corning; Foamular 250.

2. Type IV, 1.60 lb/cu. ft.
3. Thermal Resistance: 5 year aged R-values of 5.4 and 5.0 minimum, at 40 deg. F and 75 deg. F respectively.

4. Compressive Strength: ASTM D1621, 25 psi.
5. Water absorption: ASTM C272, 0.3% by volume maximum.

B. Extruded-Polystyrene Board Insulation (Under Slab): ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Chemical Company; Styrofoam Highload 40.
   b. GreenGuard; XPS Type VI.
   c. Owens Corning; Foamular 400.

2. Type VI, 1.80 lb/cu. ft.
3. Thermal Resistance: 5 year aged R-values of 5.4 and 5.0 minimum, at 40 deg. F and 75 deg. F respectively.
4. Compressive Strength: ASTM D1621, 40 psi.
5. Water absorption: ASTM C272, 0.3% by volume maximum.

## 2.2 MINERAL-WOOL BLANKET INSULATION (THERMAL)

A. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Johns Manville; MinWool Sound Attenuation Fire Batts (SAFB).
2. Rockwool; COMFORTBATT.
3. Thermafiber; SAFB.

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 0, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. R-Value: Minimum 3.7 per inch.
2. Nominal density of 2.5 lb/cu. ft minimum.
3. Thickness: As indicated, not less than 3- inches.

## 2.3 GLASS-FIBER BLANKET INSULATION (SOUND ATTENUATION)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation; CertaPro AcoustaTherm Batts.
2. Johns Manville; Sound Control Batts.
3. Owens Corning; Sound Attenuation Batt Insulation (SAB).

B. Sound Attenuation Insulation: Provide insulating materials as follows:

1. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

    a. Thickness: As indicated, not less than 3-1/2 inches.

## 2.4 MINERAL-WOOL-BOARD INSULATION (FIRE SAFING)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Johns Manville; MinWool Safing.
2. Rockwool; SAFE.
3. Thermafiber; Safing Insulation.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; water repellant rigid insulation board with a rigid upper surface, with maximum flame-spread and smoke-developed indexes of zero, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Nominal density of 4.0 lb/cu. ft. minimum.

## 2.5 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.0 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.6 deg F x h x sq. ft./Btu at 75 deg F.

1. Basis of Design Product: Subject to compliance with requirements, provide **BASF Polyurethane Foam Enterprises LLC; Walltite** or one of the following:

    a. Icynene; MD-C-200.
    b. Johns Manville; Corbond III.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

    a. Product must be approved for use in Type II construction in accordance with the Connecticut State Building Code (IBC) Section 2603.5 and tested in accordance with and comply with the acceptance criteria of NFPA 285.

4. Thickness: Maximum of 3 inches.

5. Material Properties:

   a. R-Value: 6.6 per inch, minimum.
   b. Vapor Permeance: ASTM E 96, 0.90 at 2.5 inch thickness.
   c. Density: ASTM D 1622, minimum 2.0 lbs./cu.ft.
   d. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference (0.02L/s*$m^2$ at 75 Pa); ASTM E 2178.

6. Free of Urea-Formaldehyde: Insulation manufactured with no urea-formaldehyde.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

   1. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

## 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 48 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

## 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, use mechanical anchorage to provide permanent placement and support of units.

B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Install unfaced, slag-wool-fiber/rock-wool-fiber blanket insulation in penetrations in all non-fire rated horizontal floor/ceiling assemblies, including edge of slab conditions indicated. Fill annular space of penetration to resist the free passage of flame and the products of combustion.

## 3.6 INSTALLATION OF SPRAY APPLIED INSULATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

C. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

D. Miscellaneous Voids: Apply according to manufacturer's written instructions.

E. Thermal Barrier: Apply thermal barrier to spray foam insulation that will remain exposed in attic areas.

1. Verify that substrates are ready to receive barrier coat.
2. Install in accordance with manufacturer’s written instructions.

## 3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

## 3.8 WASTE MANAGEMENT

A. Plan and coordinate insulation work to minimize generation of off-cuts and waste. Reuse insulation scraps to the maximum extent feasible.

B. Construction Waste Management: Comply with Division 01 Section “Construction Waste Management and Disposal” and as follows:

1. Separate and recycle waste materials in accordance with the Waste Management Plan and to the extent economically feasible.
2. Reuse insulation scraps in ceiling spaces and other locations where out of view.
3. Give preference to suppliers who take waste back for reuse or recycling.

END OF SECTION 07 21 00

# SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section "Unit Masonry" for masonry walls to receive fluid-applied air and vapor barrier membrane system, and for cavity wall insulation compatible with fluid applied air barriers.
3. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
4. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

### 1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

### 1.4 REFERENCES

A. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

### 1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
2. Include installers of other construction connecting to air barrier, such as roofing, waterproofing, masonry, joint sealants, windows, and door frames.
3. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

## 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
2. Certification by the manufacturer that products supplied comply with State of Connecticut regulations controlling use of volatile organic compounds (VOCs).

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For air-barrier products, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit 5d: For air barriers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.
4. Include details specific to this Project; generic details are not permitted.

D. Samples: For the following products:

1. 12-by-12-inch square of fluid applied membrane.
2. 12-by-12-inch square of transition tape.

## 1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of air and vapor barrier system for compliance with requirements, based on comprehensive testing of current air and vapor barrier system formulations.

1. Submit test results for air permeance in accordance with ASTM E 2178.

C. Research/Evaluation Reports: From ICC-ES.

D. Sample Warranty: Copy of special air and vapor barrier system manufacturer's warranty stating obligations, remedies, limitations, and exclusions before starting air and vapor barrier system.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
2. Provide list of at least three (3) projects completed by the Installer within the past five (5) years of similar scope and complexity to this Project.
3. Installer must show evidence of adequate equipment and trained field personnel to successfully complete project.

B. Mockups: Build mockups to set quality standards for materials and execution, and for preconstruction testing.

1. Build integrated mockups of exterior wall assembly as directed by Construction Manager**,** 150 sq. ft., incorporating each type of backup wall construction, external cladding, window, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by air and vapor barrier system manufacturer. Do not double stack pallets of materials.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight, extreme heat, and freezing.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Apply air and vapor barrier system within the range of ambient and substrate temperatures recommended by air and vapor barrier system manufacturer, but at not less than 40 deg F. Do not apply air and vapor barrier system to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply air and vapor barrier system in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of air and vapor barrier system materials.

1.11 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by air and vapor barrier system manufacturer agreeing to repair or replace air and vapor barrier system that does not comply with requirements or that does not remain watertight within specified warranty period.

1. Warranty does not include failure of air and vapor barrier system due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch in width.
2. Warranty Period: Five years from date of Substantial Completion.
3. Warranty Period for Material Only: 10 years from date of Substantial Completion.

B. Installer Warranty: Written warranty, signed by Installer agreeing to repair or replace materials installed according to manufacturer’s written recommendations, that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain air and vapor barrier system materials through one source from a single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

C. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

D. Low Temperature Installation: Provide products suitable for low temperature installation as required by construction schedule. Apply air and vapor barrier system within the range of ambient and substrate temperatures recommended by air and vapor barrier system manufacturer, but at not less than 25 deg F.

E. Fire Performance Characteristics: Provide water-resistive barrier meeting the following fire-test characteristics.

1. Surface-Burning Characteristics: ASTM E 84.

a. Flame spread index: 25 or less
b. Smoke developed index: 450 or less

F. Provide vapor-retarding membrane air barrier compatible with exterior wall insulation specified in Division 04 Section “Unit Masonry” that has also been tested in an assembly with the insulation in accordance with NFPA 285.

## 2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, synthetic polymer membrane.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings and Waterproofing, Inc.; Fire Resist Barritech NP.
b. GCP Applied Technologies; Perm-A-Barrier NPL 10.
c. Henry Company; Air-Bloc 16MR.
d. W.R. Meadows; Air-Shield LSR.

B. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, synthetic polymer membrane for low temperature installation:

1. Product: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings and Waterproofing, Inc.; Fire Resist Barritech NP-LT.
b. GCP Applied Technologies; Perm-A-Barrier NPL 10 LT.
c. Henry Company; Air-Bloc 16MR.
d. W.R. Meadows; Air-Shield LSR.

C. Fluid-Applied air and vapor barrier system: Comply with manufacturer's written physical requirements, and performance requirements as follows:

1. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M.
2. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference (0.02L/s*$m^2$ at 75 Pa); ASTM E 2178.
3. Low Temperature Flexibility: ASTM D 1970, unaffected to -45 deg F.
4. Elongation: ASTM D 412, Die C, minimum 500%.
5. Pull adhesion to concrete block: ASTM D 4541, 35 psi.

## 2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Transition Membrane: Manufacturer’s standard, vapor retarding, smooth surfaced, modified bitumen, self-adhering sheet membrane complete with an engineered thermoplastic film.

1. Membrane Thickness: 40 mils minimum.

D. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

E. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

F. Adhesive: Air-barrier manufacturer's standard adhesive.

G. Termination Sealant: Air-barrier manufacturer's standard moisture cure, medium modulus polymer modified sealing compound.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrate is visibly dry and free of moisture.
2. Verify that masonry joints are flush and completely filled with mortar.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for air and vapor barrier system application.

B. Mask off adjoining surfaces not receiving air and vapor barrier system to prevent spillage or overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

## 3.3 JOINT TREATMENT

A. Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

## 3.4 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials as indicated.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Membrane: Roll firmly to enhance adhesion.

a. Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.

2. Provide flashing, as detailed, over window base shims and upturned sides and back face of window units.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

## 3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
4. Install air barrier membrane prior to installation of masonry veneer anchors.
5. Protect in place masonry veneer anchor pintels.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: Provide total dry or wet film thickness for each type of substrate as recommended in writing by manufacturer to meet specified performance requirements, applied in one coat

C. Start installing air and vapor barrier system in presence of manufacturer's technical representative.

D. Mix materials and apply air and vapor barrier system by spray application method.

1. Apply air and vapor barrier system to prepared wall terminations and vertical surfaces using a cross-hatching technique to ensure coverage and thickness.
2. Carry membrane into any opening a minimum of 2-inches.
3. Seal all masonry ties and other penetrations as work progresses.
4. Verify wet film thickness of air and vapor barrier system every 100 sq. ft.

E. Allow the fluid applied membrane to cure to tack-free and apply transition membrane with a minimum 3-inch overlap onto each surface at all beams, columns and joints as indicated in detail shop drawings.

1. Tie-in to window and door frames, roof and floor intersections and changes in substrate.
2. Overlap adjacent pieces 2-inches and roll all seams with a hand roller.
3. Seal top edge of flashing with a termination mastic.

F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

## 3.6 FIELD QUALITY CONTROL

A. Engage an independent testing agency to perform testing and confirm dry film thickness of air and vapor barrier system.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections shall include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to each substrate according to ASTM D 4541 for each 1000 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

## 3.7 CURING, PROTECTING, AND CLEANING

A. Cure air and vapor barrier system according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.

B. Protect air and vapor barrier system from damage and wear during remainder of construction period.

C. Protect installed air and vapor barrier system from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where air and vapor barrier system will be subject to abuse and cannot be concealed and protected by permanent construction within 30 days after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

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# SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes the following:

1. Laminated-insulation-core metal wall panels, flat and curved, with accessory extrusions and attachments.

    a. Insulated metal wall panel is a sealed system to provide a continuous vapor barrier through the rear face of the panels, panel trim and flashing, and sealants.

2. Integrated wall louvers.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal wall panel assemblies.
3. Division 07 Section “Joint Sealants” for joint sealants furnished and installed by this Section.
4. Division 08 Section “Fixed Louvers” for fixed louvers installed in exterior wall assemblies.
5. Division 09 Section “Gypsum Board Assemblies” for exterior non-loadbearing metal framing.

### 1.3 DEFINITIONS

A. Metal Wall Panel Assembly: Insulated-core metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and aluminum-framed entrances and storefronts.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show project specific fabrication and installation layouts of metal wall panels and louvers; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop-, and field-assembled work. Show connection and relationship to adjacent elements.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.
2. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

    a. Flashing and trim.
    b. Anchorage systems, including Z furring.

D. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of joint gaskets showing the full range of colors available for each gasket exposed to view.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall Panels: 12 inches long by actual panel width for each panel type. Include fasteners, battens, closures, and other metal wall panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- long Samples for each type of accessory including the following:

    a. Louver corner.
    b. Base extrusion.

F. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

G. Coordination Drawings: Exterior elevations, drawn to scale, and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
2. Girts.
3. Wall-mounted items including doors, windows, plumbing, electrical and lighting fixtures.
4. Penetrations of wall by pipes and utilities.

H. Qualification Data: For Installer.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

J. Maintenance Data: For insulated-core metal wall panels to include in maintenance manuals.

K. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall panel; one bay wide by one story high by full thickness, including insulation, supports, attachments, and accessories, in location as directed by Architect.

    a. Include termination at fascia extrusion.

2. Conduct water spray test of mockup of metal wall panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal wall panels for period of metal wall panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Installer Warranty: Standard form in which the Installer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Connecticut, using performance requirements and design criteria indicated.

C. Pressure Equalization: The typical horizontal and vertical joint system shall exhibit rapid pressure equalization when subjected to cyclic external pressure fluctuations applied in accordance with ASTM E1233. Panels shall be successfully tested using procedure similar to AAMA 508; modified as appropriate for insulated foam core panels with an integral vapor barrier. The liner sheet of the panel shall be considered as the imperfect air barrier during the test procedure.

D. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 15 lbf/sq. ft.

F. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 15 lbf/sq. ft.

1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

G. Structural Performance: Metal wall panel assemblies shall withstand the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the Connecticut State Building Code and the following minimum design wind pressures:

a. Uniform pressure of 30 lbf/sq. ft., acting inward or outward.

2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.

H. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake movements determined according to the Connecticut State Building Code, as determined by the metal wall panel manufacturer’s professional engineer.

I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

J. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 236, corrected to 15 mph outside and still air inside.

## 2.2 LAMINATED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and core material laminated or otherwise securely bonded to facing sheets during fabrication without use of contact adhesives, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

B. Shiplap-Edge, Laminated-Insulation-Core Metal Wall Panels: Formed with flush exterior panel facing and with shiplap edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips and fasteners; with factory-applied gaskets in side laps.

1. Basis of Design Product (**Type A**): Subject to compliance with requirements, provide **Benchmark; Designwall 2000 Series** or comparable product by one of the following:

   a. CENTRIA; Formawall Dimension Series.
   b. MBCI.

2. Panel Type: Horizontal Installation.

   a. Panel Coverage: As indicated on Drawings.
   b. Panel Thickness: 3.0 inches.
   c. Profile: Flat (non-embossed).
   d. Thermal-Resistance Value (R-Value): 21 minimum.
   e. Reveal: 1/8 inch.
   f. Exterior Facing Material: Zinc-coated (galvanized) steel sheet, 22-gauge nominal thickness.
   g. Exterior Finish: Two-coat fluoropolymer.

      1) Color: As selected by Architect from manufacturer's full range.

C. Shiplap-Edge, Laminated-Insulation-Core Metal Wall Panels: Formed with flush exterior panel facing and with shiplap edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips and fasteners; with factory-applied gaskets in side laps.

1. Basis of Design Product (**Type B**): Subject to compliance with requirements, provide **Benchmark; Designwall R Series** or comparable product by one of the following:

   a. CENTRIA; Formawall Dimension Series DS60.
   b. MBCI.

2. Panel Type: Horizontal Installation.

   a. Panel Coverage: As indicated on Drawings.
   b. Panel Thickness: 3.0 inches.
   c. Profile: Ribbed.
   d. Thermal-Resistance Value (R-Value): 14 minimum.
   e. Exterior Facing Material: Zinc-coated (galvanized) steel sheet, 22-gauge nominal thickness.
   f. Exterior Finish: Two-coat fluoropolymer.

      1) Color: As selected by Architect from manufacturer's full range.

## 2.3 PANEL MATERIALS

A. Metallic-Coated Steel Face Sheet: Coil-coated, ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90, structural quality.
2. Face Sheet Thickness: 22 gauge.
3. Surface: Smooth, flat**.**

B. Metallic-Coated Steel Liner Sheet: Coil-coated, ASTM A 755/A 755M, 0.019 inch/26 gauge.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90, structural quality.
2. Surface: Manufacturer's standard.
3. Interior Liner Panel Finish: 0.2 mil primer with 0.6 mil acrylic color coat.

2.4 INTEGRATED WALL LOUVER UNITS

A. Exterior Wall Louvers, General: Extruded aluminum louvers, designed to integrate with metal wall panel profile and secondary support system without receptor channels or other flashing, nominal thickness not less than 0.060 inch for blades and 0.080 inch for frames, of types and performance indicated. System to be tested integrated with panels.

B. Horizontal Storm-Resistant Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

a. **Benchmark; Designwall Louver Integrated Jamb**.

2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.080 inch for frames.
4. Louver Performance Ratings:

a. Free Area: Not less than 7.56 sq. ft. (47%) for 48-inch- wide by 48-inch- high louver.
b. Air Performance: Not more than 0.32-inch wg static pressure drop at 900-fpm free-area intake velocity.
c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 8 inches per hour and a wind speed of 50 mph at a core-area intake velocity of 295 fpm.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
6. Finish and Color: Custom to match metal wall panel finish.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Mill finish unless otherwise indicated.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

E. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.

## 2.6 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.018-inch- minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather, provide continuous vapor barrier, and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, soffits, reveals, and fillers.

1. Provide custom formed trim to provide continuity between the panel vapor barrier and vapor barrier at window sealant, roof vapor barrier, and wall vapor barrier.

a. Base of wall flashing to be continuous under window openings. Modify as necessary to coordinate with window installation.

2. Color: Match panel finish.

## 2.7 INSULATION FOR PANEL CORES

A. Isocyanurate Insulation: Modified isocyanurate foam using a non-CFC blowing agent, foamed-in-place type, with maximum flame-spread index of 25 and smoke-developed index of 450.

1. Closed-Cell Content: 90 percent when tested according to ASTM D 2856.

## 2.8 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

1. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, 20 gauge minimum but not less than that required to meet structural performance requirements.

a. Depth: 3 inches.

2. Hat-Shaped, Rigid Furring Channels: ASTM C645.

a. Minimum Base-Steel Thickness: 0.0179 inch but not less than that required to meet structural performance requirements.
b. Depth: 7/8 inch.

B. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

C. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Basis of Design Product: Subject to compliance with requirements, provide **ELBEX Corporation; ELBEX HS-222 Silicone Transition Sheet** or one of the following:

a. Dow Corning Corporation; Dow Corning® 123 Silicone Seal.
b. Pecora Corporation; Sil-Span.
c. Tremco Incorporated; Spectrem Simple Seal.

2. Thickness: 30 mils (0.03 inch)
3. Color: Manufacturer's standard.

E. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 0, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; MinWool Sound Attenuation Fire Batts (SAFB).
b. Rockwool; ComfortBatt.
c. Thermafiber; SAFB.

2. R-Value: Minimum 3.7 per inch.
3. Nominal density of 2.5 lb/cu. ft minimum.
4. Thickness: As indicated.

## 2.9 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

## 3.2 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

1. Shim and secure all framing on wall substrates to provide a level and plumb mounting surface plane for wall panels.

## 3.3 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Flash and seal metal wall panels with weather closures at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
4. Install screw fasteners in predrilled holes.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal wall panel work proceeds.

    a. Bridge between laps of abutting trim with sealant and silicone sheet to provide continuity of vapor barrier.

b. Install a minimum of 8 inches of mineral wool insulation at top and bottom of wall panels.

7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls. Seal to maintain vapor barrier of wall panels.

B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
3. Sealants between framing and wall panels to provide continuity of vapor barrier from rear face of wall panels to flashing and trim.

## 3.4 INSULATED-CORE METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated-core metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten insulated-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
4. Locate and space fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Laminated-Insulation-Core Metal Wall Panels:

1. Shiplap-Edge Panels: Mechanically attach wall panels to supports using staggered, concealed side clips engaging tongue-and-groove panel edges. Install clips to supports with self-tapping fasteners.

a. Horizontal Joints: Seal joints with backer rod and sealant.
b. Vertical Joints: Seal joints with backer rod and sealant.

## 3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

## 3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Commissioning Agent for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Metal wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

## 3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.19

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**SECTION 07 42 13.63 – LINEAR METAL SOFFITS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes strip, linear metal pans and suspension systems for exterior ceilings.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 09 Section "Acoustical Panel Ceilings" for interior ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
3. Division 26 Sections for light fixtures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

D. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Linear Metal Pan: Set of 12-inch- long Samples of each type and color and a 12-inch-long spliced section.
2. Suspension System Members: 12-inch- long Sample of each type.
3. Exposed Molding and Trim: Set of 12-inch- long Samples of each type, finish, and color.
4. End Cap: Full size.

F. Delegated-Design Submittal: For design of seismic restraints and attachment devices.

## 1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Linear pattern.
2. Joint pattern.
3. Ceiling suspension members.
4. Method of attaching hangers to building structure.
5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
6. Ceiling perimeter and penetrations through ceiling; trim and moldings.
7. Minimum Drawing Scale: 1/8 inch = 1 foot.

B. Qualification Data: For professional engineer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each linear metal ceiling.

D. Evaluation Reports: For linear metal ceiling and components and anchor type.

E. Maintenance Data: For finishes to include in maintenance manuals.

## 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each set of linear metal pans and suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver linear metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle linear metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install linear metal ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for Linear Metal Ceilings and Suspension Systems: Manufacturer's standard form in which manufacturer agrees to replace panel ceilings and suspension systems that fail in materials or workmanship within specified warranty period.

1. Failure of ceiling panels includes sagging and warping, and growth of mold, mildew and stain causing bacteria.
2. Failure of suspension systems includes rusting.
3. Warranty does not cover damages that may occur from vibrations, fire, water, freezing temperatures, accident or any form of abuse or exposure to abnormal conditions.
4. Warranty Period: One year from date of Substantial Completion.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Linear Metal Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements" to design seismic restraints and attachment devices.

B. Structural Performance: Exterior linear metal ceilings shall withstand exterior exposure and the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:

1. Wind Load: Uniform pressure of 30 lbf/sq. ft. acting inward or outward.

C. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Connecticut State Building Code.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

E. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 450 or less.

2.2 METAL PANS AND SUSPENSION SYSTEM FOR LINEAR METAL CEILING

A. Steel Pans and Suspension System:

1. Basis-of-Design Product (**C-4**): Subject to compliance with requirements, provide **Armstrong World Industries; MetalWorks Linear Exterior** or comparable product by the following:

a. ATAS International, Inc.; Linear Ceiling Series.
b. USG; Paraline Linear Metal Systems.

B. Perforation Pattern: M1 Unperforated.

C. Pan Thickness: 0.028 inch.

D. Pan Edge Detail: Manufacturer's standard edge detail, with bevel at long edges and short edges form hook-on return flanges.

E. Linear Module Width and Pan Face Width: 8-inches nominal minimum, 5/8-inches deep, with square interlocking, integral reveal closure edge.

F. Pan Face Finish:

1. Color: As selected by Architect from manufacturer's full range.

G. End Cap, Finish of Exposed Portions: To match pan.

H. Suspension-System Main-Carrier Material: Manufacturer's standard material and protective finish.

1. Concealed carrier suspension system: Formed, inverted V-shaped, 0.95 mm (0.040 inch) thick roll-formed aluminum, by 62 mm (2.45 inch) high carrier sections. Pre-punch carrier cross sections, that are to receive ceiling panels, with prongs for snap attachment and support of panel side edges.

a. Provide manufacturer's standard metal carrier suspension system components, including splices, connector wire clips, hanger rods and adjustment springs, PVC closing pieces and trim for panel end attachment to wall.

## 2.3 LINEAR METAL CEILING PANS

A. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

1. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
2. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C 635.

a. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A 591/A 591M, 40Z coating; surface treatment as recommended by finish manufacturer for type of use and finish indicated.

B. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to snap on and be securely retained on carriers without separate fasteners, and finished to comply with requirements indicated.

C. Pan Splices: Construction same as pans, in lengths 8 to 12 inches; with manufacturer's standard finish.

D. End Caps: Metal matching pans; fabricated to fit and conceal exposed ends of pans.

E. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges and penetrations of ceiling, around fixtures, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.

## 2.4 METAL SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Suspension System: ASTM C 645, direct-hung, double-web suspension system composed of main beams and cross-furring members that interlock. Hot dipped galvanized per ASTM A 653.

1. Furring Runners: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2-inches high.
2. Furring Tees: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2-inches high with staked-on clip couplings, factory punched cross tee slots, and hanger holes.

F. Carrier Splices: Same metal, profile, and finish as indicated for carriers.

G. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished with matte-black baked finish.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Exterior Bracing: Cold-rolled steel channels and angles, hot-dip galvanized to comply with ASTM A 653/A 653M, G60 coating designation; size and profile as required to withstand wind load.

J. Hold-Down Clips: Manufacturer's standard hold-down clips spaced as standard with manufacturer.

K. Edge Moldings and Trim: Provide exposed members as indicated or required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

## 2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 FINISHES

A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Measure each ceiling area and establish layout of linear metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width or -length pans at borders, and comply with layout shown on reflected ceiling plans and Coordination Drawings.

## 3.3 INSTALLATION

A. Comply with ASTM C 636 and seismic requirement indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers but without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

G. Install linear metal pans in coordination with suspension system and exposed moldings and trim.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
3. Install pans with butt joints using internal pan splices and in the following joint configuration:

a. Aligned.

4. Where metal pan ends are visible, install end caps unless trim is indicated.

## 3.4 CLEANING

A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 07 42 13.63

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# SECTION 07 54 00 - THERMOPLASTIC MEMBRANE ROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Adhered membrane roofing system.
2. Roof insulation, tapered insulation and crickets.
3. Vapor retarders.
4. Cover board.
5. Walkway pads.
6. Flashing for roof drains, vent piping, and all roof penetrations.
7. Metal-flanged, bellows-type roof expansion assemblies.
8. All hoisting and scaffolding necessary of the completion of the roofing installation.
9. Waste disposal.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section “Metal Fabrications” for metal ladders.
3. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
4. Division 07 Section “Preparation for Re-Roofing” for roof removals.
5. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
6. Division 07 Section “Roof Specialties” for roof edge fascia.
7. Division 07 Section “Roof Accessories” for roof hatches.
8. Division 07 Section “Expansion Control” for exterior wall expansion joint assemblies.
9. Division 07 Section "Joint Sealants."
10. Division 22 Sections for installation of roof drains and related piping.
11. Division 23 Sections for installation of mechanical equipment.
12. Division 26 Sections for electrical.

### 1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
2. Product Data for Credit e11: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation layout, including slopes.
3. Insulation fastening patterns.
4. Expansion joints.

D. Samples for Verification: For the following products:

1. 6-by-6-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 6-by-6-inch square of roof insulation.
3. 6-by-6-inch square of walkway pads or rolls.
4. 6-inch length of metal termination bars.
5. Six insulation fasteners of each type, length, and finish.
6. Six roof cover fasteners of each type, length, and finish.
7. 18-inch length of through wall and counterflashing assembly. Include sample of fully soldered end dam, inside and outside corners, for the through wall assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system. Certification is required to be issued by manufacturer not less than one year prior to start of work.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.
2. Submit certificate of roof membrane sheet thickness specified, signed by manufacturer's control manager. ASTM +/- tolerance for membrane thickness is not acceptable.

C. Qualification Data: For Installer and manufacturer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer within the last four years and witnessed by a qualified testing agency, for components of roofing system.

E. Research/Evaluation Reports: For components of membrane roofing system.

F. Maintenance Data: For roofing system to include in maintenance manuals.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that has a UL Listing and FMG approval for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

1. The Installer shall be doing business under the same name for a minimum of 5 years prior to January 1, 2021 and have applied similar roofing systems on 10 or more projects which have been completed for more than two years.

a. Furnish names and addresses of each project within 100 miles of Project.

2. The Contractor that receives the award of this Project shall be the Installer of the roofing system. Installation of the roofing system shall not be subcontracted.

C. Installer’s Field Supervision: Maintain a full-time supervisor/foreman on-site during times that the roofing installation is in progress, who is experienced in installing roofing systems similar to type and scope required for this Project, and who is certified by the manufacturer as an approved applicator of the roofing system.

D. Technical Field Monitor: Arrange with the manufacturer’s roofing consultant to provide the services of an on-site, technical field monitor to periodically observe the total roofing system installation, and to provide the following:

1. Confirm that the Roofing Contractor’s applicators have completed the membrane manufacturer’s training program.
2. Monitor quality control over the total roofing operation, including but not limited to, wood blocking installation, roofing installation, metal work, flashing, and manufacturer supplied roofing system components and accessories required for the complete installation of the roofing system.

a. Confirm that all work is in compliance with the Contract Documents and installed as required to obtain warranty.

3. Monitor the quality of the hot air welded seams by taking a minimum of three cross seam cuts, measuring 2 by 6 inches at each periodic observation. Patch test cuts with same material at no additional cost to Owner.

a. Include field samples with reports.

4. Inspect roof installation bi-monthly and prepare punchlist for corrective action by the Installer.
5. Provide a written report to the Architect, Construction Manager, and Installer.

E. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.

F. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

1. Store membrane rolls horizontally on pallets, fully protected from the weather with canvas tarpaulins. Non-vented, polyethylene tarpaulins are not permitted.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Substrate Conditions: Proceed with roofing installation after substrates have been inspected and determined to be in satisfactory condition. Commencement of work indicates acceptance of substrates.

1.9 WARRANTY

A. Special Warranty: Manufacturer's customized form, without monetary limitation, edge-to-edge, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, vapor retarder, walkway products, expansion joints, and other components of membrane roofing system.
2. Wind Speed Warranty: Special warranty includes peak gust wind speed up to 100 mph.
3. Manufacturer shall certify the application methods and performance of the roofing system as part of the warranty.
4. Warranty Period: 20 years from date of Substantial Completion.
5. Warranty Period (Alternate): 30 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, vapor retarders, expansion joints, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

1.10 GUARANTEE

A. Special Project Guarantee: Pursuant to Connecticut General Statute, Chapter 173, Section 10-291 provide an unlimited manufacturer's guarantee for watertightness covering material and workmanship on the entire roofing system including insulation, bitumen, felts, membranes, flashings, metals, and other feature required by the roof design. All manufacturer's materials used in the roofing system must meet the latest ASTM standards for individual components of the roofing system. Provide a minimum roof pitch in all locations of 1/4-inch per foot.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-10 and the Connecticut State Building Code, and to meet manufacturer's warranty requirements for warranty terms indicated.

1. Ultimate Design Wind Speed: 135 mph.
2. Risk Category: III.
3. Exposure Category: B.

C. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

## 2.2 PVC ROOFING MEMBRANE

A. PVC Sheet: ASTM D 4434, Type II, Grade I, glass fiber reinforced.

1. Basis of Design Product: Subject to compliance with requirements, provide **Sika Sarnafil, Inc.; G410** or comparable product by one of the following:

   a. Carlisle SynTec; Sure-Flex PVC FRS Membrane.
   b. Johns Manville.

2. Thickness:

   a. Base Bid: 60 mils, nominal.
   b. Alternate: 80 mils, nominal.

3. Exposed Face Color: White.

## 2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

C. Flashing Membrane: Manufacturer’s 60 mil thickness fiberglass reinforced, asphalt compatible, membrane used where asphalt contamination is anticipated, or when adhering to smooth asphalt flashings.

D. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

E. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8-inch thick; with anchors.

F. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

1. Provide fasteners in lengths sufficient for a minimum embedment of 1-1/4”.

   a. Fasteners for attachment of metal to wood blocking: Annular ring nails.
   b. Fasteners for attachment of metal to masonry: Expansion type.

G. Miscellaneous Accessories: Provide preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

## 2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarder: ASTM D 4397, 10 mils thick, minimum, with maximum permeance rating of 0.1 perm.

1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Self-Adhering Vapor Retarder: Self-adhesive vapor barrier composed of SBS modified bitumen with a top surface of high-density polyethylene grid laminated between two layers of polyethylene film, and a silicone release plastic film that covers the self-adhesive back side.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Carlisle; VapAir Seal 725TR.
b. Johns Manville; Vapor Barrier SA.
c. Sika Sarnafil; Sarnavap SA.

## 2.5 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. To maintain system warranty, manufacturer’s approved insulation must be installed.
2. R-Value: 5.7 per inch.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4-inch per 12 inches, unless otherwise indicated on Drawings as 1/8-inch per 12 inches.

1. Thickness: As indicated on Drawings.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Foamable Adhesive: Elastomeric, one- or two-part, foamable adhesive formulated to adhere roof insulation to non-nailable substrate.

D. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

E. High Density Cover Board: ASTM C 1289, Type II, Class 2, high density, fiberglass coated, closed-cell polyisocyanurate foam insulation.

1. Compression Strength: ASTM D 1621, not less than 100 psi.
2. Thickness: 1/2-inch or manufacturer’s standard not less than 1/4- inch thick.
3. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle SynTec Incorporated; SecurShield HD Plus.
b. Firestone Building Products; IsoGuard HD.
c. Johns Manville; Invinsa Roof Board.

## 2.7 WALKWAYS

A. Flexible Walkways: Manufacturer’s standard, factory-formed, nonporous, polyester reinforced PVC membrane, slip-resisting, surface-textured walkway rolls, approximately 96 mils thick.

## 2.8 BELLOWS-TYPE ROOF EXPANSION ASSEMBLIES

A. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide manufacturer's standard assemblies of sizes and types indicated, with prefabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate assemblies specifically for applications indicated.

B. Fire-Resistance Rating: Comply with ASTM E 1966 or UL 2079; testing by a qualified testing agency to resist the spread of fire and to accommodate building thermal and seismic movements without impairing its ability to resist the passage of fire and hot gases. Identify products with appropriate markings of applicable testing agency.

1. Rating: Not less than 2-hour.
2. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Provide assemblies consisting of exposed polymeric sheet over foam bellows, securely anchored at both edges to 3- to 4-inch- wide sheet metal nailing flanges, either flat or angle formed to fit cant or curbs as required. Insulate bellows with closed-cell, flexible rubber or plastic foam not less than 5/16 inch thick; adhere bellows to underside of polymeric sheet.

1. Products: Subject to compliance with requirements, provide one of the following by the same manufacturer of roofing membrane:

a. Carlisle; Sure-Seal Expansion Joint Supports.
b. Johns Manville; Expand-O-Flash Style EJ/WC.

c. Sarnafil; Expansion Joint.

2. PVC Sheet: 80 mils thick.

a. Color: To match membrane roofing.

3. Metal Flanges: Sheet aluminum, minimum 0.032 inch thick, mill finish.
4. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assemblies at locations indicated. Fill space with blanket-type, mineral-fiber insulation.
5. Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Contractor shall examine substrates, areas, and conditions, with Roofing Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 05 Section "Steel Deck."
4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

1. Do not permit waterstops to remain in contact with permanent roofing as the installation progresses.
2. Do not permit incompatible materials, including asphalt, coat tar, heavy oils, and roofing cements to come in contact with roofing membrane. If contact occurs, remove contaminated membrane and replace at no additional cost to the Owner.

## 3.3 FASTENER PULL-OUT TESTING

A. Comply with Division 01 Section “Exterior Enclosure Commissioning Requirements.”

B. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Architect and roofing membrane manufacturer before installing new membrane roofing system.

1. Obtain roofing membrane manufacturer's approval to proceed with specified fastening pattern. Roofing membrane manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

## 3.4 TEMPORARY CUT-OFF

A. All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100 percent watertight seal. The stagger of the insulation joints shall be made even by installing partial panels of insulation. The new membrane shall be carried into the waterstop. Waterstop shall be sealed to the deck or substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant as specified. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of offsite. None of these materials shall be used in the new work.

B. If inclement weather occurs while a temporary waterstop is in place, the Contractor shall provide the labor necessary to monitor the situation to maintain a watertight condition.

C. If any water is allowed to enter under the newly-completed roofing, the affected area shall be removed and replaced at the Contractor’s expense.

## 3.5 VAPOR-RETARDER INSTALLATION

A. Coordinate installation and transition of roofing system component serving as a vapor barrier with air and vapor barrier specified under Division 07 Section "Fluid-Applied Membrane Air Barriers."

B. Vapor Retarder for Metal Deck:

1. Loosely lay polyethylene-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

    a. Seal side and end laps with butyl tape.

2. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.
3. Lap vapor retarder over, and seal to wall membrane air barriers at head joint of walls below and base joint of walls above roof.

C. Self-Adhering Vapor Retarder for Existing Gypsum and Concrete Decks:

1. Substrate must be clean, dry and free of dust, grease or other contaminants; smooth and free of voids. Apply primer to clean and dry surfaces with a brush, roller or sprayer at application rate recommended by manufacturer and as required for substrate. Allow primer to dry completely prior to installation of vapor barrier. Install vapor barrier on the same day as primer.
2. Laminate Sheet: Install laminate-sheet vapor retarder in a single layer, shingle fashion, over area to receive vapor retarder, side and end lapping each sheet a minimum of 3 inches and 6 inches, respectively. Stagger end laps a minimum of 12 inches. Bond vapor retarder to substrate as follows:

    a. Unroll sheet onto substrate without adhering for alignment. Do not immediately remove the silicone release sheet.
    b. Once aligned, peel back a portion of the silicone release sheet and press membrane onto the substrate for initial adherence. Hold sheet tight and peel back release sheet by pulling diagonally.
    c. Use a 75 lb. roller to press sheet down onto the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut membrane to remove air bubbles trapped under laps. Squeeze air bubbles by pushing the roller to the edge of the laps.

3. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system. Avoid tenting or wrinkles in the vapor retarder. If tenting or wrinkles occur, cut out imperfection and apply patch over area in accordance with manufacturer’s instructions.

## 3.6 WOOD NAILER AND BLOCKING INSTALLATION

A. Install continuous wood nailers at perimeter of the entire roof, around roof projections, penetrations, and locations indicated.

1. Do not use nailers less than three feet in length.
2. Build up nailer height to match thickness of substrate or insulation, with smooth transitions.

a. Wood blocking and nailers are indicated in nominal lumber sizes. Where required, as indicated or not, provide ripped, continuous shims to create nailer height to match thickness of substrate or insulation.

B. Anchor nailers to resist a minimum force of 300 lbf in any direction. Provide a 1-1/2" space between lengths of nailers.

1. Anchor nailers with fasteners spaced at 12 inches on center, staggered 1/3 the nailer width and installed within 6 inches of each end.
2. Comply with fastening requirements of FM Loss Prevention Data Sheet 1-49.

## 3.7 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

1. Ensure insulation is tapered to create a 4' x 4' sump. Provide insulation at perimeter of sump abutting field insulation in thickness required to provide a minimum R-25 thermal value.
2. End top edge of flashing just below the top edge of the sump to prevent any blockage for positive water flow.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

H. Adhered Insulation (Non-Nailable Gypsum and Concrete Deck):

1. Adhere insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Install all layers of insulation, flat and tapered, adhered to substrate with low-rise insulation adhesive in accordance with manufacturer's instructions.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.

1. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.

## 3.8 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

1. Install sheet according to ASTM D 5036.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical field monitor.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing in accordance with FMG's "Approval Guide."

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

H. Termination Bar: Following installation of roof membrane, install termination bar at 4 feet from the roof edge and fastened at 12 inches on center to the structural deck with acceptable fasteners. Hot air weld cover-strip over termination bar.

## 3.9 ROOF DRAIN INSTALLATION

A. General: Roof drains must be flashed the same day as work is done in the area. Temporary drain inserts (copper stacks) or temporary flashing-in of the drains will not be allowed.

B. Examine existing drain components and replace as necessary. If reusing existing clamping rings, clean body, ensure solid strainer and clamping ring. Tap bolt holes and replace bolts. Install new metal strainers.

C. Ensure insulation is tapered to create a 4’ x 4’ sump.

D. Prepare the substrate around the roof drain to prevent membrane bridging or distortion and to provide a smooth transition from the roof surface to the drain clamping ring. The mating surfaces between the field membrane and the drain base must be clean and have a smooth finish.

E. Cut the membrane so that the hole is at least the size of the corresponding drain leader opening.

F. The seal between the membrane and the drain base shall be provided by compression from the drain-clamping ring. Install manufacture’s recommended sealant between clamping ring and membrane.

1. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

G. Drains to be elevated to allow base layer of insulation to extend under the drain in order to comply with the Connecticut Energy Code.

## 3.10 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

## 3.11 EXPANSION JOINT ASSEMBLIES INSTALLATION

A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.

1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
2. Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
3. Provide for linear thermal expansion of roof expansion joint materials.
4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
5. Provide uniform, neat seams.
6. Install roof expansion joints to fit substrates and to result in watertight performance.

B. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.

C. Transitions to Other Expansion-Control Joint Assemblies: Coordinate installation of roof expansion joints with other exterior expansion-control joint assemblies specified in Division 07 Section "Expansion Control" to result in watertight performance. Install factory-fabricated units at transitions between roof expansion joints and exterior expansion-control joint systems.

D. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.

1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.

E. Fire Barrier: Install fire barrier as required by manufacturer to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.

F. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

## 3.12 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

## 3.13 FIELD QUALITY CONTROL

A. Engage a qualified testing agency to perform the following test, to be witnessed by the Roofing Manufacturer’s Representative:

1. Infrared thermal scan of completed membrane roofing system.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect and Construction Manager.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.14 PROTECTING AND CLEANING

A. Contractor to protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

1. Comply with Division 01 Section “Temporary Facilities and Controls.”

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

## 3.15 WASTE DISPOSAL

A. Unless otherwise indicated, excess materials are Contractor's property. At completion of roofing work, remove from Project site. Comply with Division 01 Section “Construction Waste Management and Disposal.”

## 3.16 PROJECT COMPLETION

A. Prior to demobilization from the site, the work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of the manufacturer shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and the manufacturer prior to demobilization.

B. All Warranties referenced in this Section shall have been submitted and have been accepted at time of contract award.

END OF SECTION 07 54 00

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# SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Formed Products:

   a. Formed through-wall flashing and counterflashing.
   b. Formed reglets and counterflashing.
   c. Formed low-slope roof sheet metal fabrications.
   d. Roof penetration flashing.
   e. Brake metal cladding / flashing.

2. All hoisting and scaffolding necessary for the completion of the work.
3. Waste disposal.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Division 07 Section “Thermoplastic Membrane Roofing.”
4. Division 07 Section “Roof Specialties” for manufactured roof edge specialties.
5. Division 07 Section "Roof Accessories" for roof hatches.
6. Division 07 Section "Expansion Control" for manufactured sheet metal expansion-joint covers.

### 1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

3. Accessories and Miscellaneous Materials: Full-size Sample.

F. Qualification Data: For qualified fabricator.

G. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

H. Warranty: Sample of special warranty.

## 1.5 QUALITY ASSURANCE

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

C. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

D. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 COORDINATION

A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. 2-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper, of minimum uncoated weight (thickness) indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin).

1. Products: Subject to compliance with requirements, provide the following:

a. Revere Copper Products, Inc.; FreedomGray.

## 2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Tin Alloy-Coated Copper Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

I. Do not use graphite pencils to mark metal surfaces.

2.4 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

B. Counterflashing: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

C. Flashing Receivers: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

D. Equipment Support Flashing: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

E. Roof-Penetration Flashing: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

F. Roof-Drain Flashing: Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

## 2.5 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following material:

1. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft.

B. Brake Metal Cladding/Flashing: Fabricate from the following material:

1. Aluminum: 0.050 inch thickness.

a. Color: Custom to match Architect’s sample.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for

installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Pre-tinning is not required for zinc-tin alloy-coated copper.
3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

## 3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions,] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

## 3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

C. Reglets: Installation of reglets is specified in Division 04 Section "Unit Masonry."

D. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

## 3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

## 3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

## 3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

## 3.8 WASTE DISPOSAL

A. Unless otherwise indicated, excess materials are Contractor's property. At completion of roofing work, remove from Project site.

END OF SECTION 07 62 00

**SECTION 07 71 00 - ROOF SPECIALTIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Roof-edge specialties.

B. Related Requirements:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Division 07 Section “Thermoplastic Membrane Roofing.”
4. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
5. Division 07 Section "Roof Accessories" for roof hatches.
6. Division 07 Section "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details and condition of other construction that will affect roof specialties.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

D. Samples: For each type of roof specialty and for each color and texture specified.

E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

F. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include roof-edge specialties made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof edge flashing that is ANSI/SPRI ES-1 tested.

C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

## 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

## 1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are ANSI/SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.

1. Build mockup of typical roof edge approximately 10 feet long, including supporting construction, seams, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

## 1.9 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Roofing-System Warranty: Roof-edge specialties are included in warranty provisions in Division 07 Section "Thermoplastic Membrane Roofing".

B. Special Warranty for Roof Edge System: Manufacturer's standard form in which manufacturer agrees to provide a lifetime warranty for the roof edge system, when installed per manufacturer's instructions, covering blow-off from winds up to 95 mph.

1. Warranty Period: 20 years from date of Substantial Completion, not to exceed life of membrane roofing system.

C. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Metal-Era, Inc.; Anchor-Tite Standard Fascia** or comparable product by one of the following:

    a. Hickman Edge Systems.
    b. Roofing manufacturer's standard.

2. Size: As indicated.
3. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, 0.040 inch thick.

    a. Surface: Smooth, flat finish.
    b. Finish: Two-coat fluoropolymer.
    a. Color: Custom to match Architect's sample (metal wall panels).

4. Corners: Factory mitered and continuously welded.
5. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
6. Receiver: Extruded aluminum in manufacturer's standard thickness, with pre-punched slotted holes. All bar miters are welded.

## 2.3 MATERIALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

## 2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

## 2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Extrusion Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

## 3.3 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

## 3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

**SECTION 07 72 00 - ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Roof hatches.
2. Roof penetration housings (distribution boxes).
3. Pipe supports.

B. elated Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section "Metal Fabrications" for metal vertical ladders for access to roof hatches.
3. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers and blocking.
4. Division 07 Section “Thermoplastic Membrane Roofing.”
5. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

D. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

E. Samples: For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

F. Warranty: Special warranty specified in this Section.

## 1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

## 1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which roof hatch manufacturer agrees to repair or replace parts which fail to function in normal use within the warranty period. Materials shall be free of defects in material and workmanship for specified period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.

B. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.

C. Galvanized Steel Pipe: ASTM A 53/A 53M.

D. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:

1. Mill Finish: As manufactured.

2.3 MISCELLANEOUS MATERIALS

A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.

B. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

D. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Basis of Design Product: Subject to compliance with requirements, provide **Bilco Company (The); Type S-50TB** or one of the following:

    a. Babcock-Davis; Model BRHTA.
    b. Milcor; RD-EE Series.

2. Type and Size:

    a. Typical: Single-leaf lid, 36 by 30 inches.

3. Performance characteristics:

    a. Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
    b. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
    c. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
    d. Operation of the cover shall not be affected by temperature.
    e. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

4. Cover: Shall be 11 gauge aluminum with a 5” beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
5. Curb: 12” in height, fabricated from 11 gauge aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5-1/2” flange with 7/16” holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6” on center, to be bent inward to hold single ply roofing membrane securely in place.
6. Cover insulation: 3” thick polyisocyanurate with an R-value of 20.3 (U=0.279 W/m2K), fully covered and protected by an 18 gauge aluminum liner.
7. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
8. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
9. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
10. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
11. Sloping Roofs: Where slope or roof deck exceeds 1/4-inch per foot, fabricate hatch curbs with height tapered to match slope to level tops of units.
12. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

a. Lifting mechanism: Compression spring operators enclosed in telescopic tubes to provide smooth and controlled cover operation throughout the entire arc of opening and closing. The upper tube is the outer tube to prevent accumulation of moisture and debris inside the lower tube assembly.
b. Cover to automatically lock in the open position with a rigid hold-open arm equipped with a 1-inch diameter vinyl grip handle.

B. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.

C. Safety Railing System: Complete railing system including rails, clamps, fasteners, safety barrier at railing opening, top rail, mid rail, self-closing swinging gate, and accessories required for a complete installation; attached to roof hatch and complying with OSHA Fall Protection 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Test Load: 200 lbs.
2. Height: 42 inches above finished roof deck.
3. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
4. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
5. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
6. Fabricate joints that will be exposed to weather in a watertight manner.
7. Close exposed ends of handrail and railing members with prefabricated end fittings.
8. Fasteners: Manufacturer's standard.
9. Color: Manufacturer’s standard, safety yellow.
10. Product: Subject to compliance with requirements, provide one of the following:

a. Ellis Ladder Improvements, Inc.; HatchSafe Model HSF.
b. Key Safety; KeeHatch Safety Railing System.
c. Safe Pro, LP; Roof Hatch Rails.

## 2.5 ROOF PENETRATION HOUSING

A. Roof Penetration Housing: Four-piece configuration consisting of a removable vandal resistant lid, middle housing, insulation extension and wide flange curb fabricated from heavy gauge, powder coated, welded aluminum with gaskets and stainless steel hardware.

1. Basis of Design Product: Subject to compliance with requirements, provide **Roof Penetration Housings; AWI Series Vault** or comparable product by one of the following:

a. Alta Products; Pipe Chase Housing.
b. Comsite Hardware Inc.; QuikPort Jr.

2. Construction:

a. 0.080 inch (2mm) thick aluminum housing and curb
b. UV protected powder coated finish (2 mil (.05 mm) thick)
c. Stainless Steel. V.P. fasteners.
d. Gasketed lid to housing and housing to curb connection joints to ensure compliance to ICC 2015 Air Permeance Levels 5.
e. Standard Color: Beige.
f. Constructed to withstand wind to 225+ MPH, third party tested.

3. Size: As indicated, or as required to suit number of penetrations indicated.
4. Exit Seals: Weather tight seal for vertical surface/plane penetrations. Seal construction to be manufactured in all aluminum construction and 100% Sil-X-14 silicone gaskets.

a. Series 5000: 0.25” to 1.90”
b. Series 6000: 2” to 3.125”
c. Series 7000: 3.5” Large Diameter Double Gasketed inside and out.

## 2.6 PIPE SUPPORTS

A. Pipe Supports: Prefabricated, engineered pipe supports installed without roof penetrations or damage to membrane roofing.

1. Basis of Design Products: Subject to compliance with requirements, provide the following or equal:

**a. OMG Roofing Products; OMG PipeGuard.**

2. Fabricated from smooth, flexible, UV stable, black EPDM rubber; with drainage slots to prevent pipes from sitting in standing water.
3. Model: Small.

a. Pipe Support Height: 3-1/2 inches.
b. Supports Nominal Pipe Size: 3/4-inch to 2 inches.
c. Maximum Load Capacity per Support: 650 lbs.

4. Model: Strut.

a. Strut Channel: Low profile, 1-5/8-inch, galvanized steel, accepts standard strut clamps. Can support single or multiple pipes.
b. Pipe Support Height: 4 inches.
c. Width at Top: 6 inches.
d. Supports Nominal Pipe Size: Single pipe up to 5 inches.
e. Maximum Load Capacity per Support: 800 lbs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Hatch Installation:

1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
2. Attach safety railing system to roof hatch curb.

F. Pipe Support Installation:

1. Spacing of Pipe Supports:

a. Pipe Diameters 2 inches to 5 inches: Maximum 10 feet apart.
b. Pipe Diameter 1-1/2 inches: Maximum 8 feet apart.
c. Pipe Diameters less than 1-1/2 inches: Maximum 6 feet apart.
d. Place 1 additional support at every union and source and along with 1 at side of junctions.

2. Adhere pipe supports to membrane roofing:

a. PVC Membrane Roofing: Weld PVC slip sheet to membrane roofing and adhere rooftop pipe supports with 1-component, elastomeric, gun-grade polyurethane sealant.

G. Seal joints with elastomeric sealant as required by manufacturer of roof accessories, in accordance with Division 07 Section “Joint Sealants.”

## 3.3 TOUCH UP

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

## 3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

# SECTION 07 81 00 - APPLIED FIREPROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Concealed sprayed fire-resistive material (SFRM).

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section "Structural Steel Framing" for surface conditions required for structural steel receiving SFRM.
3. Division 07 Section "Thermal Insulation" for fire-safing insulation.
4. Division 07 Section "Penetration Firestopping" for fire-resistance-rated firestopping systems.
5. Division 07 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.

### 1.3 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed and have not been defined as exposed.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying SFRM.
2. Extent of SFRM for each construction and fire-resistance rating, including the following:

a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.

1) For steel joist assemblies, include applicable fire-resistance design designations, with each steel joist tested with the same maximum tensile stress as each steel joist indicated on Drawings. Design designations with steel joists tested at lower maximum tensile stress than those indicated are not permitted.

b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

1) Fire resistant ratings indicated by design designations are considered restrained assemblies.

3. Treatment of SFRM after application.

C. Product Certificates: For each type of SFRM, signed by product manufacturer.

D. Qualification Data: For Installer, manufacturer, and testing agency.

E. Compatibility and Adhesion Test Reports: From SFRM manufacturer indicating the following:

1. Materials have been tested for bond with substrates.
2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.
3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.

G. Research/Evaluation Reports: For SFRM.

H. Field quality-control test and special inspection reports.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain SFRM through one source from a single manufacturer.

C. Compatibility and Adhesion Testing: The Owner will engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.

1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.

2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.

D. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory", for SFRM serving as direct-applied protection tested per ASTM E 119.
2. Surface-Burning Characteristics: ASTM E 84.

E. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

F. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Extent of Mockups: Approximately 100 sq. ft. of surface for each product indicated.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
2. Review and finalize construction schedule and verify sequencing and coordination requirements.
3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.
4. Review surface conditions and preparations.
5. Review field quality-control testing procedures.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 COORDINATION

A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.1 CONCEALED SFRM

A. Products: Subject to compliance with requirements, provide one of the following:

1. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
2. GCP Applied Technologies; Monokote Type MK-6.
3. Isolatek International Corp.; CAFCO 300.

B. Material Composition: Manufacturer's standard product, as follows:

1. Concealed Cementitious SFRM: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Thickness: Minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:

    a. Where the referenced fire-resistance design lists a thickness of 1 inch or more, the minimum allowable individual thickness of SFRM is the design thickness minus 0.25 inch.
    b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of SFRM is the greater of 0.375 inch or 75 percent of the design thickness.
    c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft.

3. Bond Strength: 150 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
4. Compressive Strength: 5.21 lbf/sq. in. minimum per ASTM E 761. Minimum thickness of SFRM tested shall be 0.75 inch and minimum dry density shall be as specified but not less than 15 lb/cu. ft.
5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.
7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of SFRM is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

    a. Flame-Spread Index: 0.
    b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

## 2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:

1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive SFRM.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by manufacturer of SFRM.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by manufacturer of intumescent mastic coating fire-resistive material. Include pins and attachment.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of SFRM. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

## 3.3 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Install metal lath and reinforcing fabric, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath and fabric to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by SFRM manufacturer. Attach accessories where indicated or required for secure attachment of lath and fabric to substrate.

D. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

G. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply SFRM that differs in color from that of encapsulant over which it is applied.

H. Where sealers are used, apply products that are tinted to differentiate them from SFRM over which they are applied.

## 3.4 APPLICATION, CONCEALED SFRM

A. Apply concealed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed SFRM" Article.

B. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating.

C. Cure concealed SFRM according to product manufacturer's written recommendations.

## 3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspection and prepare reports:

1. SFRM.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

C. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.

1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.

2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.

    a. Field test SFRM that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
    b. If surfaces of structural steel receiving SFRM are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. minimum per ASTM E 736.

5. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

D. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

E. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

## 3.6 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.

D. Repair or replace work that has not successfully protected steel.

END OF SECTION 07 81 00

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# SECTION 07 84 13 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

   a. Penetrations in fire-resistance-rated walls.
   b. Penetrations in horizontal assemblies.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section “Thermal Insulation” for fire safing insulation in non-fire rated horizontal floor/ceiling assemblies.
3. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction.
4. Division 21 Sections specifying fire-suppression piping penetrations.
5. Division 22 Sections specifying plumbing piping penetrations.
6. Division 23 Sections specifying duct and piping penetrations.
7. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

C. Work of this Section includes:

1. Fire Protection Subcontractor: Penetrations of all new and existing fire barriers, smoke barriers, and fire resistant rated floor and roof assemblies for fire protection piping.
2. Plumbing Subcontractor: Penetrations of all new and existing fire barriers, smoke barriers, and fire resistant rated floor and roof assemblies for plumbing and vent piping related to plumbing and natural gas systems.
3. HVAC Subcontractor: Penetrations of all new and existing fire barriers, smoke barriers, and fire resistant rated floor and roof assemblies for piping and ductwork related to HVAC systems.
4. Electrical Subcontractor: Penetrations of all new and existing fire barriers, smoke barriers, and fire resistant rated floor and roof assemblies for electrical conduit, cables, and cable trays related to electrical, security and technology systems.
5. Contractor: Penetrations of all new and existing fire barriers, smoke barriers, and fire resistant rated floor and roof assemblies for all other Work.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit 5d: For penetration firestopping sealants and sealant primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Provide floor plans indicating location and type of firestopping system.
2. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
3. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
4. Engineering Judgments: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests is to be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

C. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

D. Material Safety Data Sheets.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1. Engage an experienced firm who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products in accordance with specified requirements.
2. Firm with not less than 3 years’ experience with firestop installation.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

C. Do not use products and materials that contain flammable solvents.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."
2) FM Approval in its "Approval Guide."

## 2.2 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3 that are produced by one of the following manufacturers:

1. Hilti, Inc.
2. 3M; Fire Protection Products Division.
3. Specified Technologies, Inc. (STI).
4. Tremco; Tremstop Fire Protection Systems Group.

## 2.3 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

H. Labels: Self-adhering labels for identification of fire-resistive joint systems and fire resistant rated partitions identified in Part 3.

1. Product: Subject to compliance with requirements, provide labels by one of the following:

   a. Emedco (www.emedco.com).
   b. Fire Wall Signs, Inc. (www.firewallsigns.com).
   c. Seton (www.seton.com).

2.4 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials required in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

## 2.5 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

## 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems, and on both sides of partition, so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "WARNING - PENETRATION FIRESTOPPING SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

B. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

## 3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

1. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

## 3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

## 3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestop Systems with No Penetrating Items.

1. Available UL-Classified Systems: C-AJ-001-0999.

C. Firestop Systems for Metallic Pipes, Conduit or Tubing:

1. Available UL-Classified Systems: C-AJ-1001-1999 and W-L-1001-1999.

D. Firestop Systems for Nonmetallic Pipe, Conduit or Tubing:

1. Available UL-Classified Systems: C-AJ-2001-2999 and W-L-2001-2999.

E. Firestop Systems for Electrical Cables:

1. Available UL-Classified Systems: C-AJ-3001-3999 and W-L-3001-3999.

F. Firestop Systems for Cable Trays:

1. Available UL-Classified Systems: C-AJ-4001-4999 and W-L-3001-3999.

G. Firestop Systems for Insulated Pipes:

1. Available UL-Classified Systems: C-AJ-5001-5999 and W-L-5001-5999.

H. Firestop Systems for Miscellaneous Electrical Penetrants (Busducts):

1. Available UL-Classified Systems: C-AJ-6001-6999 and W-L-6001-6999.

I. Firestop Systems for Miscellaneous Mechanical Penetrants (Ductwork):

1. Available UL-Classified Systems: C-AJ-7001-7999 and W-L-7001-7999.

J. Firestop Systems for Groupings of Penetrants:

1. Available UL-Classified Systems: C-AJ-8001-8999 and W-L-8001-8999.

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# SECTION 07 84 46 - FIRE-RESISTIVE JOINT SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Wall-to-wall joints.
2. Head-of-wall joints.
3. Concealed expansion joints in concealed concrete slabs on deck.
4. Exposed joints between columns in fire rated partitions.
5. Exposed sealant joints in fire rated partitions.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
3. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.
4. Division 07 Section "Expansion Control" for interior fire-resistive architectural joint systems.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For fire-resistive joint systems, including printed statement of VOC content.

C. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
2. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests is to be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

D. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control test reports.

C. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICC ES AC30, from the ICC Evaluation Service.

D. Research/Evaluation Reports: For each type of fire-resistive joint system.

E. Material Safety Data Sheets.

## 1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1. Engage an experienced firm who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products in accordance with specified requirements.
2. Firm with not less than 3 years’ experience with firestop installation.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

    a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

        1) UL in its "Fire Resistance Directory."
        2) FM Approval in its "Approval Guide."

## 2.2 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following fire-resistive joint systems indicated for each application in the Fire-Resistive Joint System Schedule at the end of Part 3:

1. Hilti, Inc.; CFS-SP WB Firestop Joint Spray.
2. 3M; Fire Protection Products Division; FireDam™ Spray 200.
3. Specified Technologies, Inc. (STI).
4. Tremco; Fire Protection Systems Group; Tremstop Acrylic SP.

## 2.3 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

C. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by ASTM E 1966 or UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time of test.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

F. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

H. Labels: Self-adhering labels for identification of fire-resistive joint systems and fire resistant rated partitions identified in Part 3.

1. Product: Subject to compliance with requirements, provide labels by the following, or equal:

a. Emedco (www.emedco.com).
b. Fire Wall Signs, Inc. (www.firewallsigns.com).
c. Seton (www.seton.com).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

## 3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

1. Apply a thin bead of sealant to the end of the silicone facing only.
2. Peel off release paper to expose mounting adhesive on one face of material. Feed material into joint, working sequentially in one direction starting at the bottom of the joint. Recess 3/8-inch from wall surface.
3. When material is fully expanded against both sides of the joint, install corner caulking bead where the sealant facing meets the substrate.

## 3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "WARNING - FIRE-RESISTIVE JOINT SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

B. Identify fire resistance rated walls including fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions required to have protected openings or through penetration firestopping. Attach labels permanently to surfaces so that labels will be visible to anyone seeking to install penetrating items or firestop systems. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted.

1. Locate labels above accessible ceilings and in attic spaces, spaced at intervals not exceeding 30 feet measured horizontally, along both sides of the wall or partition, and not less than 15 feet from end of wall.
2. For occupied spaces without a finished ceiling, coordinate location of labeling with Architect.
3. Include lettering not less than 3 inches in height incorporating the words "*1 HOUR* RATED *FIRE BARRIER* – PROTECT ALL OPENINGS AND PENETRATIONS." Specifically identify the hourly rating of the wall and the type of partition (i.e. fire wall, fire barrier, fire partition) for each condition.

## 3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.

1. Inspection of fire resistive joints and perimeter fire barriers shall be performed in accordance with ASTM E 2393, "Standard Practice for On-Site Inspection of Installed Fire Resistive Joints and Perimeter Fire Barriers"

B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.

1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

## 3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

## 3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.

B. Head-of-Wall Fire-Resistive Joint Systems:

1. Available UL-Classified Systems: HW-D-0000-0999.
2. Assembly Rating: As indicated.
3. Movement Capabilities: Class II – 25 percent compression or extension.

C. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: WW-D-0000-0999.
2. Assembly Rating: As indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II – 25 percent compression or extension.

END OF SECTION 07 84 46

**SECTION 07 92 00 - JOINT SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants for exterior seismic joints.
5. Acoustical joint sealants.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
3. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
4. Division 07 Section "Expansion Control" for interior building expansion joints.
5. Division 08 Section "Glazing" for glazing sealants.
6. Division 09 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
7. Division 09 Section "Tiling" for sealing tile joints.
8. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

## 1.4 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

## 1.5 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

## 1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

B. Qualification Data: For Installer.

C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Warranties: Special warranties specified in this Section.

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
2. Each type of sealant and joint substrate indicated.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period for Urethane: Five years from date of Substantial Completion.
2. Warranty Period for Silicone: 20 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.
b. Pecora Corporation; 890 NST.
c. Tremco Incorporated; Spectrem 1.

B. Mildew Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Silicones; Sanitary SCS1700.
c. Tremco; Tremsil 200 Sanitary.

## 2.3 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation-Construction Systems; MasterSeal NP 2.
b. Pecora Corporation; Dynatrol II.
c. Sherwin Williams; Loxon 2K NS.
d. Tremco; Dymeric 240 FC.

B. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation-Construction Systems; MasterSeal SL 2.
b. Pecora Corporation; Dynatrol II-SG.
c. Sherwin Williams; Loxon 2K SL.
d. Tremco; THC-900.

## 2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. American Sealants, Inc.; ASI 174.
b. Pecora Corporation; AC-20+.
c. Sherwin Williams; 950A.
d. Tremco; Tremflex 834.

## 2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Products: Subject to compliance with requirements, provide one of the following:

a. Green Glue; Green Glue Noiseproofing Sealant.
b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
c. Sherwin Williams; 950A.
d. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

## 2.6 PREFORMED JOINT SEALANTS

A. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer; and complies with the following:

1. Basis of Design Product: Subject to compliance with requirements, provide **EMSEAL Joint Systems, Ltd.; Colorseal** or one of the following:

    a. MM Systems, Corp.; ColorJoint SIF Series.
    b. JointMaster/InPro Corporation; Foam Seal Series 1200.

2. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.

    a. Density: Manufacturer's standard.

3. Width: As indicated.
4. Colors: As selected by Architect from manufacturer’s full range for each adjacent material.

## 2.7 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

1. Apply a thin bead of sealant to the end of the silicone facing only.
2. Peel off release paper to expose mounting adhesive on one face of material. Feed material into joint, working sequentially in one direction starting at the bottom of the joint. Recess 3/8-inch from wall surface.
3. When material is fully expanded against both sides of the joint, install corner caulking bead where the sealant facing meets the substrate.

## 3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

## 3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints in unit masonry.
b. Joints in metal wall panels.
c. Perimeter joints between materials listed above and frames of doors, windows and louvers.
d. Control and expansion joints in ceilings and other overhead surfaces.
e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors, for each material.

B. Joint-Sealant Application: Exterior vertical nontraffic seismic joints.

1. Joint Locations:

a. Seismic and expansion joints in exterior joints as indicated.

2. Preformed Joint Sealant: Preformed foam sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range for each adjacent material.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Slab on grade penetrations.
c. Joints between slab on grade and foundation.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, pourable, traffic grade, Class 25.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors, for each material.

D. Joint-Sealant Application: Interior joints in vertical surfaces.

1. Joint Locations:

a. Joints between steel columns and all wall types.
b. Joints between steel stair stringers and all wall types at areas exposed to view, top and bottom surfaces.
c. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, nonsag, Class 50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

E. Joint-Sealant Application: Interior joints in all other vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.

e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
f. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Other joints as indicated.

2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
3. Joint-Sealant Color: White.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces at counters and backsplashes.

1. Joint Sealant Location:

a. Joints between counters and walls.
b. Joints between backsplashes and walls.
c. Joints between counters and backsplashes.
d. Other joints as indicated.

2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
3. Joint-Sealant Color: Clear.

H. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.
b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07 92 00

**SECTION 07 95 00 – EXPANSION CONTROL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Architectural joint systems for building interiors.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
3. Division 07 Section “Thermoplastic Membrane Roofing" for factory-fabricated roof joint systems.
4. Division 07 Section "Joint Sealants" for liquid-applied and preformed exterior joint sealants.

1.3 DEFINITIONS

A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.

D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.4 SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

B. Shop Drawings: Provide the following for each joint system specified:

1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

a. Manufacturer and model number for each joint system.
b. Joint system location cross-referenced to Drawings.
c. Nominal joint width.
d. Movement capability.
e. Classification as thermal or seismic.
f. Materials, colors, and finishes.
g. Product options.
h. Fire-resistance ratings.

C. Samples for Initial Selection: For each type of joint system indicated.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

D. Samples for Verification: For each type of architectural joint system indicated.

1. Full width by 6 inches long, for each system required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessibility Requirements: Comply with applicable provisions in 2010 ADA Standards and ICC/ANSI A117.1.

E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
2. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
3. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.

D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.

E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

## 2.2 ARCHITECTURAL JOINT SYSTEMS, GENERAL

A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.

B. Design architectural joint systems for the following size and movement characteristics:

1. Nominal Joint Width: As indicated on Drawings.
2. Maximum Joint Width: As scheduled.
3. Minimum Joint Width: As scheduled.
4. Movement Capability: As scheduled.
5. Type of Movement: Seismic.

## 2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified by **Construction Specialties, Inc**., or a comparable product by one of the following:

1. MM Systems Corporation.
2. Nystrom, Inc.

B. Floor-to-Floor Joint Systems:

1. Basis-of-Design Product: **Model ALR-200 W/FB.**
2. Type: Slide, center plate.

a. Exposed Metal: Aluminum.

1) Finish: Mill.

3. Cover-Plate Design: Plain.

4. Attachment Method: Mechanical anchors.
5. Load Capacity: Heavy duty.
6. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than 2 hours, where indicated.

C. Floor-to-Wall Joint Systems:

1. Basis-of-Design Product: **Model ALRW-200 W/FB.**
2. Type: Slide, center plate.

a. Exposed Metal: Aluminum.

1) Finish: Mill.

3. Cover-Plate Design: Plain.
4. Attachment Method: Mechanical anchors.
5. Load Capacity: Heavy duty.
6. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than 2 hours, where indicated.

D. Wall-to-Wall Joint Systems:

1. Basis-of-Design Product: **Model FWF-200M.**
2. Type: Elastomeric seal anchored to frames fixed to sides of joint gap.

a. Exposed Metal: Aluminum.

1) Finish: Class I, clear anodic.

3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than 2 hours, where indicated.

E. Wall Corner Joint Systems:

1. Basis-of-Design Product: **Model FWFC-200M**.
1. Type: Elastomeric seal anchored to frames fixed to sides of joint gap.

a. Exposed Metal: Aluminum.

1) Finish: Class I, clear anodic.

2. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than 2 hours, where indicated.

F. Ceiling-to-Wall (Acoustic Panel) Joint Systems:

1. Basis-of-Design Product: **Model FCFC-200**.
2. Type: Elastomeric seal anchored to frames fixed to sides of joint gap.

a. Exposed Metal: Aluminum.

1) Finish: High-performance organic.

a) Color: White.

b. Seal Material: PVC.

1) Color: White.

3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than 2 hours, where indicated.

## 2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.

C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Locate in continuous contact with adjacent surfaces.
5. Standard-Duty Systems: Shim to level where required. Support underside of frames continuously to prevent vertical deflection when in service.
6. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
7. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both sides of slabs before installing compression seals.

E. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 95 00

**SECTION 08 06 00 – OPENINGS SCHEDULE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Openings Schedule.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 08 06 00

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# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | OPENING NOTES | ADDENDUM NUMBER |
| DRAWING NO: | | | | *A1.01* | | | | | *LOWER LEVEL FLOOR PLAN - AREA "A"* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| A02 | A1.01 | ● | | 2' - 4" | | | 6' - 8" | 1 3/4" | RHR | | HM-1 | EX | EX | EX | | | 60 | SP | | ● | ● | | | ● | | | | *207* | ● | 066 | AC.207, E1, EXFR2 | |
| DRAWING NO: | | | | *A1.01* | | | | | *LOWER LEVEL FLOOR PLAN - AREA "A"* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| A002A | A1.01 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | HM-3 | HMF-1 | H-4 | J-4 | T-1 | | | | ● | ● | ● | | | ● | ● | | ● | *208* | ● | 031 | AC.208, E1, CL11, SW1 | |
| A002B | A1.01 | ● | | 3' - 0" | | | 6' - 8" | | CO | | CO | HMF-2 | H-2 | J-2 | | | | | | | | | | | | | | | | | NHR | CAOP | |
| A004 | A1.01 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | 90 | WD-3 | HMF-2 | H-3 | J-3 | | | | | | ● | | | | ● | | | | | | | 301 | DS4, SW1 | |
| A005 | A1.01 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR-ACT | 90 | WD-1 | EX | EX | EX | | | | SP | | ● | ● | | | ● | ● | | | | | | 432 | OALR, EXFR2, SW1 | |
| A006A | A1.01 | | ● | 4' - 0" | 4' - 0" | | 6' - 8" | 1 3/4" | RHR-ACT | 90 | HM-1 | HMF-3 | H-7 | J-6 | | AR | | | | ● | ● | | | ● | | ● | | | | | 451 | AR11, CL06, OARL, SW1 | |
| A006B | A1.01 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | 90 | HM-1 | EX | EX | EX | | | | | | ● | ● | | | ● | ● | ● | | | | | 441 | CL05, EXFR2, SW1 | |
| A007A | A1.01 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | 90 | HM-1 | EX | EX | EX | | | | | | ● | ● | | | ● | ● | ● | | | | | 422 | CL06, EXFR2, SW1 | |
| A007B | A1.01 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | | HM-1 | EX | EX | EX | | | | SP | | ● | ● | | | ● | ● | | | | | | 424 | EXFR2 | |
| DRAWING NO: | | | | *A1.02* | | | | | *MAIN LEVEL FLOOR PLAN - AREA "A"* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| A12A | A1.02 | ● | | 2' - 4" | | | 6' - 8" | 1 3/4" | RHR | 90 | HM-1 | EX | EX | EX | | | | | | ● | ● | | | ● | | | | | | | 425 | CL01, EXFR2, SW1 | |
| A12B | A1.02 | ● | | 2' - 4" | | | 6' - 8" | 1 3/4" | RHR | 90 | HM-1 | EX | EX | EX | | | | | | ● | ● | | | ● | | | | | | | 425 | CL01, EXFR2, SW1 | |
| DRAWING NO: | | | | *A1.02* | | | | | *MAIN LEVEL FLOOR PLAN - AREA "A"* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| A101A | A1.02 | | ● | 3' - 6" | 3' - 6" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS01 | ALH-14 | ALJ-5 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 001 | AC.298, E1, AL, CL11, SW1 | |
| A101B | A1.02 | | ● | 3' - 6" | 3' - 6" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS02 | ALH-2 | ALJ-8 | XX | | | | ● | ● | ● | | | ● | ● | | | *298* | ● | 010 | AC.298, E1, AL, CL11, SW1 | |
| A103 | A1.02 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 2" | RHR/LHR | 90 | AL-1 | AL | EX | EX | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 003 | AC.298, E1, AL, CL21, SW1 | |
| A104A | A1.02 | | ● | 3' - 6" | 3' - 6" | | 7' - 8" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-3 | J-3 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 081 | AC.298, E1, MH12 | |
| A106A | A1.02 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 1 3/4" | RHR/LHR | (*) | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | ● | ● | ● | | | ● | ● | | | | | 112 | AR11, SW1/SW3 (*) 90/180; | |
| A106B | A1.02 | | ● | 3' - 0" | 3' - 0" | | 6' - 10" | 2" | RHR/LHR | 90 | AL-1 | AS31 | ALH-19 | ALJ-7 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 009 | AC.298, E1, AL, CL11, SW1 | |
| A106C | A1.02 | | ● | 3' - 0" | 3' - 0" | | 6' - 10" | 2" | RHR/LHR | 90 | AL-1 | AS31 | ALH-19 | ALJ-7 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 009 | AC.298, E1, AL, CL11, SW1 | |
| A106D | A1.02 | ● | | 1' - 8" | | | 1' - 8" | | BLF | | BLF | HMF-13 | H-1 | J-1 | S-1 | | | | | | | | | | | | | | | | NHR | BLF | |
| A106E | A1.02 | ● | | 2' - 8" | | | 2' - 8" | | BLF | | BLF | HMF-14 | H-1 | J-1 | S-1 | | | | | | | | | | | | | | | | NHR | BLF | |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |
| A106F | A1.02 | ● | | 2' - 4" | | | 2' - 4" | | BLF | | BLF | HMF-15 | H-1 | J-1 | S-1 | | | | | | | | | | | | | | | | NHR | BLF |
| A106G | A1.02 | ● | | 2' - 4" | | | 2' - 4" | | BLF | | BLF | HMF-15 | H-1 | J-1 | S-1 | | | | | | | | | | | | | | | | NHR | BLF |
| A106H | A1.02 | ● | | 3' - 8" | | | 3' - 8" | | BLF | | BLF | HMF-16 | H-1 | J-1 | S-1 | | | | | | | | | | | | | | | | NHR | BLF |
| A107A | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 170 | WD-1 | HMF-1 | H-6 | J-6 | | AR | | | ● | ● | ● | | | ● | ● | | | | | 104 | AR11, SW4 |
| A107B | A1.02 | ● | | | | | | | OHD | | | | | | | | | | | | | | | | | | | | | | NHR | OHD |
| A108 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 180 | WD-5 | HMF-1 | H-6 | J-6 | | | | | | ● | ● | | | ● | ● | | | | | 404 | SW3 |
| A109 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 180 | WD-5 | HMF-1 | H-6 | J-6 | | | | | | ● | ● | | | ● | ● | | | | | 405 | CL06, SW3 |
| A110A | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-3 | HMF-2 | ??? | ??? | T-1 | | | | | ● | ● | | | ● | ● | | | | | 232 | CL06, SW1 |
| A110B | A1.02 | ● | | 3' - 8" | | | 7' - 0" | 1 3/4" | LHR | 180 | WD-3 | HMF-1 | H-6 | J-6 | | | | | | ● | ● | | | ● | ● | | | | | 211 | CL06, SW3 |
| A110C | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-1 | J-1 | | | | | | ● | ● | | | ● | ● | | | | | 302 | |
| A111 | A1.02 | ● | | 3' - 2" | | | 7' - 0" | 1 3/4" | RH | | WD-1 | HMF-1 | H-6 | J-6 | | | | SP | | ● | ● | | | ● | ● | | | | | 407 | |
| A112 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | HM-1 | HMF-1 | | | T-1 | | | | | ● | ● | | | ● | | | ● | | | 038 | E1, CL11, SW1 |
| A113 | A1.02 | ● | | 3' - 2" | | | 6' - 8" | 1 3/4" | LHR | 90 | HM-3 | HMF-2 | H-8 | J-8 | T-1 | | | | ● | ● | ● | ● | | ● | ● | | ● | *208* | ● | 032 | AC.208, E1, CL13, SW1 |
| A114 | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-1 | EX | EX | EX | | | | SP | | ● | ● | | | ● | ● | | | | | 423 | EXFR2 |
| A115 | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-1 | HMF-3 | H-7 | J-6 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 605 | AR11 |
| A116 | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-1 | HMF-3 | H-7 | J-6 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 606 | AR11, SW1 |
| A117A | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | 90 | WD-1 | EX | EX | EX | | | | | | ● | | | | ● | | | | *207* | ● | 064 | AC.207, E1, DS3, EXFR2, SW1 |
| A117B | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-3 | EX | EX | EX | | | | | | ● | | | | ● | | | | *207* | ● | 065 | AC.207, E1, EXFR2 |
| A119 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-1 | HMF-1 | H-1 | J-1 | | AR | | | | ● | ● | | | ● | ● | ● | | | | 442 | CL01, SW1 |
| A120 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-1 | HMF-1 | H-5 | J-5 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 603 | AR11 |
| A121A | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-1 | H-6 | J-6 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| A121B | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| A122A | A1.02 | ● | | 4' - 8" | | | 4' - 0" | | BLF | | BLF | HMF-6 | H-1 | J-1 | | | | | | | | | | | | | | | | NHR | BLF |
| A122B | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | 90 | WD-1 | HMF-4 | H-1 | J-1 | | AR | | | | ● | ● | | | ● | ● | | | *207* | ● | 063 | AC.207, E1, AR11, CL02, SW1 |
| A122C | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | ● | | | ● | ● | | | *400* | ● | 071 | AC.400, E1, AR11 |
| A124 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | *207* | ● | 062 | AC.207, E1, AR11 |
| A125 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ● NEW WORK<br>**EX** EXISTING TO REMAIN<br>**AR** ACOUSTICAL RATED<br>**SP** SMOKE / POSITIVE PRESSURE<br>**AC.XXX**<br>"XXX" SEE SECURITY DRAWINGS | ADDENDUM NUMBER |
| A126 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 401 | DS1, SW1 | |
| A127 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | | 603 | AR11 | |
| A128 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 180 | WD-1 | HMF-1 | H-6 | J-6 | | | | | | ● | ● | | | ● | ● | | | *207* | ● | 061 | AC.207, E1, SW3 | |
| A129A | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 304 | AR11, DS2, SW1 | |
| A129B | A1.02 | ● | | 2' - 3" | | | 3' - 10" | | BLF | | BLF | HMF-5 | H-3 | J-3 | S-2 | | | | | | | | | | | | | | | NHR | BLF | |
| A130 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | 90 | WD-3 | HMF-1 | H-6 | J-6 | | AR | | | | ● | ● | | | ● | ● | | | | | 212 | AR11, CL02, SW1 | |
| A131 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | 90 | WD-1 | HMF-2 | H-3 | J-3 | | AR | | | | ● | ● | | | ● | ● | | | | | 602 | AR11, CL02, SW1 | |
| A132 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 180 | WD-1 | HMF-1 | H-6 | J-6 | T-3 | | | | | ● | ● | | | ● | ● | | ● | | | | 406 | CL06, SW3 | |
| A133A | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | ● | | | ● | ● | | | *207* | ● | 069 | AC.207, E1, AR11, CL01, SW1 | |
| A133B | A1.02 | ● | | 3' - 0" | | | 3' - 10" | | BLF | | BLF | HMF-12 | H-1 | J-1 | | | | | | | | | | | | | | | | NHR | BLF | |
| A134 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | 90 | WD-3 | HMF-1 | H-6 | J-6 | | AR | | | | ● | ● | | | ● | ● | | | | | 212 | AR11, CL02, SW1 | |
| A135 | A1.02 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR-ACT | 180 | WD-1 | HMF-3 | H-7 | J-6 | T-3 | | | | | ● | ● | | | ● | | | | | | 452 | CL06, OALR, SW3 | |
| A136 | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | 90 | WD-1 | EX | EX | EX | T-3 | AR | | | | | ● | | ● | | ● | | ● | | | 702 | AR11, CL02, SW1 | |
| A137 | A1.02 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | 90 | WD-1 | EX | EX | EX | T-3 | AR | | | | | ● | | ● | | ● | | ● | | | 702 | AR11, CL02, SW1 | |
| A138 | A1.02 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-1 | HMF-2 | H-3 | J-3 | | | | | | ● | | | | ● | | | | | | 402 | | |
| DRAWING NO: | | *A1.03* | | | | | *MAIN LEVEL FLOOR PLAN - AREA "B" & "C"* | | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| B101A | A1.03 | | ● | 3' - 6" | 3' - 6" | | 7' - 8" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-3 | J-3 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 081 | AC.298, E1, MH12 | |
| B101B | A1.03 | | ● | 3' - 6" | 3' - 6" | | 7' - 8" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-3 | J-3 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 081 | AC.298, E1, MH12 | |
| B102A | A1.03 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR/LHR | | WD-3 | EX | EX | EX | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 083 | AC.298, E1, MH12 (SURF) | |
| B102B | A1.03 | | ● | 3' - 6" | 3' - 6" | | 7' - 8" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-3 | J-3 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 081 | AC.298, E1, MH12 | |
| B103A | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 2" | RHR | 90 | AL-1 | AS13 | ALH-5 | ALJ-5 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *207* | ● | 008 | AC.207, E1, AL, CL11, SW1 | |
| B103B | A1.03 | ● | | 12' - 0" | | | 8' - 0" | | | | | | | | | | | | | | | | | | | | | | | NHR | See Section # 102239.13 | |
| B104 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-5 | J-5 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 | |
| B105 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-5 | J-5 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 | |
| B106 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-5 | J-5 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 | |
| B107 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 | |

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |
| B108 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | |
| B109 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | |
| B110 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | |
| B112A | A1.03 | ● | | 3' - 8" | | | 7' - 0" | 2" | RHR | 90 | AL-1 | AS46 | ALH-5 | ALJ-5 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *208* | ● | 022 | AC.207, E1, AL, CL11, SW1 |
| B112B | A1.03 | ● | | 3' - 8" | | | 7' - 0" | 2" | RHR | | AL-1 | AS14 | ALH-2 | ALJ-2 | XX | | | | | | ● | | ● | | | | | | | 017 | AL, CL01, SW1 |
| B113 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 |
| B114 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 604 | AR11, CL01, SW1 |
| B115 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-5 | J-5 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| B117 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 |
| B118 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | | | | ● | | | ● | | | 501 | DS1, SW1 |
| B119 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 |
| B120 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | | | | ● | | | ● | | | 501 | DS1, SW1 |
| B121 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 |
| B122 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | | | | ● | | | ● | | | 501 | DS1, SW1 |
| B123 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 213 | AR11, SW1 |
| B124 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | | | | ● | | | ● | | | 501 | DS1, SW1 |
| C101A | A1.03 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS08 | ALH-8 | ALJ-8 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 005 | AC.298, E1, AL, CL11, SW1 |
| C101B | A1.03 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS08 | ALH-8 | ALJ-8 | XX | | | | | | ● | | ● | | | | | | | 019 | AL, CL01, SW1 |
| C103 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| C104 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 604 | AR11, CL01, SW1 |
| C105 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| C106 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | 90 | WD-1 | HMF-2 | H-3 | J-3 | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 502 | AR11, CL01, SW1 |
| C107 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| C108 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| C109 | A1.03 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | 90 | WD-1 | EX | EX | EX | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 503 | AR11, CL01, EXFR2, SW1 |
| C110 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |
| C111 | A1.03 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | 215 | AR11 |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |
| C112 | A1.03 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | 90 | WD-1 | EX | EX | EX | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 503 | |
| DRAWING NO: | | *A1.04* | | | *MAIN LEVEL FLOOR PLAN - AREA "D"* | | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| D101 | A1.04 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS17 | ALH-4 | ALJ-4 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 005 | |
| D102A | A1.04 | | ● | 3' - 4" | 3' - 4" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS15 | ALH-4 | ALJ-4 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *126* | ● | 006 | |
| D102B | A1.04 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | LHR/LHR | 110 | WD-1 | EX | EX | EX | | | 90 | SP | ● | ● | ● | ● | | ● | ● | | | | ● | 111 | |
| D102C | A1.04 | | ● | 3' - 4" | 3' - 4" | | 6' - 8" | 2" | RHR/LHR | 90 | AL-1 | AL | EX | EX | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 002 | |
| D103A | A1.04 | | ● | 3' - 2" | 3' - 2" | | 7' - 2" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-1 | J-1 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 082 | |
| D103B | A1.04 | | ● | 3' - 2" | 3' - 2" | | 7' - 2" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-1 | J-1 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 082 | |
| D104A | A1.04 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS22 | ALH-4 | ALJ-4 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *126* | ● | 007 | |
| D104B | A1.04 | | ● | 3' - 4" | 3' - 4" | | 6' - 8" | 2" | RHR/LHR | 90 | AL-1 | AL | EX | EX | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 002 | |
| D105 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 235 | |
| D106 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 235 | |
| D107 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-1 | HMF-10 | H-9 | J-1 | | AR | | | | ● | | | | ● | | | | | | 214 | |
| D108 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 235 | |
| D109 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 235 | |
| D110 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-1 | EX | EX | EX | T-3 | AR | | | | | ● | | ● | | ● | | ● | | | 703 | |
| D111 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-1 | EX | EX | EX | T-3 | AR | | | | ● | ● | | | ● | ● | | ● | | | 601 | |
| D112 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-1 | EX | EX | EX | | AR | | | | ● | ● | | | ● | | ● | | *207* | ● | 067 | |
| D113A | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | | WD-3 | EX | EX | EX | | AR | | | ● | ● | ● | | | ● | ● | | | | | 103 | |
| D113B | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-6 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 234 | |
| D113C | A1.04 | ● | | 3' - 5" | | | 3' - 4" | | BLF | | BLF | HMF-9 | H-8 | J-8 | S-4 | | | | | | | | | | | | | | | NHR | |
| D113D | A1.04 | ● | | 3' - 5" | | | 3' - 4" | | BLF | | BLF | HMF-9 | H-8 | J-8 | S-4 | | | | | | | | | | | | | | | NHR | |
| D114A | A1.04 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR/LHR | 90 | WD-6 | EX | EX | EX | | AR | | | ● | ● | ● | | | ● | ● | | | | | 101 | |
| D114B | A1.04 | ● | | 3' - 0" | | | 7' - 0" | 2" | LHR | 90 | AL-1 | AS40 | ALH-11 | ALJ-11 | ALS-11 | | | | ● | ● | ● | | | ● | | | ● | *207* | ● | 021 | |
| D115 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-1 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 311 | |
| D116 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-3 | EX | EX | EX | | | | | | ● | | | | ● | | | | | | 231 | |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |
| D117A | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 312 | |
| D117B | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | 90 | WD-1 | HMF-3 | H-7 | J-6 | | AR | | | | ● | | | | ● | | | | | | 303 | |
| D118 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 311 | |
| D119 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-3 | HMF-3 | H-7 | J-6 | | AR | | | | ● | | | | ● | | | | | | 214 | |
| D120A | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | *.ECTRI* | | 236 | |
| D120B | A1.04 | ● | | 3' - 0" | | | 2' - 8" | | BLF | | BLF | HMF-11 | H-7 | J-6 | | | | | | | | | | | | | | | | NHR | |
| D121 | A1.04 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-1 | EX | EX | EX | T-3 | AR | | | | | ● | | ● | | ● | | ● | | | 703 | |
| DRAWING NO: | | *A1.05* | | | | | *MAIN LEVEL FLOOR PLAN - AREA "E" & "F"* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| E101A | A1.05 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS24 | ALH-8 | ALJ-8 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 005 | AC.298, E1, AL, CL11, SW1 |
| E101B | A1.05 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS24 | ALH-8 | ALJ-8 | XX | | | | | | ● | | ● | | | | | | | 019 | AL, CL01, SW1 |
| E104 | A1.05 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR/LHR | | WD-3 | EX | EX | EX | | | 90 | SP | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 084 | AC.298, E1, EXFR2, MH12 (SURF) |
| E105 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| E106 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| E107 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| E108 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | 216 | AR11 |
| E109 | A1.05 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RHR | 90 | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 233 | AR11, DS2, SW1 |
| E110 | A1.05 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | 90 | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 233 | AR11, DS2, SW1 |
| E111 | A1.05 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | RH | | WD-1 | HMF-2 | H-9 | J-1 | | | | | | ● | ● | | | ● | ● | | | | | 201 | |
| E112 | A1.05 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR-ACT | 90 | WD-1 | EX | EX | EX | | | | | | ● | | | | ● | | | | | | 431 | DS1, EXFR2, OALR, SW1 |
| E113 | A1.05 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LH | | WD-3 | EX | EX | EX | | AR | | | | ● | | | | ● | | | | | | 234 | AR11 |
| E114 | A1.05 | ● | | 3' - 0" | | | 6' - 8" | 1 3/4" | LHR | 90 | WD-1 | EX | EX | EX | T-3 | | | | | ● | | | | ● | | | ● | | | 421 | DS1, EXFR2, SW1 |
| F101A | A1.05 | | ● | 3' - 1" | 3' - 1" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS27 | ALH-15 | ALJ-7 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *298* | ● | 004 | AC.298, E1, AL, CL11, SW1 |
| F101B | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 2" | RHR | 90 | AL-1 | AS27 | ALH-15 | ALJ-7 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *228* | ● | 023 | AC.228, E1, AL, CL11, SW1 |
| F101C | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 2" | RHR | 90 | AL-1 | AS27 | ALH-2 | ALJ-8 | | | | | | | ● | | ● | | | | | | | 015 | AL, CL11, SW1 |
| F101D | A1.05 | | ● | 3' - 1" | 3' - 1" | | 7' - 0" | 2" | RHR/LHR | 90 | AL-1 | AS27 | ALH-2 | ALJ-8 | | | | | | | ● | | ● | | | | | | | 018 | AL, CL01, SW1 |
| F102 | A1.05 | | ● | 3' - 6" | 3' - 6" | | 7' - 0" | 1 3/4" | RHR/LHR | | WD-3 | HMF-2 | H-3 | J-3 | | | | | ● | ● | ● | ● | | ● | ● | | | *298* | ● | 079 | AC.298, E1, MH12 |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |
| F104A | A1.05 | ● | | 3' - 8" | | | 7' - 0" | 2" | RHR | 90 | AL-1 | AS46 | ALH-5 | ALJ-5 | T-1 | | | | ● | ● | ● | | | ● | | | ● | *208* | ● | 022 | |
| F104B | A1.05 | ● | | 3' - 8" | | | 7' - 0" | 2" | RHR | | AL-1 | AS14 | ALH-2 | ALJ-2 | XX | | | | | | ● | | ● | | | | | | | | 016 | |
| F105 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 216 | |
| F106 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 216 | |
| F107 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-1 | HMF-1 | H-1 | J-1 | T-3 | | | | | ● | | | | ● | | | | ● | | | 403 | |
| F108 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-1 | HMF-1 | H-1 | J-1 | T-3 | | | | | | ● | | ● | | ● | | | ● | | | 701 | |
| F110 | A1.05 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 1 3/4" | RH-ACT | | WD-1 | HMF-1 | H-6 | J-6 | | | | SP | | ● | ● | | | ● | ● | | | | | | 411 | OAL, SW1 |
| F111 | A1.05 | ● | | 4' - 0" | | | 7' - 0" | | CO | | CO | HMF-1 | H-2 | J-2 | | | | | | | | | | | | | | | | | NHR | CAOP |
| F112 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LHR | | WD-1 | HMF-1 | H-1 | J-1 | T-3 | AR | | | | ● | ● | | | ● | ● | | | ● | | | 607 | AR11 |
| F113A | A1.05 | | ● | 3' - 0" | 3' - 0" | | 7' - 0" | 1 3/4" | RHR/LHR | 90 | HM-1 | HMF-1 | H-10 | J-10 | T-1 | | | | ● | ● | ● | | | ● | ● | | | ● | *126* | ● | 035 | AC.126, E1, CL11, SW1 |
| F113B | A1.05 | | ● | 3' - 0" | 3' - 0" | | 6' - 8" | 1 3/4" | RHR/LHR | 180 | WD-3 | EX | EX | EX | | AR | | | ● | ● | ● | | | ● | ● | | | | | | 102 | AR11, CL06, EXFR2, SW3 |
| F115 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-6 | J-6 | | AR | | | | ● | | | | ● | | | | | | | 305 | AR11 |
| F116 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-6 | J-6 | | AR | | | | ● | | | | ● | | | | | | | 305 | AR11 |
| F117 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-1 | HMF-1 | H-1 | J-1 | T-3 | | | | | | ● | | ● | | ● | | | ● | | | 701 | |
| F118 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-1 | HMF-1 | H-1 | J-1 | | | | | | ● | ● | | | ● | ● | ● | | | *207* | ● | 068 | AC.207, E1, |
| F119 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 216 | AR11 |
| F120 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RHR | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 216 | AR11 |
| F121 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | 90 | WD-6 | HMF-7 | H-3 | J-3 | | AR | | | | ● | ● | | | ● | ● | | | | | | 212 | AR11, CL02, SW1 |
| F122 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | | 215 | AR11 |
| F123 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | RH | | WD-3 | HMF-1 | H-1 | J-1 | | AR | | | | ● | | | | ● | | | | | | | 215 | AR11 |
| F124 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | | WD-3 | HMF-2 | H-3 | J-3 | | AR | | | | ● | | | | ● | | | | | | | 215 | AR11 |
| F125 | A1.05 | ● | | 3' - 0" | | | 7' - 0" | 1 3/4" | LH | 90 | WD-6 | HMF-7A | H-3 | J-3 | | AR | | | | ● | ● | | | ● | ● | | | | | | 212 | AR11, CL02, SW1 |
| DRAWING NO: | | *A1.06* | | | | | *UPPER LEVEL FLOOR PLAN - AREA A* | | | | | | | | | | | | | | | | | | | | | | | | | OPENING NOTES | |
| A201 | A1.06 | ● | | 2' - 6" | | | 2' - 10.5" | 1 3/4" | RHR | 90 | HM-1 | EX | EX | EX | | | | | | ● | | | | ● | | ● | | | ● | 039 | AC.101, E1, CL13, EXFR2, SW1 |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ● NEW WORK<br>**EX** EXISTING TO REMAIN<br>**AR** ACOUSTICAL RATED<br>**SP** SMOKE / POSITIVE PRESSURE<br>**AC.XXX**<br>"XXX" SEE SECURITY DRAWINGS | ADDENDUM NUMBER |

## SCHEDULE GENERAL NOTES

. CONSTRUCTION MANAGER / GENERAL CONTRACTOR:

"NO EXCEPTIONS"

ALL DOOR HARDWARE MUST BE FURNISHED BY SECTION 087100 DOOR HARDWARE SUPPLIER.
"CONTRACTS, Including Door Hardware, ISSUED TO ALUMINUM DOOR SUPPLIER" must stipulate aluminum door hardware must be purchased from SECTION 087100 HARDWARE SUPPLIER.

"NO EXCEPTIONS"

---
CONSTRUCTION MANAGER / GENERAL CONTRACTOR / HARDWARE SUPPLER:
Shall coordinate an inspection, with all manufacturer's representatives to confirm that all hardware has been installed and adjusted properly;
See "Specification Section - 08 71 00 - 3.2 - INSTALLATION
---
HARDWARE SUPPLIER:
Must employ an experienced Architectural Hardware Consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

CONFLICTS between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to the ARCHITECT.

HARDWARE SUPPLIER must schedule a pre - installation meeting to instruct installers on proper installation and adjustment of the Locks, Exit Devices, and Closers. A manufacturers' representative of each major hardware category shall be present to complete the instructions, and then certify to the Architect that the door hardware installer has been trained in the proper installation procedures and is certified to install the finish hardware.

DOOR HARDWARE INSTALLATION: All door hardware shall be installed according to manufactures' instructions.
This includes following the template required to complete the intended operation of the door hardware, and all fastener holes required shall be drilled and tapped to the correct size as detailed in the template.
Template Hardware Installation so that Door will be able to swing a Minimum of 90 degrees. Doors swinging less than 90 Degrees will be reinstalled to meet ADA requirements.

All "DOOR HARDWARE FASTENERS" used during installation must be original hardware manufacturer's supplied fasteners.
The use of drywall screws or non "OEM" self tapping screws will be rejected, reinstallation of hardware will be required.
Fastener holes in doors and frames from the use of improper hardware fasteners will not be acceptable,
doors and frames will be replaced at no cost to the owner.

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

HARDWARE SUPPLIER shall confirm specified LOCK FUNCTIONS with the OWNER at the KEYING MEETING.
---
CONTINUOUS HINGES on ALUMINUM DOORS
Verify with Aluminum Door Supplier Hinge Model Selections for compatibility with Aluminum Head and Jamb Profiles.

All "LOCKS" shall be of the same Manufacturer.
All "EXIT DEVICES" shall be of the same Manufacturer.
All "DOOR CLOSERS" shall be of the same Manufacturer unless specified as no substitution.
(Provide All Necessary Hardware To Complete Installation of Closers on Aluminum and Hollow Metal Frames)

All Aluminum Sills to be continuous, exterior Sills set in Sealant Typical.

Exterior HM Frames and Doors shall be Galvanized and Insulated.

Provide Blocking in walls for all Door Hardware (i.e., but not limited to: Door Closers, Wall & Overhead Stops)

Provide Blocking for Door Closers in Wood Doors ( USE THRU BOLTS WHEN INSTALLING DOOR CLOSERS )

DOOR PROTECTION PLATES:
"MOP PLATES" Install on PULL SIDE od Door.
"KICKPLATES" Install on "PUSH SIDE" of Door.
"ARMOR PLATES" Install on "PUSH SIDE" of Door.

TACTILE WARNING: See Door Schedule.
---
HARDWARE / ELECTRICAL / SECURITY

CONDUIT & WIRING:

1. Install all conduits where required for electrified door hardware prior to applying in Grouting Solid or Spray Foam Solid in Door Frame.
2. All Conduits required for Power and Control Wiring, and Power Wiring, to be furnished and installed by Electrical Contractor.
3. All Low Voltage Access Control Wiring and Terminations are furnished and installed by the Access Control Contractor.
4. Controls and Control Wiring (provide 16 ga. Wire unless noted otherwise) of Electrified Devices, Transfer Hinges, and Power Supplies to be provided by Security Contractor.

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ● NEW WORK<br>**EX** EXISTING TO REMAIN<br>**AR** ACOUSTICAL RATED<br>**SP** SMOKE / POSITIVE PRESSURE<br>**AC.XXX**<br>"XXX" SEE SECURITY DRAWINGS | ADDENDUM NUMBER |

DOOR & FRAMES:

1. Door Frame Supplier must coordinate Door Contact Frame Prep with Security Contractor.
2. Door and Frame Suppliers must prep doors and frames to accommodate all electrified hardware, including all required conduits in doors and frames, when prepping doors and frames for door hardware.

HARDWARE:

1. All door hardware QC Connectors must be capable with all the electrified hardware.
2. Hardware supplier must provide, Wiring Diagrams - Elevation and Riser & Point to Point, to Electrical Contractor.
3. Electromagnetic Door Release (Magnetic Door Holders) to be furnished by Section 08 71 00 and Installed by Electrical Contractor.

ACCESS CONTROL READERS:

1. “READERS" by Access Control / Security Contractor.

## OPENING NOTES

\- GENERAL DOOR NOTES:
"A" All Doors Exiting 50 or More Persons shall have Panic Hardware.
"B" All Door Hardware shall be Accessible to Persons with Disabilities. Hardware shall comply with ADA Standards.
"C" Closers shall open a minimum of 175 Degrees, where 180 Deg swing is shown as such on Floor Plans.
"D" Where (*) occurs in the "HEAD", "JAMB", or "SILL" detail column, refer to the "OPENING NOTES" for "DETAILS" .
"E" Provide UL Rated KICK / ARMOR PLATES where detailed on UL Rated Openings.
"F" Refer to Mechanical Series Drawing for all "Door Undercuts"

AC ACCESS CONTROLLED OPENINGS: Opening hardware will include some form of electrical access control.
"AC" by "READER"

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | | |

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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● NEW WORK
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**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

CL05 Provide Regular Arm Closer with Hold Open Arm.

CL06 Provide Par Arm Closer with Hold Open Arm.

CL11 Provide Par Arm Closer with Integral HD Integral Cush Stop Arm.

CL13 Provide Par Arm Closer with Integral HD Integral Cush Stop and Hold Open Arm.

CL21 Provide Track Arm Closer (Pull Side Install)

DS1 Provide Overhead Positive Stop, install "PUSH SIDE".

DS2 Provide Overhead Positive Stop and Hold Open, install "PUSH SIDE".

DS3 Provide Overhead Positive Stop, install "PULL SIDE".

DS4 Provide Overhead Positive Stop and Hold Open, install "PULL SIDE".

E1 "E1" DOOR CONTACTS - Door Position Contacts to be furnished and installer by Security Contractor.
Door(s) and Frame(s) to have factory preparations for Door Contact(s), coordinate with Door Position Contacts Supplied.

# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

**AC.XXX**
"XXX" SEE SECURITY DRAWINGS

EXFR2 "EXISTING FRAMES, NEW DOORS & HARDWARE" - All openings scheduled to receive a new door, prior to fabrication, must be verified in field, along with
"General Contractor" / "Construction Manager", by the Door & Frame Suppliers for correct size and hardware compatibility.
Where Existing Door Hardware has been removed, All holes from previously used fasteners must be welded close and finished to accept new Door Hardware.
Field check to be noted on shop drawing submittal.
All conflicts shall be brought to the Architect for their clarification and direction prior to proceeding with fabrication of new Doors.
It is the responsibility of the "General Contractor" / "Construction Manager" to insure that all new hardware will work with any and all existing conditions,
including retrofitting and reinforcing Existing Frames as required to accept all new hardware.
Hardware supplier will furnish all necessary strike and hinge filler plates where required to complete a finished look of door frame.
If Opening is called out on the Door Schedule as U.L. Rated, Field verify the Opening meets all requirements of a Rated Opening. (U.L. Labels on Frames ).

Where new butt hinges are specified, remove existing hinges and reinstall new.

** At locations where existing frames are being reused, frames must be drilled and tapped at locations where hardware is applied to the frames. SELF TAPPING SCREWS ARE NOT ACCEPTABLE. If additional screw reinforcement is necessary, the installer is to provide fasteners similar to Rivet nuts or Jack nuts at those locations. **

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# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |

● NEW WORK
**EX** EXISTING TO REMAIN
**AR** ACOUSTICAL RATED
**SP** SMOKE / POSITIVE PRESSURE

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"XXX" SEE SECURITY DRAWINGS

EXFR2.1 "EXISTING FRAMES, NEW DOORS & HARDWARE" - All openings scheduled to receive a new door, prior to fabrication, must be verified in field, along with
"General Contractor" / "Construction Manager", by the Door & Frame Suppliers for correct size and hardware compatibility.
Where Existing Door Hardware has been removed, All holes from previously used fasteners must be welded close and finished to accept new Door Hardware.
Field check to be noted on shop drawing submittal.
All conflicts shall be brought to the Architect for their clarification and direction prior to proceeding with fabrication of new Doors.
It is the responsibility of the "General Contractor" / "Construction Manager" to insure that all new hardware will work with any and all existing conditions,
including retrofitting and reinforcing Existing Frames as required to accept all new hardware.
Hardware supplier will furnish all necessary strike and hinge filler plates where required to complete a finished look of door frame.
If Opening is called out on the Door Schedule as U.L. Rated, Field verify the Opening meets all requirements of a Rated Opening. (U.L. Labels on Frames ).

Where new butt hinges are specified, remove existing hinges and reinstall new.

Remove Existing Electric Strike, Modify Frame as required to Install New Strike Plate.

** At locations where existing frames are being reused, frames must be drilled and tapped at locations where hardware is applied to the frames. SELF TAPPING SCREWS ARE NOT ACCEPTABLE. If additional screw reinforcement is necessary, the installer is to provide fasteners similar to Rivet nuts or Jack nuts at those locations. **

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LAED LOCAL ALARM - EXIT DEVICE: Panic Release Hardware with battery Operated Key Controlled "LOCAL ALARM".

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MH12 "MH12" (2 Ea.) Wall Mounted Wall Mounted Electromagnetic Door Release shall release doors upon receiving signal from "FIRE ALARM SYSTEM" or "LOCKDOWN ALARM".
EMDR to be furnished by Section 08 71 00
EMDR installed by Electrical Contractor under the direction of the Door Hardware Supplier.
POWER SUPPLY: "110/120 VAC - 0.020 amp Power furnished by Electrical Division

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OAL "OAL" OVERLAPPING ASTRAGAL Install on Push Side "LH" Inactive Leaf

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OALR "OALR" OVERLAPPING ASTRAGAL Install on Push Side "LHR" Inactive Leaf

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# OPENINGS SCHEDULE

| DOOR | | | | | | | | | | | | FRAME | | | | | FIRE RATING | | FIRE CODE | | | | | | ACCESSIBILITY REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPENING ID | DRAWING NUMBER | SINGLE DOOR LEAF | DOUBLE DOOR LEAF | ACTIVE LEAF | ACTIVE LEAF (PRH & PP Hardware) | IN - ACTIVE LEAF | HEIGHT | THICKNESS | HANDING | DEGREE OF SWING REQUIRED | DOOR MATERAIL | FRAME MATERAIL | HEAD DETAIL | JAMB DETAIL | SILL / THRESHOLD DETAIL | SOUND DOOR AND GASKETING | U. L. RATING (IN MINUTES) | GASKETS AND SMOKE SEALS | PANIC RELEASE HARDWARE | POSITIVE LATCHING | AUTOMATIC CLOSING | ELECT. MAG. DOOR RELEASE | PUSH / PULL (Interior Oenpings) | "U" HANDLE / LEVER HANDLE | MOP, KICK, & ARMOR PLATES | TACTILE WARNING | ACCESSIBLE THRESHOLD | "XXX" SECURITY DWGS DETAIL NUMBER | ELECTRICAL / SECURITY | HARDWARE SET NO. | ADDENDUM NUMBER |

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"XXX" SEE SECURITY DRAWINGS

OHD OVERHEAD DOOR: No Hardware Required:

SW1 "SW1" DEGREE SWING (90) - Template Hardware (Door Closers / Overhead Stops) Installation to Specified Degree of Swing (90), See Door Schedule.

SW2 "SW2" DEGREE SWING (110 - 120) - Template Hardware (Door Closers / Overhead Stops) Installation to Specified Degree of Swing (110 - 120), See Door Schedule.

SW3 "SW3" DEGREE SWING (180) - Door must be able to swing 180 degrees. Template Hardware installation for 180 Degree swing operation. (175 Degrees where limited by field conditions or hardware specified)

SW4 "SW4" DEGREE SWING (170-180) - Door must be able to min. swing 170 degrees. Template Hardware installation for 180 Degree swing operation. (170 Degrees where limited by field conditions or hardware specified)

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# SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 04 Section "Unit Masonry" for building anchors into and grouting hollow metal frames in masonry construction.
3. Division 08 Section “Flush Wood Doors.”
4. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
5. Division 08 Section "Glazing" for glazed lites in hollow metal doors and frames.
6. Division 09 Section “Painting” for field painting hollow metal doors and frames.
7. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

### 1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

### 1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

### 1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Construction Manager, Architect, electrical contractor, security systems supplier, and hardware installers whose work interfaces with or affects hollow metal doors and frames.
2. Review requirements for type of cut-out and back-box as part of the door and frame assembly.
3. Document proceedings, including receipt of samples and approved shop drawings of security contact devices which accurately represent the installation of the device, back-box, and conduit terminations required.
4. Distribute an installation book, including all manuals and instructions.

## 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide products by **Curries Company; ASSA ABLOY** or comparable products by one of the following:

1. Ceco Door; ASSA ABLOY.
2. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

**1. Basis of Design Product: Curries; 707 Series.**
2. Physical Performance: Level B according to SDI A250.4.
3. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (18 gauge).

1) Provide 16 gauge face sheets for doors over 3'-0" wide.

d. Edge Construction: Model 2, Seamless, tack weld, grind smooth, fill and touch-up paint.
e. Core: Vertical steel stiffener with fiberglass insulation.
f. Fire Rated Core: Mineral fiber.

4. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 16 gauge for openings up to and including 4'-0" wide; 14 gauge for openings over 4'-0" wide.
b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Face welded.

5. Exposed Finish: Prime.

## 2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

**1. Basis of Design Product: Curries; 747 Series.**
2. Physical Performance: Level A according to SDI A250.4.
3. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge), with minimum A60 coating.
d. Edge Construction: Model 2, Seamless, continuous weld, grind smooth, fill and touch-up paint.
e. Core: Polyurethane.

1) Thermal-Rated Doors: Provide doors fabricated with an average U-factor of not more than 0.37 Btu/sq. ft. x h x deg F (R-value of 2.7 minimum) when tested according to ASTM C 1363 for operable door assembly.

4. Frames: Provide maximum-duty frames for exterior frames.

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 gauge), with minimum A60 coating.
b. Construction: Continuous face welded, dressed and ground smooth.

5. Exposed Finish: Prime.

## 2.5 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch (16 gauge).

B. Construction: Face welded.

## 2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## 2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with minimum A60 metallic coating.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M. Comply with Division 04 Section “Unit Masonry.”

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with Division 08 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.

    c. Compression Type: Not less than two anchors in each frame.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

F. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with manufacturer's standard gauges and sizes, but not less than the following minimum sizes.

1. Hinges: Minimum 10 gauge by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Lock Face, Flush and Surface Bolts, Closers, and Concealed Holders: Minimum 14 gauge.
3. Pull Plates and Bar: Minimum 16 gauge.

G. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## 2.10 ACCESSORIES

A. Mullions: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
e. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80, and the following:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of noncombustible Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of noncombustible Finish Floor (No Threshold): Maximum 3/4 inch.
e. Between Bottom of Door and all other Finish Floor Coverings: Maximum 1/2 inch.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Division 09 Section “Painting.”

END OF SECTION 08 11 13

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**SECTION 08 14 16 - FLUSH WOOD DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Acoustical solid-core doors with wood-veneer faces.
3. Factory finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 08 Section “Hollow Metal Doors and Frames” for hollow metal door frames for flush wood doors.
3. Division 08 Section “Glazing” for glazed frames in flush wood doors.
4. Division 08 Section “Door Hardware.”
5. Division 26 Electrical Sections.
6. Division 28 Security Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

2. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
3. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Provide a schedule of wood doors using same reference numbers for details, openings, and door types as those indicated in the Door Schedule.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate location of security door contacts; coordinate with security systems requirements.
5. Indicate fire-protection ratings for fire-rated doors.
6. Indicate factory finish requirements.

D. Samples for Initial Selection: For factory-finished doors.

E. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

    a. Provide samples for each species of veneer and solid lumber required.
    b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

## 1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

## 1.5 QUALITY ASSURANCE

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Meet with Construction Manager, Architect, electrical contractor, security systems supplier, and installers whose work interfaces with or affects flush wood doors.
2. Review requirements for type of cut-out and back-box as part of the wood door and frame assembly.
3. Document proceedings, including receipt of samples and approved shop drawings of security contact devices which accurately represent the installation of the device, back-box, and conduit terminations required.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

## 1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products by one of the following:

1. Masonite Architectural.
2. Oshkosh Architectural Door Company.
3. VT Industries Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI "Architectural Woodwork Standards.

1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site.

C. Certified Wood: Flush wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.

F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

G. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide all wood blocking in particleboard-core doors as needed to allow secure application of all hardware.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: White maple.
3. Cut: Plain sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core: Particleboard.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
9. Stiles: 1-3/8- inch laminated strand lumber (LSL) with veneer band to match veneer face.
10. Crossbands: Engineered fiber.
11. Top and bottom rails: 1-1/8- inch LSL or hardwood.
12. Doors with glazed opening cutouts that exceed more than 40% of the door area shall have structural composite lumber cores (AWI SLC core) to maintain the Life Time Warranty.

B. Acoustical Doors (**Type AR**): ASTM E 90 and ASTM E 413.

1. Core: Manufacturer’s standard sound retardant core with acoustic pan.
2. Stiles and rails: Manufacturer’s standard for acoustical door.
3. STC Rating: 40 minimum.

C. Fire-Protection-Rated Doors: Provide manufacturer’s standard mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

D. Blocking: Provide blocking in all doors to allow for secure application of all hardware.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At 20-minute, fire-rated, wood-core doors, provide wood mouldings and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with powder-coated finish; and approved for use in doors of fire-protection rating indicated.

1. Color: Manufacturer's standard bronze.
2. Cutting of fire rated doors in field is not permitted.

C. All cutouts for glazed openings in all wood doors must be a minimum of 6 inches from the edge of the door and/or other cutouts for locks, closers or other hardware.

## 2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Furnished and installed by Division 08 Section "Glazing."

D. Drill all pilot holes for butt hinges and lock fronts at the factory.

E. Prepare doors to receive security systems hardware in accordance with final security systems shop drawings and templates provide by security systems supplier.

1. Include an integral ½-inch diameter wire tube in doors to receive electrified locksets, exit devices, mortised electrical locksets, or electric strikes in the inactive leaf of pairs of doors to accommodate wiring associated with the power transfer hinges, knuckles, and electrified hardware within the door.

## 2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer’s full range.
4. Effect: Open grain finish.
5. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Hardware: For installation, comply with requirements in Division 06 Section “Miscellaneous Rough Carpentry” and Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80 and UL 10C.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

F. Light openings.

1. Install wood-veneered beads for light openings in flush wood doors using 16 gauge finish nails spaced at 3-inch from end of each molding and at 6-inch spacing. Fill all nail holes with wood putty to match molding.

## 3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

**SECTION 08 31 13 – ACCESS DOORS AND FRAMES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
3. Division 09 Section “Painting” for field finishing factory-primed access doors and frames.
4. Division 23 Section for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

E. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

## 1.4 QUALITY ASSURANCE

A. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

## 1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.
2. ASTM E 119 or UL 263 for horizontal access doors and frames.

## 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Source Limitations: Obtain access doors and frames through one source from a single manufacturer.

B. Basis of Design Product: Subject to compliance with requirements, provide product indicated, or comparable product by one of the following:

1. J. L. Industries, Inc.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Company.
4. Milcor Inc.
5. Nystrom, Inc.

C. Flush Access Doors with Exposed Flanges:

**1. Basis-of-Design Product: Babcock Davis; Model BNT.**
2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall and ceiling, gypsum board and masonry walls.
4. Uncoated Steel Sheet for Door: Nominal 14 gage.

    a. Finish: Factory prime.

5. Frame Material: Nominal 16 gauge, factory prime.
6. Hinges: concealed pivoting rod hinge.
7. Hardware: Mortise cylinder preparation.
8. Door Size: 12x12, unless otherwise noted on Drawings.

D. Flush Access Doors with Exposed Flanges:

**1. Basis-of-Design Product: Babcock Davis; Model BNT.**
2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall, gypsum board and masonry walls with ceramic tile finish.
4. Stainless-Steel Sheet for Door: Nominal 14 gage.

    a. Finish: No. 4.

5. Frame Material: Nominal 16 gauge, stainless steel.
6. Hinges: concealed pivoting rod hinge.
7. Hardware: Mortise cylinder preparation.
8. Door Size: 12x12, unless otherwise noted on Drawings.

E. Fire-Rated, Flush Access Doors with Exposed Flanges:

**1. Basis-of-Design Product: Babcock Davis; BU-Series Model BUT.**
2. Assembly Description: Fabricate door to fit flush to frame, uninsulated. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall and ceiling, gypsum board.
4. Fire-Resistance Rating: Not less than 1 hour.
5. Uncoated Steel Sheet for Door: Nominal 14 gage.

    a. Finish: Factory prime.

6. Frame Material: Nominal 16 gauge, factory prime.
7. Hinges: concealed pivoting rod hinge.
8. Hardware: Mortise cylinder preparation.
9. Door Size: 12x12, unless otherwise noted on Drawings.

F. Hardware:

1. Lock: Mortise cylinder.

a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware."

## 2.3 MATERIALS

A. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

## 2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: As indicated.
2. Provide mounting holes in frames for attachment of units to metal framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

## 2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

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# SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Interior and exterior storefront framing.
2. Interior and exterior manual-swing entrance doors and door-frame units.
3. Composite insulated metal panels.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
3. Division 08 Section “Aluminum Windows” for operable windows installed in storefront systems.
4. Division 08 Section "Door Hardware" for hardware to the extent not specified in this Section.
5. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Glazing-to-glazing contact.
e. Noise or vibration created by wind and by thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.
h. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Connecticut, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: Provide entrance systems capable of withstanding wind-load design pressures calculated using a “design wind pressure” as determined from the Connecticut State Building Code, and as determined by the Fabricator’s design engineer.

a. Risk Category: III.
b. Ultimate Design Wind Speed: 135 mph.
c. Exposure Category: B.

2. Seismic Loads: Provide entrance systems capable of withstanding the effects of earthquake motions calculated according to the Connecticut State Building Code, as determined by the Fabricator’s design engineer.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.

J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.38 Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.

K. Thermal Conductance: Provide aluminum-framed entrance doors with fixed glazing having an average U-factor of not more than 0.77 Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

a. With the exception of weatherstripping, hardware is furnished under Division 08 Section "Door Hardware."
b. Indicate coordination of security door contacts with security system requirements.

1) Do not prepare doors and frames without an approved security systems shop drawing and sample of the Contract.

D. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

E. Samples for Initial Selection: For units with factory-applied color finishes.

F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

## 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

C. Welding certificates.

D. Preconstruction Test Reports: For sealant.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

F. Source quality-control reports.

G. Warranties: Sample of special warranties.

## 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessible Entrances: Comply with applicable provisions in ICC/ANSI A117.1 and 2010 ADA Standards**.**

E. Source Limitations for Aluminum-Framed Systems: Obtain aluminum-framed entrance and storefront systems and aluminum windows from a single source from a single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as directed by the Construction Manager.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Recycled Content of Metal Products: Postconsumer recycled content not less than 25 percent.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

C. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

### 2.2 FRAMING SYSTEMS, GENERAL

A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads to install hardware only, finished to match framing system.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

F. Provide UL listed electrical back boxes of suitable size to allow termination of 1/2-inch EMT or 3/4-inch flexible metallic conduit at the following locations:

1. Openings to receive security system devices.
2. Openings to receive electrified locksets.
3. Openings to receive electrified power transfer hinges.

## 2.3 EXTERIOR FRAMING SYSTEM

A. Basis of Design Product: Subject to compliance with requirements, provide **EFCO; Series 433T** or one of the following:

1. Kawneer; Trifab VG 451T.
2. Wausau Window and Wall Systems; 14000 Series.

B. Framing Members: Manufacturer's standard extruded-aluminum framing members, minimum wall thickness of .080”, and reinforced as required to support imposed loads.

1. Construction: Thermally improved.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Depth of Frame: Not less than 4-1/2”.
5. Face of Frame: Not less than 2”.

## 2.4 GLAZING SYSTEMS

A. Glazing Types: As indicated on Drawings and as specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

## 2.5 EXTERIOR ENTRANCE DOOR SYSTEMS

A. General: Provide exterior entrance door systems at all exterior doors and interior vestibule doors.

B. Basis of Design Product: Subject to compliance with requirements, provide **EFCO; D518 Heavy Duty Entrance Door** or one of the following

1. Kawneer; 500 Heavy Duty Entrance Door.
2. Wausau Window and Wall Systems; Monumental Doors.

C. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch nominal width.

    a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

4. Door Frames: Provide **EFCO Series 402** framing at all exterior doors.

## 2.6 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: For hardware other than that furnished by this Section, as specified in Division 08 Section "Door Hardware" and in the hardware sets included in the Door and Hardware Schedule.

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

D. Silencers: BHMA A156.16, Grade 1.

## 2.7 ACCESSORIES

A. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

## 2.8 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, furnished and installed by Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

## 2.9 COMPOSITE INSULATED METAL PANELS

A. Composite Insulated Metal Panels: Prefinished ASTM B209 aluminum sheets over a corrugated polyallomer (CPA) stabilizers on both faces with an insulating foam core.

1. Basis of Design Product: Subject to compliance with requirements, provide **Mapes; MapeShape** or comparable product by one of the following:

    a. Citadel Architectural Products, Inc.
    b. Laminators, Inc.; Thermolite.

2. Overall Panel Thickness: 2 inches, or thickness required to be flush with exterior face of door stile / rail.
3. Interior and Exterior Substrate: Corelite (HDPE).
4. Interior and Exterior Skin: Aluminum.

    a. Thickness: 0.021 inch.
    b. Finish: Matching framing system.
    c. Texture: Smooth.

5. Thermal Insulation Core: Manufacturer's standard polystyrene core.

    a. U-Value: 0.11 or 0.24 maximum.

6. Surface-Burning Characteristics: Class A when tested according to ASTM E 84 as follows:

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

7. Color: Custom to match aluminum framing finish.

## 2.10 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using screw-spline system.

1. Mullions: Provide mullions and cover plates as shown, matching curtainwall units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of curtainwall units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of curtainwall units.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. Prepare doors and frames to receive security systems hardware in accordance with final security systems shop drawings and templates provided by security systems hardware supplier.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.11 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: As selected by Architect from manufacturer’s full range.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

## 3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Furnish and install glazing as specified in Division 08 Section "Glazing."

G. Furnish and install horizontal sliding windows as specified in Division 08 Section “Aluminum Windows.”

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

I. Installation of perimeter joint sealants by Division 07 Section "Joint Sealants", to produce weathertight installation.

## 3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

## 3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors indicated to be accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

B. Clean aluminum surfaces immediately after installing aluminum-framed systems. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean glass immediately after installation. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect aluminum framed surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact surfaces, remove contaminants immediately according to manufacturer's written recommendations.

## 3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of installed storefronts shall take place as follows:

1. Testing Methodology: Testing of storefronts for water resistance shall be performed according to AAMA 503, 2/3 of the tested or rated laboratory performance.
2. Testing Extent: Test storefront as selected by the Commissioning agent, Architect, Contractor, and a qualified independent testing and inspecting agency. Curtain walls shall be tested immediately after complete installation.

    a. Water test three (3) units representing different sizes/types prior to installation of 10 percent of each size/type. Perform corrective action and retesting until specified levels of performance are achieved.
    b. Test three (3) additional, randomly selected units of the same size/type originally tested, between installation of 25 and 50 percent of each size/type.

3. Test Reports: Shall be prepared according to AAMA 503.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 08 41 13

# SECTION 08 45 23 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories, factory unitized, as shown and specified. Work includes furnishing and installing the following:

1. Factory prefabricated structural insulated translucent sandwich panels.
2. Aluminum installation system.
3. Aluminum sill flashing.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal flashings installed at perimeters of assemblies.
3. Division 07 Section "Joint Sealants" for sealants installed at perimeters of assemblies.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design fiberglass-sandwich-panel assemblies.

B. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure.
4. Dimensional tolerances of building frame and other adjacent construction.

C. Failure includes the following:

1. Deflection exceeding specified limits.
2. Water leakage.
3. Thermal stresses transferred to building structure.
4. Noise or vibration created by wind and thermal and structural movements.
5. Loosening or weakening of fasteners, attachments, and other components.
6. Delamination of fiberglass-sandwich-panel faces from panel cores.

D. Structural Loads:

1. Design Loads: In accordance with the Connecticut State Building Code and minimum design wind loads for components and cladding indicated on Structural Drawings.
2. Design fiberglass sandwich panel assemblies to accommodate lateral building drift and differential foundation settlement as indicated on Structural Drawings.
3. Seismic Loads: In accordance with the requirements of the Connecticut State Building Code.
4. Load Combinations: Calculate according to the Connecticut State Building Code.

E. Structural-Performance Test: ASTM E 330.

1. Performance at Design Load: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. Performance at Maximum Test Load: When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main supporting members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

F. Test for Water Penetration under Static Pressure: ASTM E 331.

1. Minimum Static-Air-Pressure Difference: 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
2. Water Leakage: None.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

H. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:

1. Thermal Transmittance (U-Factor) for Walls: Fixed glazing and framing areas shall have U-factor of not more than **0.23** Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Solar-Heat-Gain Coefficient for Walls: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than **0.28** as determined according to NFRC 200.
3. Visible Light Transmittance: 20 percent.
4. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
5. Minimum Condensation Resistance Factor of **80** by AAMA 1503 measured on the bond line.

1.5 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

D. Delegated-Design Submittal: For fiberglass-sandwich-panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional structural engineer responsible for their preparation.

E. Samples for Initial Selection: For units with factory-applied color finishes.

F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Sandwich panels: 14" x 28" units
2. Factory finished aluminum: 5" long sections

G. Fabrication Sample: Of each frame system intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Fiberglass sandwich panels.
5. Flashing and drainage.

## 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, manufacturer and testing agency.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.

C. Preconstruction Testing Program: For assemblies, developed specifically for Project. Include plans, elevations, sections, and details of laboratory mockup.

D. Maintenance Data: For assemblies to include in maintenance manuals.

E. Field quality-control test reports.

F. Warranties: Special warranties specified in this Section.

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: Entity capable of assuming engineering responsibility, including preparation of Shop Drawings, and performing work of this Section and who is acceptable to manufacturer.

B. Manufacturer Qualifications: For fiberglass sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICC-ES AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems.”

C. Professional Structural Engineer Qualifications: A professional structural engineer who is legally qualified to practice in the State of Connecticut and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations that are similar to those indicated for this Project in material, design, and extent.

D. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

E. Product Options: Information on Drawings and in Specifications establishes requirements for assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are

indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

F. Fire-Test-Response Characteristics: Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

G. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

H. NFRC Certification: Provide fiberglass sandwich panels that are certified for U-factors indicated according to NFRC 100 and listed in its "National Fenestration Council Incorporated - Certified Products Directory."

I. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical assembly area as directed by Construction Manager.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

## 1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Water leakage.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.

1. Defects include, but are not limited to, the following:

a. Fiberbloom.
b. Delamination of coating, if any, from exterior face sheet.
c. Discoloration of exterior face sheet of more than 3.0 units Delta E when measured according ASTM D 2244.
d. Delamination of panel face sheets from panel cores.

2. Warranty Period: 10 years from date of Substantial Completion.

C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by **Kalwall Corporation,** the following or equal:

1. Major Industries; Guardian 275.

### 2.2 ALUMINUM FRAME SYSTEMS

A. Recycled Content: Postconsumer recycled content plus one-half of post industrial recycled content not less than 10 percent.

B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.

C. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermal strut; framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by a material of low thermal conductance.

D. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch thick.

E. Frame-System Gaskets: Manufacturer's standard.

F. Frame-System Sealants: As recommended in writing by manufacturer.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.

1. At closures, retaining caps, or battens, use ASTM A 193/A 193M, 300 series stainless-steel screws.
2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

H. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

I. Anchor Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hot-dip zinc coating, ASTM A 153/A 153M, Class C.

J. Frame System Fabrication:

1. Fabricate components before finishing.
2. Fabricate components that, when assembled, have the following characteristics:

a. Profiles that are sharp, straight, and free of defects or deformations.
b. Accurately fitted joints with ends coped or mitered.
c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within the assembly to exterior.

3. Fabricate sill closures with weep holes and for installation as continuous component.
4. Reinforce components as required to receive fastener threads.
5. Weld components in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2.3 FIBERGLASS SANDWICH PANELS

A. Panel Construction: Flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

B. Translucent Face Sheets: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use. Face sheets shall not deform, deflect, or drip when subjected to fire or flame. Thermoplastic (polycarbonate or acrylic) faces are not acceptable.

1. Face-Sheet, Self-Ignition Temperature: 650 deg F or more per ASTM D 1929.
2. Face-Sheet Burning Extent: 1 inch or less per ASTM D 635.
3. Face-Sheet, Smoke-Developed Index: 250 or less per ASTM E 84.
4. Interior Face-Sheet, Flame-Spread Index: Not more than 50 per ASTM E 84.

C. Panel Thickness: 2-3/4 inches.

D. Panel Strength Characteristics:

1. Maximum Panel Deflection: 3-1/2 inches when a 4-by-12-foot panel is tested according to ASTM E 72 at 34 lbf/ sq. ft., with a maximum 0.090-inch set deflection after 5 minutes.
2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf concentrated load when applied to a 3-inch- diameter disk according to ASTM E 661.

E. Grid Core:

1. I-Beam Construction: Thermally broken composite I-beam grid core shall be of 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16”.
2. I-beam Thermal break: Minimum 1”, thermoset fiberglass composite.
3. Grid Pattern: 12 x 24 Shoji.

F. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council “Acceptance Criteria for Sandwich Panel Adhesives”.
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:

a. 50% Relative Humidity at 68° F: 540 PSI
b. 182° F: 100 PSI
c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

G. Exterior Face Sheet:

1. Thickness: 0.070 inch.
2. Color: Crystal.
3. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
4. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
5. Erosion Protection: Integral, embedded-glass erosion barrier.

H. Interior Face Sheet:

1. Thickness: 0.045 inch.
2. Color: White.

I. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.

    a. White spots indicating lack of bond at intersections of grid-core members are limited in number to 4 for every 40 sq. ft. of panel and limited in diameter to 3/64 inch.

2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

## 2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: Various series stainless steel screws for aluminum closures, excluding final fasteners to the building.

## 2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight, unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.

D. Install components to drain water passing joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.

E. Install components plumb and true in alignment with established lines and elevations.

F. Install insulation materials as specified in Division 07 Section "Spray Foam Insulation."

G. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length.

## 3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed assemblies with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.

a. Test Procedures: Test under uniform static air pressure.
b. Static-Air-Pressure Difference: As indicated.
c. Water Penetration: None.

2. Water-Spray Test: Before installation of interior finishes has begun, assemblies shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

END OF SECTION 08 45 23

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**SECTION 08 51 13 – ALUMINUM WINDOWS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes:

1. Operable aluminum-framed windows for exterior locations.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units and installation of aluminum windows in storefront framing.
3. Division 08 Section "Glazing" for glazing requirements for aluminum windows.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size required by AAMA/WDMA 101/I.S.2/NAFS for gateway performance, not less than 4’-0” x 6’-0”.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

a. Ultimate Design Wind Speed: 135 mph.
b. Risk Category: III.
c. Exposure Category: B.

2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

D. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS unless more stringent performance requirements are indicated.

1. Performance Class and Grade: Not less than AW-PG55.

E. Forced Entry Test: When tested in accordance with ASTM F 588, shall have a minimum performance grade of 10.

F. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of not less than 60 for frame.

G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.1.

1. U-Value: Not more than 0.45 Btu/sq. ft. x h x deg F for operable units and 0.38 for fixed units.

H. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.

1. Maximum Rate: 0.30 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft. for fixed and projected units.

I. Water Resistance: No water leakage when tested in accordance with ASTM E 331/ASTM E 547.

1. Test Pressure: 15 percent of positive design pressure, but not less than 15 lbf/sq. ft.

## 1.5 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:

1. AW: Architectural.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:

1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

## 1.6 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.

2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window cleaning provisions.
9. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer licensed in the State of Connecticut detailing fabrication and assembly of aluminum windows and used to determine the following:

    a. Structural test pressures and design pressures from wind loads indicated, and the Connecticut State Building Code.
    b. Deflection limitations of glass framing systems.

D. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

E. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.

1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.
2. Hardware: Full-size units with factory-applied finishes.
3. Weather Stripping: 12-inch- long sections.

F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

G. Qualification Data: For Installer, professional engineer and testing agency.

H. Field quality-control test reports.

I. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

J. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

K. Warranty: Special warranty specified in this Section.

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations for Aluminum-Framed Systems: Obtain aluminum windows and aluminum-framed entrance and storefront systems from a single source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

## 1.8 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window System: Two years from date of Substantial Completion.
b. Glazing: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ALUMINUM WINDOWS

A. Window Type: Horizontal Sliding.

1. Basis of Design Product: Subject to compliance with requirements, provide **EFCO Corporation; Series 3500** or comparable product by one of the following:

a. Kawneer.
b. Wausau Window and Wall Systems.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.090-inch thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.

1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.

F. Replaceable Weather Seals: Comply with AAMA 701/702.

G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

## 2.3 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze.

B. Horizontal-Sliding Window Hardware:

1. Sill Cap/Track: Manufacturer's standard of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.

a. Provide concealed plunger lock in the meeting rail with a flush mounted actuating handle.

3. Roller Assemblies: Low-friction design.
4. Limit Devices: Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.

a. Limit clear opening to 4 inches for ventilation; with custodial key release.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

D. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for insulating glass units and glazing requirements applicable to glazed aluminum window units.

## 2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame.

1. Locate screens on outside of window and provide for each operable exterior sash or ventilator.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch wall thickness.
3. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.6 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

1. Construction: Thermally broken.
2. Depth of Frame: 3-1/4 inches.

B. Framing and Sash Members: Manufacturer's standard extruded-aluminum framing members, minimum wall thickness of 0.062”, frame sill members minimum thickness of 0.094”, and reinforced as required to support imposed loads.

1. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.

C. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

D. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
2. Sills are thermally broken with thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. Other thermally broken members can use the latest technology in two-part, high-density polyurethane. A nonstructural thermal barrier is unacceptable.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

H. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

## 2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: As selected by Architect from manufacturer’s full range, to match aluminum framing systems.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

F. Install joint sealants specified to comply with Division 07 Section "Joint Sealants", to produce weathertight installation.

## 3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
2. Air-Infiltration Testing:

    a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

    a. Test Pressure: 100 percent test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three windows as selected by Commissioning Authority. Windows shall be tested immediately after installation.
5. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace noncomplying aluminum window and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 51 13

**SECTION 08 62 00 – UNIT SKYLIGHTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Unit skylights mounted on field fabricated curbs.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking at unit skylights.
3. Division 07 Section “Thermoplastic Membrane Roofing.”
4. Division 07 Section "Sheet Metal Flashing and Trim" for flashing at unit skylights.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide unit skylights capable of withstanding loads indicated without failure. Failure includes the following:

1. Thermal stresses transferred to the building structure.
2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
3. Noise or vibration created by thermal and structural movement and wind.
4. Weakening of fasteners, attachments, and other components.

B. Test Performance Criteria: Provide unit skylights capable of complying with performance requirements indicated, based on testing manufacturer's unit skylights that are representative of those specified.

1. Structural Performance: Provide unit skylights, including glazing and anchorage, capable of withstanding the effects of design loads in accordance with AAMA 1606 and the Connecticut State Building Code.

C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC of 0.40.

D. Thermal Transmittance: NFRC 100 maximum U-factor of 0.50 Btu/sq. ft. x h x deg F.

E. Air Infiltration: NFRC 4000, maximum air leakage of 0.2 cfm/sq. ft. a minimum static-air-pressure differential of 1.57 lbf/sq. ft., or 0.3 cfm/sq. ft. at 6.24 lbf/sq. ft.

F. Fall Protection: Provide unit skylights capable of complying with OSHA fall protection regulation 29 CFR 1910.23, where no dome breakage or total displacement of glazing from the frame occurs when a load of 200 lbs. is applied perpendicular at any one area of the skylight.

1. Provide manufacturer's standard glazing material capable of meeting fall protection requirements, or manufacturer's standard integral screening as required.

## 1.4 SUBMITTALS

A. Product Data: For each type of unit skylight indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.

B. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

C. Samples for Initial Selection: For unit skylights with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in a representative section of each unit skylight in manufacturer's standard size.

E. Product Schedule: For unit skylights.

F. Qualification Data: For qualified Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, performance class, performance grade, and size of unit skylight. Test results based on use of downsized test units will not be accepted.

H. Maintenance Data: For unit skylights to include in maintenance manuals.

I. Field quality-control reports.

J. Warranty: Sample of special warranty.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

C. Source Limitations: Obtain unit skylights from single source from single manufacturer.

D. Surface-Burning Characteristics of Plastic Glazing: Provide plastic glazing sheets identical to those tested for fire-exposure behavior per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested per ASTM D 1929.
2. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843
3. Burning Characteristics: Tested per ASTM D 635.

a. Acrylic Glazing: Tested according to ASTM D 635. Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use.

E. Unit Skylight Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified unit skylights with an attached label.

F. Preinstallation Conference: Conduct conference at Project site.

## 1.6 COORDINATION

A. Coordinate unit skylight flashing requirements with roofing system.

B. Provide anchors and inserts to be placed in adjacent construction in proper sequence so as not to delay the Work.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Uncontrolled water leakage.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Yellowing of acrylic glazing.
d. Deterioration of insulating-glass hermetic seal.

2. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis of Design Product: Subject to compliance with requirements, provide **Wasco Products, Inc.; EcoSky3** or comparable product by the following:

1. Kingspan Light + Air.
2. Sunoptics.

### 2.2 UNIT SKYLIGHTS

A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.

B. Unit Shape and Size: As indicated on Drawings.

C. Acrylic Glazing: Monolithic, formable, transparent (colorless) or translucent (white) sheets with good weather resistant.

1. Outer Glazing: Dome thermoformed:

a. Acrylic: Acrylite® Satin Sky 2 translucent.

2. Middle Glazing: Thermoformed Dome.

a. Acrylic: Clear.

3. Inner Glazing: Thermoformed Dome:

a. Acrylic Clear.

D. Glazing Gaskets: Manufacturer's standard.

E. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

F. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.

### 2.3 MATERIALS

A. Aluminum Components:

1. Sheets: ASTM B 209, alloy and temper to suit forming operations and finish requirements but with not less than the strength and durability of alclad Alloy 3005-H25.
2. Extruded Shapes: ASTM B 221, alloy and temper to suit structural and finish requirements but with not less than the strength and durability of Alloy 6063-T52.

B. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.

1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

## 2.4 ACCESSORIES

A. Exterior safety screen accessory: Fall protection screen attaches directly to the skylight frame and provides fall protection coverage over the exterior of the skylight dome. Safety screen constructed from a minimum 0.1875-inch steel mesh with a 4 inch on center grid spacing. Exterior safety screen shall meet fall protection requirements by supporting a minimum static load of 400 pounds per square foot.

## 2.5 INSTALLATION MATERIALS

A. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic, nominally free of sulfur and containing no asbestos fibers, formulated for 15-mil dry film thickness per coating.

B. Joint Sealants: As specified in Division 07 Section "Joint Sealants."

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Roofing Cement: ASTM D 4586, asbestos free, designed for trowel application or other adhesive compatible with roofing system.

## 2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M10C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

C. Install unit skylights level, plumb, and true to line, without distortion.

D. Anchor unit skylights securely to supporting substrates.

E. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

F. Set unit skylight flanges in thick bed of roofing cement to form a seal unless otherwise indicated.

G. Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.

C. Perform test for total area of each unit skylight.

D. Work will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.4 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 08 62 00

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# SECTION 08 71 00 – DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary.".

### 1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same Sections as the doors and door frames on which they are installed. Furnish and deliver all door hardware necessary for all doors, also hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware:

**B. ALL DOOR HARDWARE MUST BE FURNISHED BY SECTION 08 71 00 DOOR HARDWARE SUPPLIER.**

**"CONTRACTS, Including Door Hardware, ISSUED TO ALUMINUM DOOR SUPPLIER" must stipulate aluminum door hardware must be purchased from SECTION 087100 HARDWARE SUPPLIER**

C. ***HARDWARE SUPPLIER****:* Must employ an experienced ***Architectural Hardware Consultant (AHC)*** who is available to Owner, Architect, and Contractor, at reasonable times during the Work, for consultation.

D. Related Sections:

**1.** 08 06 00 SCHEDULE FOR OPENINGS.
**2.** 08 11 13 HOLLOW METAL DOORS AND FRAMES.
**3.** 08 14 16 FLUSH WOOD DOORS.
**4.** 08 41 13 ALUM-FRAMED ENTRANCES AND STOREFRONTS.
**5.** 08 41 26 ALL-GLASS ENTRANCES AND STOREFRONTS.
**6.** 08 71 13 AUTOMATIC DOOR OPERATORS.
**7.** Division 26 ELECTRICAL.
**8.** Division 28 ELECTRONIC SAFTY AND SECURITY.

### 1.3 REFERENCES

A. Standards:

**1.** ANSI/BHMA, A156.1 (2013) - Butts & Hinges.

**2.** ANSI/BHMA, A156.3 (2008) - Exit Devices.

**3.** ANSI/BHMA, A156.4 (2008) - Door Controls - Closers.

**4.** ANSI/BHMA, A156.5 (2010) - Auxiliary Locks and Associated Products.

**5.** ANSI/BHMA, A156.6 (2010) - Architectural Door Trim.

**6.** ANSI/BHMA, A156.7 (2009) - Template Hinge Dimensions.

**7.** ANSI/BHMA, A156.8 (2010) - Door Controls - Overhead Stops and Holders.

**8.** ANSI/BHMA, A156.13 (2012) - Mortise Locks & Latches, Series 1000.

**9.** ANSI/BHMA, A156.15 (2011) - Release Devices – Closer Holder, Electro Mag/Mech.

**10.** ANSI/BHMA, A156.16 (2008) - Auxiliary Hardware

**11.** ANSI/BHMA, A156.18 (2012) - Materials and Finishes.

**12.** ANSI/BHMA, A156.21 (2009) - American National Standard for Thresholds.

**13.** ANSI/BHMA, A156.22 (2012) - Door Gaskets and Edge Seal Systems.

**14.** ANSI/BHMA, A156.25 (2007) - Electrified Locking Devices.

**15.** ANSI/BHMA, A156.26 (2012) - Continuous Hinges.

**16.** ANSI/BHMA, A156.28 (2007) - Recommended Practices for Keying Systems.

**17.** ANSI/BHMA, A156.29 (2012) - American National Standard for Exit Locks & Alarms.

**18.** ANSI/BHMA, A156.30 (2003) - American National Standard for High Security Cylinders.

**19.** ANSI/BHMA, A156.36 (2010) - American National Standard for Auxiliary Locks.

**20.** ANSI/BHMA, A156.115 (2006) - Hardware Preparation in Steel Doors and Frames.

**21.** NFPA 80 - Fire Doors and Windows.

**22.** UL10C - Positive Pressure Fire Tests of Door Assemblies.

**23.** AIA 232 2009 - General Conditions of the Contract for Construction Manager as Risk Edition

B. Codes:

**1.** Applicable state and local building codes.

**2.** 2015 International Building Code as Amended for the 2018 Connecticut State Code [CSBC 101.1.1]

**3.** ICC / ANSI A117.1 - Accessible and Usable Buildings and Facilities

**4.** ADA - Americans with Disabilities Act.

C. UL Underwriters Laboratories:

**1.** UL 10C – Fire Tests of Door Assemblies.

**2.** UL 305 – Panic Hardware.

**3.** NFPA 101 - Life Safety code.

**4.** NFPA 105 - Smoke and Draft Control Door Assemblies

D. DHI – Door and Hardware Institute:

**1.** Sequence and Form and for the Hardware Schedule.

**2.** Recommended Locations for Builders Hardware.

1.4 SUSTAINABLE BUILDING REQUIREMENTS AND CRITERIA

A. The Owner requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving compliance with CONNECTICUT HIGH PERFORMANCE BUILDING requirements. Specific project goals which may impact this, and the other sections of this specification include use of recycled-content materials; use of locally manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling;

and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are fully implemented. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated CONNECTICUT HIGH PERFORMANCE BUILDING criteria.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Section 1 Specification Sections:

B. Product data including manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish of door hardware.

C. Final hardware schedule must be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware. Conflicts between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to the ARCHITECT.

D. HARDWARE SUPPLIER shall confirm specified LOCK FUNCTIONS with the OWNER at the KEYING MEETING.

**1.** Final Hardware Schedule Content: Based on hardware indicated, organize schedule into *"HARDWARE SETS"* indicating complete designation of every item required for each door or opening. Include the following information. Type, style, function, size, and finish of each hardware item.

a. Name and manufacturer of each item.
b. Fastenings and other pertinent information.
c. Location of Hardware Set, cross-referenced to indication of Drawings both on floor plans, in door, and frame schedule.
d. Explanation of all abbreviations, symbols, and codes contained in schedule.
e. Mounting locations for hardware. Provide "DHI" Standard Mounting Locations in the Hardware Submittal.
f. Door and frame sizes and materials.
g. Keying information.
h. *Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum above the finish floor. Locks used only for security purposes and not used for normal operation are permitted at any height.*

**2.** Submittal Sequence: submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review to schedule.

**3.** Keying Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled.

E. Samples: If requested by Architect, submit samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule:

**1.** Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

G. Wiring Diagrams: Upon final approval of the hardware schedule, submit wiring and riser diagrams as required for the complete and proper installation of all electrical, electromechanical, and electromagnetic products. Submittals must represent that coordination has occurred with the security system submittals and shop drawings. Also, that shop drawings submitted, and schedules developed have been specifically reviewed and coordinated for both physical equipment fitment and power requirements with the security system contractor approved shop drawings.

H. "Hardware Schedule and Templates", Hardware schedules shall be created which reference specifically to the specified lock voltages and separately indicating whether the door is a "fail safe" or "fail secure" electrified lock arrangement.

I. Electrified Hardware: Electrified Hardware to be used for security purposes must be UL Listed for Burglary Applications.

J. "Quick Connect Cables", QC Cables must be capable with all electrified hardware.

K. At the completion of hardware installation, and prior to issuance of certificate of occupancy, prepare and submit the hardware inspection report to include the following:

**1.** Current and predictable problems of substantial nature in the performance of the hardware.

**2.** Hardware has been installed and adjusted in accordance with manufacturer's recommendations and instructions.

L. At the completion of the project, provide Owner with two (2) copies of an Operation and Maintenance Manual. This manual shall consist of a hard cover (3) ring binder with the project name listed on the front. Included will be:

**1.** A final copy of the approved and as built hardware schedule.

**2.** A final copy of the approved keying schedule.

**3.** Catalog cuts for each item used in the project.

**4.** Parts list and numbers for each item used.

**5.** Maintenance instructions for all items.

**6.** Name, address and phone number of local representatives for each item used.

## 1.6 QUALITY ASSURANCE

A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Section 1 requirements. If proposing a substitute to a specified item, indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability. All Hardware is "Basis-of-Design" product specification as defined in Section 08 71 00. Model numbers (and Manufacturer's) listed in "Hardware Set Schedule" are "Basis-of-Design".

**1.** Items specified, as "no substitution" shall be provided exactly as listed.

**2.** Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.

**3.** If no other products are listed in a category, then "no substitution" is implied.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, architect, and Contractor, at reasonable times during the course of the Work, for consultation.

**1.** Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

C. A pre-installation meeting shall be held to instruct installers on the proper installation and adjustment of door hardware. A representative of each major hardware category, including, but not limited to, Locks, Exit Devices, & Closers, shall instruct the installers on the correct installation of their products. The manufacturers of the Door Hardware provided on this project shall certify to the Architect that the door hardware installer for this project has been trained in the proper installation procedures and is certified to install the door hardware.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Intertek Testing Services, Warnock Hersey, Factory Mutual, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

E. Accessible Hardware: Door Hardware; *Handles, pulls, latches, locks and other operable parts on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, pinching, or twisting of the wrist to operate. Such hardware shall 34 inches (865 mm) minimum and 48 inches (1220 mm) maximum above the floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.* EXCEPTION: *Locks used only for security purposes and not used for normal operation are permitted in any location.*

F. Accessible Hardware: Door-Opening Force; Fire Doors shall have the minimum opening force allowable by the appropriate administrative authority. The maximum force for pushing open or pulling open doors other than fire doors shall be as follows:

**1.** Interior hinged door: 5.0 pounds.

**2.** Sliding or folding door: 5.0 pounds.

**3.** Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not greater than 10 lbf. *These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. The maximum force required to release the latch shall not exceed 15 lbf.*

**4.** Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

**5.** Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.7 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Each item of hardware shall be individually packaged in manufacturer's original container.

C. Receiving and storing of door hardware is responsibility of supplier. Prior to delivery of door hardware to the project, Hardware Supplier must sort and clearly mark with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

E. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

F. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 WARRANTY

A. Provide manufacturer's Standard Warrantees.

B. Starting date for all warranty periods to be date of substantial completion of the Project.

C. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.

D. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

**1.** Butts and Hinges:
   a. Hager Companies.
   b. McKinney Hinge, Div of Assa Abloy
   c. Stanley Hardware.

**2.** Continuous Hinges:
   a. Hager/Roton Companies.
   b. Pemko
   c. Select

**3.** Key Control System:
   a. HPC.
   b. Lund, Inc.
   c. Telkee, Inc.

**4.** Locks:
   a. Corbin-Russwin, Div of Assa Abloy, "CLX3300", "ML2000", "NSA" Series.
   b. Sargent, Div of Assa Abloy .

c. Yale, Div of Assa Abloy.

**5.** Flush Bolts:
a. Rockwood Manufacturing.
b. Trimco Triangle Brass.

**6.** Exit/Panic Devices (provide U.L. label at rated doors):
a. Corbin/Russwin, Div of Assa Abloy, "5000 x 900" Series.
b. Sargent, Div of Assa Abloy, "80 x FW-ETL" Series.
c. Yale, Div of Assa Abloy, "7000 x 600" Series

**7.** Push/Pull Units:
a. Rockwood Manufacturing.
b. Trimco Manufacturing, Inc

**8.** Overhead Surface Closers:
a. Corbin/Russwin, Div of Assa Abloy, "6200" Series.
b. Norton, Div of Assa Abloy. "PR7500/PR7700" Series.
c. Sargent, Div of Assa Abloy, Inc., "351 (Heavy Duty Arms)" Series.
d. Yale, Div of Assa Abloy, "4400" Series.

**9.** Electro Magnetic Hold Opens:
a. Rixson, Div of Assa Abloy.
b. Sargent, Div of Assa Abloy.

**10.** Door Control Devices:
a. Rixson, Div of Assa Abloy.
b. Sargent, Div of Assa Abloy.

**11.** Kick and Mop Plates:
a. Rockwood.

**12.** Weather-stripping and Seals:
a. Pemko Manufacturing Co., Inc.
b. Reese Enterprises, Inc.

**13.** Thresholds:
a. Pemko Manufacturing Co., Inc.
b. Reese Enterprises, Inc.

**14.** Smoke and Sound Stripping:
a. Pemko Manufacturing Co., Inc.
b. Reese Enterprises, Inc

**15.** Astragals:
a. Pemko Manufacturing Co., Inc.
b. Reese Enterprises, Inc.

**16.** Door Stops:
a. Rockwood Manufacturing.
b. Trimco

**17.** Electrified Hinges:

a. Hager Companies.
b. McKinney Hinge, Div of Assa Abloy
c. Stanley Hardware.

**18.** Electrified Power Transfers:
a. Securitron, Div of Assa Abloy.

2.2 SCHEDULED HARDWARE

A. Requirements for each type of door hardware are indicated on the "Door Schedule", and in the Schedule at the end of this Section. Products are identified by using hardware designation numbers of the following:

**1.** Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Manufacturer and model numbers indicated in Hardware Sets constitute a "Basis-of-Design" product specification as defined in this Section.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

**1.** Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Product hardware units of basic metal and forming methods indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized), quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive paint.

E. Provide concealed fasteners. Provide tamper resistant fasteners when they cannot be concealed. Fasteners shall be of the same finish as the balance of the hardware. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, AND CONTINUOUS HINGES

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

**1.** For metal doors and frames install machine screws into drilled and tapped holes.

**2.** For wood doors and frames install wood screws.

**3.** For fire-rated wood doors install #12 x ¼ inch, threaded-to-the-head steel wood screws.

**4.** Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

**1.** Out-Swing Exterior Doors: Non-removable pins.

**2.** Interior Doors: Non-rising pins.

**3.** All "Card Reader Doors": Non-removable pins.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches of additional height:

**1.** Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

E. Size and weight of butts:

**1.** See Hardware Sets for Details.

F. Power Transfer Hinges:

**1.** Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical. When ETW is selected, provide RETW (QC Connectors) - 12-Wire Quick Connect Harness Cable. Provide all Cables required to complete Installation of ALL Electrified Devices. ***"Quick Connect Cables", QC Cables must be capable with all electrified hardware.***

**2.** Furnish all power transfer hinges as 12 conductor units.

2.5 LOCK CYLINDERS AND KEYING

A. Review the keying system with the Owner and provide the type required grandmaster or great grandmaster, integrated with Owner's existing **"PYRAMIS"** system. **Registry # CR100586**

B. HARDWARE SUPPLIER SHALL CONFIRM SPECIFIED LOCK FUNCTIONS WITH OWNER AT THE KEYING MEETING.

C. Equip locks with manufacturer's 6-pin tumbler "interchangeable core" cylinder employing "RESTRICTED KEYWAY". Such cylinders have cores that are removable using a special "control key". Deliver hardware to the contractor with temporary cores installed and keyed alike. Permanent cores are to be mastered keyed as directed by the owner. Deliver permanent cores and keys to the owner when notified by the owner in writing. Temporary cores and keys are to be returned to the hardware supplier by the contractor within 10 days of their replacement by permanent cores. (Do Not Provide Extra Key Blanks if Restricted Keyway has been specified.)

**1.** Furnish 12 each "Temporary Change Keys" and 2 each "Temporary Core Control Keys".

**2.** Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, and 5 grandmaster keys for each grandmaster system. Furnish 6 each "Core Control Keys".

**3.** Furnish 12 Temporary Change Keys and 2 Temporary Core Control Keys.

**4.** Furnish 12 each additional core for owner's stock.

**5.** Install "FINAL CORES" when instructed by Owner.

**6.** Deliver keys to Owner.

D. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

E. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

F. Key Material: Provide keys of nickel silver only.

G. Final cores to be installed by the hardware supplier, installer must verify that all cylinders are working correctly.

2.6 KEY CONTROL SYSTEM

A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of "Key Sets" required for the Project:

**1.** Provide flat lip strikes for locks with 3 pieces, anti-friction latch bolt as recommended by manufacturer.

2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated:

**1.** Provide complete cross-index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.

**2.** Provide hinged-panel type cabinet for wall mounting.

B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the 2010 ADA Standards, ICC/ANSI A117.1

**1.** Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

b. Folding Doors: 5 lbf applied parallel to door at latch.

c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not greater than 10 lbf.

**2.** Comply with the following maximum closing speed requirements:

a. Adjust closers so that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees is to be 5 seconds minimum.

b. Adjust closers so that from an open position of 70 degrees, the time required to move the door to an open position of 3 inches from the latch is to be 3 seconds minimum.

C. Cylindrical Locks:

**1.** Cylindrical locks shall be certified as ANSI A156.2, Series 4000, Grade 1, and meet A117.1 Accessibility Code, with solid cast levers without plastic inserts, and shall have wrought roses on both sides. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

**2.** Locks are to have a standard 2-3/4" backset with a ½" latch throw. At U.L. Rated pairs of doors, provide a ¾" latch throw, no exception.

**3.** Locksets shall have separate anti-rotation through-bolts and shall have no exposed screws. Levers shall operate independently and shall have 2 external return spring cassettes mounted under roses to prevent lever sag.

**4.** Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

**5.** Locksets shall have "CLUTCH' / FREE WHEELING" type trim.

**6.** Provide electrical options as scheduled.

a. All Openings scheduled to receive Electrified Hardware must include a Quick Connect Wiring Harness and Raceway in all Doors. ***"Quick Connect Cables", QC Cables must be capable with all electrified hardware***.

b. "Request to Exit", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lever Trim, as called for on the security system drawings.

c. "Latch bolt Monitoring", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lock Latch, as called for on the security system drawings.

d. Lock Power Supplies: It is imperative that the security contractor and hardware supplier coordinate the lock voltage requirements, fail safe/fail secure requirements, lock in-rush current requirements, whether locks are continuous duty or not and any other related issues. Power supplies to be furnished by Door Hardware Suppliers and installed by the Security or Electrical Contractor. Locate power supplies and battery backup in the access control mechanical space when wire run lengths permit. Where wire runs exceed manufacturer's written recommendations, coordinate the installation location with Construction Manager / General Contractor and Architect

e. Local Audible Alarms shall be furnished and installed by the Security Contractor.

f. Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical. When ETW is selected, provide RETW (QC Connectors) - 12-Wire Quick Connect Harness Cable. Provide all Cables required to complete Installation of ALL Electrified Devices.

g. Furnish all power transfer hinges as 12 conductor units.

h. Electrical Locks – See hardware Sets for requirements.

D. Mortise Locks:

**1.** Mortise locks shall be certified as ANSI A156.13, Series 1000, Operational and Security Grade 1, and meets A117.1 Accessibility Code, and shall be manufactured from heavy gauge steel, containing components of steel with zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handling.

**2.** Locks are to have a standard 2-3/4" backset with a full ¾" throw 2-piece stainless steel mechanical anti-friction latch-bolt.

**3.** Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external Security requirement. Levers shall be thru-bolted to assure proper alignment and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

**4.** Provide flat lip strikes for locks with 3 pieces, anti-friction latch bolt as recommended by manufacturer.

**5.** Provide electrical options as scheduled.

a. All Openings scheduled to receive Electrified Hardware must include a Quick Connect Wiring Harness and Raceway in all Doors. ***"Quick Connect Cables", QC Cables must be capable with all electrified hardware***.

b. "Request to Exit", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lever Trim, as called for on the security system drawings.

c. "Latch bolt Monitoring", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lock Latch, as called for on the security system drawings.

d. Lock Power Supplies: It is imperative that the security contractor and hardware supplier coordinate the lock voltage requirements, fail safe/fail secure requirements, lock in-rush current requirements, whether locks are continuous duty or not and any other related issues. Power supplies to be furnished by Door Hardware Suppliers and installed by the Security or Electrical Contractor. Locate power supplies and battery backup in the access control mechanical space when wire run lengths permit. Where wire runs exceed manufacturer's written recommendations, coordinate the installation location with Construction Manager / General Contractor and Architect

e. Local Audible Alarms shall be furnished and installed by the Security Contractor.

f. Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical. When ETW is selected, provide RETW (QC Connectors) - 12-Wire Quick Connect Harness Cable. Provide all Cables required to complete Installation of ALL Electrified Devices.

g. Furnish all power transfer hinges as 12 conductor units.

h. Electrical Locks – See hardware Sets for requirements.

E. Exit Devices:

**1.** Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated.

**2.** Touchpad shall extend a minimum of one half of the door width. Endcap shall be flush mounted and will have two-point attachment to door. Nylon bearings and stainless-steel springs shall be used for long life and durability; compression or torsion springs will be used in devices, latches, and outside trims or controls.

**3.** Where panic and fire exit hardware is installed, panic and fire exit hardware shall meet CSFSC 1010.1.9.9 and 1010.1.10: (2) *A maximum unlatching force of 15 pounds*.

**4.** All devices to incorporate a security dead latching feature.

**5.** Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trims or moldings projects off the face of the door, provide glass bead kits.

**6.** All non-fire-rated exit devices shall have cylinder dogging, unless noted otherwise in Hardware Sets.

**7.** Removable mullions shall be a steel tube, except at aluminum entrances, mullions to be aluminum. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.

**8.** Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Where scheduled, provide vandal-resistant levers that can easily be re-setting. Lever style will match the lever style of the locksets. Lever handles shall meet A117.1 Accessibility Code.

**9.** Where notation for knurling appears on door schedule, provide knurled outside lever.

**10.** Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.

**11.** Furnish and Install "THRU BOLTS" on Aluminum, Hollow Metal, and Wood Doors.

**12.** Provide electrical options as scheduled.

a. All Openings scheduled to receive Electrified Hardware must include a Quick Connect Wiring Harness and Raceway in all Doors. ***"Quick Connect Cables", QC Cables must be capable with all electrified hardware***.

b. "Request to Exit / Touch Bar Monitor", Electrified Panic Hardware shall be provided with one internal SPDT switch which monitors the touch bar, as called for on the security system drawings.

c. "Latch bolt Monitoring", Electrified Panic Hardware shall be provided with one internal SPDT switch which monitors the latch bolt, as called for on the security system drawings.

d. Openings requiring delayed exit-locking devices shall be von-Duprin "Chexit" or equivalent products by Corbin-Russwin Architectural Hardware, Sargent, and Dorma

e. Lock Power Supplies: It is imperative that the security contractor and hardware supplier coordinate the lock voltage requirements, fail safe/fail secure requirements, lock in-rush current requirements, whether locks are continuous duty or not and any other related issues. Power supplies to be furnished by Door Hardware Suppliers and installed by the Security or Electrical Contractor. Locate power supplies and battery backup in the access control mechanical space when wire run lengths permit. Where wire runs exceed manufacturer's written recommendations, coordinate the installation location with Construction Manager / General Contractor and Architect

f. Local Audible Alarms shall be furnished and installed by the Security Contractor.

g. Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical. When ETW is selected, provide RETW (QC Connectors) - 12-Wire Quick Connect Harness Cable. Provide all Cables required to complete Installation of ALL Electrified Devices.

h. Furnish all power transfer hinges as 12 conductor units.

i. Electrical Exit Devices – See hardware Sets for requirements.

## 2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use:

**1.** Where parallel arms are indicated for closers, provide closer with Heavy Duty Arm.

**2.** Provide parallel arms for all overhead closers, except as otherwise indicated Provide parallel arms for all overhead closers, except as otherwise indicated.

**3.** Closers must operate at 180 degree opening where indicated on plans and door schedule.

**4.** Provide all necessary Drop Plate Brackets, Shims, and Angle Brackets, where required to complete installation of closers on doors and frames.

**5.** Furnish and Install "THRU BOLTS" on Aluminum, Hollow Metal, and Wood Doors.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provision for door opening force and closing speed.

C. Combination Door Closers and Holders: Where indicated, provide units designed to hold door in open position under normal usage and to release and close door automatically under normal usage and to release

and close door automatically under fire conditions. Incorporate and integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.

D. Coordinators: Provide Door Coordinators where required, including Parallel Arm Brackets. Verify bracket configuration with frame profile for each opening requiring door coordinator.

E. Magnetic Holders: Provide wall- or floor-mounted electromagnetic door release with a minimum of 25 pounds of holding force. Projection of holder and armature must be coordinated with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Where magnetic holders are used on fire-rated doors, they must be wired into the fire control panel for fail-safe operation.

## 2.9 DOORSTOPS AND HOLDERS

A. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements. Where overhead stops and holders are specified, or otherwise required, they shall have 3" pins on larger doors, and be heavy duty, and of solid brass or stainless steel with no plastic type parts. Provide Door Stops as indicated in Hardware Sets.

## 2.10 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate protection plates not more than 2 inches less than door width on push side of door and by height indicated.

**1.** Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

**2.** Provide UL Rated "KICK / ARMOR' Plates where detailed on UL Rated Openings.

## 2.11 THRESHOLDS, WEATHER-STRIPPING, SOUND STRIPPING AND SEALS

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if not latch or lock sets).

## 2.12 MISCELLANEOUS HARDWARE

A. Furnish four (4) extra screws or fasteners of each type, used for the hinges, door closers, holders and protective plates of the same finish used in this project.

B. Furnish two (2) additional adjusting wrenches for the door closers.

## 2.13 HARDWARE FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if not latch or lock sets).

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes", including coordination with the traditional U.S. finishes show by certain manufacturers for their products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of door hardware. Correct all defects prior to proceeding with installation.

3.2 INSTALLATION

A. All hardware to be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance, if necessary, installers may contact the manufacturer's rep for the item in question.

B. **** At locations where, existing frames are being reused, frames must be drilled and tapped at locations where hardware is applied to the frames. SELF TAPPING SCREWS ARE NOT ACCEPTABLE. If additional screw reinforcement is necessary, the installer is to provide fasteners similar to Rivet nuts or Jack nuts at those locations. ****

**C. Furnish and Install "THRU BOLTS" on Hollow Metal and Wood Doors.**

D. Electronic hardware shall be furnished and installed by qualified tradesmen. Hardware shall be wired by the security system contractor. Door Hardware installer shall be present to complete final adjustments to door hardware, when security contractor completes electrical terminations.

E. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

F. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

G. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

H. Set units' level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

I. All operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

3.3 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy to perform a final check and adjustment of all hardware items in such space or area. Clean operating doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation.

D. At the completion of "BALANCING" of all "AIR HANDLING SYSTEMS", prior to owner taking occupancy, 'Hardware Installer" will re-adjust all closer closing and latching cycles.

**E. Approximately six months after the Date of Substantial Completion, the installer shall perform the following:**

**1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified hardware.**

**2. Consult with and instruct owners' personnel on recommend maintenance procedures.**

**3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units**.

3.4 FIELD QUALITY CONTROL

A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of latchsets and locksets, door closers, and exit devices, and of other major hardware suppliers, shall perform the following work.

B. Examine (by representatives of the manufacturers) and re-adjust (by hardware installer) each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.

C. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.

D. Replace hardware items that have deteriorated or failed due to faulty design or materials (work to be performed by representatives of the manufacturers including removal and reinstallation).

E. Replace hardware items that have deteriorated or failed due to incorrect installation (work to be performed by hardware installer including removal and reinstallation) of hardware units.

F. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.

3.5 PROTECTION

A. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.6 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of this Section and the Door and Hardware Schedule Section 08 06 00", and the following Hardware Sets. The door hardware sets listed herein shall not be considered as a complete hardware schedule and shall only be considered as an indication of the hardware requirements desired by the Owner. It shall be this Contractor's responsibility to visit the site, examine the drawings and door schedule and provide all necessary hardware as shown. Such items shall be of same quality, quantity and type as that scheduled for similar doors or parts of the building used for similar purposes.

**B. Door and Hardware Schedule Section 08 06 00, "BULLETS", "SCHEDULE GENERAL NOTES" and "OPENING NOTES" shall be considered part of Section 08 71 00.**

C. As part of the submittal process, the Contractor and/or Door, Frame, and Hardware Suppliers must inspect all existing doors and frames to confirm that the new hardware will work with existing conditions, and if necessary, Door, Frame, and Hardware Suppliers shall advise the contractor of modifications that must be made to existing doors and frames to accommodate new hardware. The Contractor is responsible for making all such modifications.

D. Conflicts between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to the ARCHITECT.

**Hardware Set 001**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 84" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 002**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 80" | Corbin-Russwin |
| 2 | Closer, Track Arm | 7500ST - 689 - Pull Side | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 80" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 003**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 80" | Corbin-Russwin |
| 2 | Closer, Track Arm | 7500ST - 689 - Pull Side | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 72" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 004**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 74" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 005**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Track Arm | 7500ST - 689 - Pull Side | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 72" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 006**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Exit Device, Rim | ED5200S - M110 - EO - 630 - LHR - W048 - D200 | Corbin-Russwin |
| 1 | Exit Device, Rim_Key | ED5200S - M110 - K157 - VT9M - 630 - RHR - W048 - D200 | Corbin-Russwin |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 80" | Pemko |

**Hardware Set 007**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Exit Device, Rim | ED5200S - M110 - EO - 630 - LHR - D200 | Corbin-Russwin |
| 1 | Exit Device, Rim_Key | ED5200S - M110 - K157 - VT9M - 630 - RHR - D200 | Corbin-Russwin |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 72" | Pemko |

**Hardware Set 008**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 36" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 009**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 81" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 81" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 82" | Corbin-Russwin |
| 2 | Closer, Track Arm | 7500ST - 689 - Pull Side | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 2 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 72" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 010**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_E.LP | ED5200S - M110 - EO - P12 - 630 - LHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 2 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 015**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - RHR - D200 | Corbin-Russwin |
| 1 | Closer, Par Arm - Stop | CLP-7500 - 689 ( At 90 Degrees ) | Norton |

**Hardware Set 016**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - RHR - W048 - D200 | Corbin-Russwin |
| 1 | Closer, Par Arm - Stop | CLP-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Stop, Wall | 409 - US26D | Rockwood |

**Hardware Set 017**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - RHR - W048 - D200 | Corbin-Russwin |
| 1 | Closer, Par Arm - Stop | CLP-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Stop, Wall | 409 - US26D | Rockwood |

**Hardware Set 018**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - LHR - W048 - D200 | Corbin-Russwin |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - RHR - W048 - D200 | Corbin-Russwin |
| 2 | Closer, Par Arm - Stop | CLP-7500 - 689 ( At 90 Degrees ) | Norton |

**Hardware Set 019**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - LHR - D200 | Corbin-Russwin |
| 1 | Push Bar | ED5000DB - M110 - P12 - 630 - RHR - D200 | Corbin-Russwin |
| 2 | Closer, Par Arm - Stop | CLP-7500 - 689 ( At 90 Degrees ) | Norton |

**Hardware Set 021**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - LHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 36" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 022**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - LHR - W048 - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 44" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 023**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 226 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - D200 - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Weatherstrip | Weatherstripping - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Door Bottom | Door Bottom - Aluminum Door Supplier Standard | Section 084113 |
| 1 | Threshold | 252 - 2AFG x 36" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 031**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - P12 - 630 - RHR - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Weatherstrip | 316AS - 36" x 84" | Pemko |
| 1 | Door Bottom Sweep | 315CN x 36" | Pemko |
| 1 | Overhead Rain Drip | 346C x 40" | Pemko |
| 1 | Threshold | 195A x 192A x 196A (Supp) x 195A x (Frame Depth + 1/2") - All Welded x 36" W x 1/2" H | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 032**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - LHR | Roton |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - VT9M - 630 - LHR - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 1 | Armor Plate | K1050 - 34" x 36" - 18 ga. - US32D | Rockwood |
| 1 | Weatherstrip | 316AS - 38" x 80" | Pemko |
| 1 | Door Bottom Sweep | 315CN x 38" | Pemko |
| 1 | Overhead Rain Drip | 346C x 42" | Pemko |
| 1 | Threshold | 195A x 192A x 196A (Supp) x 195A x (Frame Depth + 1/2") - All Welded x 38" W x 1/2" H | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 035**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Exit Device, Rim | ED5200S - M110 - EO - 630 - LHR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_E.LP | ED5200S - M110 - K157 - VT9M - 630 - RHR - M52 (CD) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Mortise - Dogging | Cylinder - Mortise - 626 ( Dogging ) | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 2 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 2 | Astragal, Overlapping | 305CN x 84" | Pemko |
| 1 | Weatherstrip | 316AS - 72" x 84" | Pemko |
| 2 | Door Bottom Sweep | 315CN x 36" | Pemko |
| 1 | Overhead Rain Drip | 346C x 76" | Pemko |
| 1 | Threshold | 195A x 192A x 196A (Supp) x 195A x (Frame Depth + 1/2") - All Welded x 72" W x 1/2" H | Pemko |

**Hardware Set 038**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Weatherstrip | 316AS - 36" x 84" | Pemko |
| 1 | Door Bottom Sweep | 315CN x 36" | Pemko |
| 1 | Overhead Rain Drip | 346C x 40" | Pemko |
| 1 | Threshold | 195A x 192A x 196A (Supp) x 195A x (Frame Depth + 1/2") - All Welded x 36" W x 1/2" H | Pemko |

**Hardware Set 039**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 33.5" - CLEAR - Conc. Leaf | Roton |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 1 | Weatherstrip | 316AS - 30" x 34.5" | Pemko |
| 1 | Door Bottom Sweep | 315CN x 30" | Pemko |
| 1 | Overhead Rain Drip | 346C x 34" | Pemko |
| 1 | Threshold | 195A x 192A x 196A (Supp) x 195A x (Frame Depth + 1/2") - All Welded x 30" W x 1/2" H x 290ASSTOP | Pemko |
| 3 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |

**Hardware Set 061**

| | | | |
|---|---|---|---|
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20608 - NAC - SEC - NSA - VN - RHR - 626 - V21 x EMC ("M91" & "M92" STANDARD) | Corbin-Russwin |
| 1 | Closer, Par Arm | PR7500 - 689 - 170 Degree Swing | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 062**

| | | | |
|---|---|---|---|
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20608 - NAC - SEC - NSA - VN - LH - 626 - V21 x EMC ("M91" & "M92" STANDARD) | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 063**

| | | | |
|---|---|---|---|
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20608 - NAC - SEC - NSA - VN - RH - 626 - V21 x EMC ("M91" & "M92" STANDARD) | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( HD / Stop Arm to 90 Degrees ) ( Install "PUSH" Side ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 064**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RH | Roton |
| 1 | Electrically Unlocked | CL33905 - NZD - RH - 626 - M92 | Corbin-Russwin |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 x 5459 RH - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 065**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RH | Roton |
| 1 | Electrically Unlocked | CL33905 - NZD - RH - 626 - M92 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 x 5459 RH - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 066**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - U/L-FF - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - U/L-FF - Conc. Leaf | Roton |
| 1 | Electrically Unlocked | CL33905 - NZD - RHR - 626 - M92 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Smoke Gasket | S88D (Smoke Gasket) - 36" x 80" | Pemko |
| 3 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 067**

| | | | |
|---|---|---|---|
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Electrically Unlocked | CL33905 - NZD - RHR - 626 - M92 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |
| 3 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 068**

| | | | |
|---|---|---|---|
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20608 - NAC - SEC - NSA - M21 (KLO) - VN - RH - 626 - V21 x EMC ("M91" & "M92" STANDARD) | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 069**

| | | | |
|---|---|---|---|
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20608 - NAC - SEC - NSA - VN - RH - 626 - V21 x EMC ("M91" & "M92" STANDARD) | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 071**

| | | | |
|---|---|---|---|
| 2 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Electric Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - ETW-QC ( 12-Wire) | Hager |
| 1 | Mortar Box | 430 | Hager |
| 1 | Electrically Unlocked | ML20932 - SEC - NSA - LH - 626 - M17 - M91 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 079**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf - RETW-QC ( 12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf - RETW-QC ( 12-Wire) - RHR | Roton |
| 2 | Mortar Box | 430 | Hager |
| 1 | Exit Device, VR_Surf. | ED5470 - M110 - N950 (DUMMY TRIM) - 630 - LHR - W048 - M55 (LBR) - M91 - MELR | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470 - M110 - N959 - 630 - RHR - W048 - M55 (LBR) - M91 - M92 - MELR | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 40" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 998 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 2 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 081**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 91" - CLEAR - Conc. Leaf - RETW-QC ( 12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 91" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 2 | Mortar Box | 430 | Hager |
| 1 | Exit Device, VR_Surf. | ED5470 - M110 - N950 (DUMMY TRIM) - 630 - LHR - W048 - M55 (LBR) - M91 - MELR - H0800 ( 8'- 0" ) | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470 - M110 - N959 - 630 - RHR - W048 - M55 (LBR) - M91 - M92 - MELR - H0800 ( 8'- 0" ) | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 40" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 998 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 2 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 082**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 85" - CLEAR - Conc. Leaf - RETW-QC ( 12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 85" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 2 | Mortar Box | 430 | Hager |
| 1 | Exit Device, VR_Surf. | ED5470 - M110 - N950 (DUMMY TRIM) - 630 - LHR - W048 - M55 (LBR) - M91 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470 - M110 - N959 - 630 - RHR - W048 - M55 (LBR) - M91 - M92 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 36" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 996 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 2 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 083**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RETW-QC ( 12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RETW-QC (12-Wire) - RHR | Roton |
| 2 | Mortar Box | 430 | Hager |
| 1 | Exit Device, VR_Surf. | ED5470 - M110 - N950 (DUMMY TRIM) - 630 - LHR - M55 (LBR) - M91 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470 - M110 - N959 - 630 - RHR - M55 (LBR) - M91 - M92 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 996 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 2 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 084**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - U/L-STUD - Conc. Leaf - RETW-QC ( 12-Wire) - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - U/L-STUD - Conc. Leaf - RETW-QC ( 12-Wire) - RHR | Roton |
| 2 | Mortar Box | 430 | Hager |
| 1 | Exit Device, VR_Surf. | ED5470B - M110 - N950 (DUMMY TRIM) - 630 - LHR - M55 (LBR) - M91 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470B - M110 - N959 - 630 - RHR - M55 (LBR) - M91 - M92 - MELR - H0702 ( 7'- 2" ) | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 996 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 1 | Astragal, Adjustable | 351CPK/351C - 2 Pc Unit (Smoke Gasket) x 80" | Pemko |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 72" x 80" | Pemko |
| 1 | Power Supply | Power Supply by Security Section | By Others |
| 1 | Diagrams | Diagrams - Elevation and Riser | By MFR |
| 1 | Diagrams | Diagrams - Point To Point | By MFR |

**Hardware Set 101**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - LHR | Roton |
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf - RHR | Roton |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - LHR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - RHR | Corbin-Russwin |
| 2 | Cylinder, Mortise | Cylinder - Mortise - 626 | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 2 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 80" | Corbin-Russwin |
| 2 | Closer, Par Arm - HO | CPS-7500 - T - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Astragal, Adjustable | 351CV/351C - 2 Pc Unit (Sound Seals - Astragal) x 80" | Pemko |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 72" x 80" | Pemko |
| 6 | Filler Plate | Filler Plates [ Strike / Hinge ] - verify in field type, size and quantity required to finish opening. | Don-Jo |

**Hardware Set 102**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - LHR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - RHR | Corbin-Russwin |
| 2 | Cylinder, Mortise | Cylinder - Mortise - 626 | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 2 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 80" | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( LHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 2 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Astragal, Adjustable | 351CV/351C - 2 Pc Unit (Sound Seals - Astragal) x 80" | Pemko |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 72" x 80" | Pemko |

**Hardware Set 103**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Exit Device, Rim | ED5200 - M110 - EO - 630 - LHR - M61 ( Exit Alarm ) | Corbin-Russwin |
| 1 | Cylinder, Mortise - Alarm | Cylinder - Mortise - 626 - Exit Alarm | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm | PR7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 104**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - RHR | Corbin-Russwin |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 | Section 087100 |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Closer, Par Arm | PR7500 - 689 - 170 Degree Swing | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 111**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Exit Device, VR_Surf. | ED5470B - M110 - N950 (DUMMY TRIM) - 630 - LHR - M55 (LBR) | Corbin-Russwin |
| 1 | Exit Device, VR_Surf._Key | ED5470B - M110 - N955 - 630 - RHR - M55 (LBR) | Corbin-Russwin |
| 1 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 2 | Electromagnetic Door Release | 996 - TRI-VOLTAGE - 689 ( Wall Mounted Magnet ) | Rixson |
| 1 | Astragal, Adjustable | 351CPK/351C - 2 Pc Unit (Smoke Gasket) x 80" | Pemko |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 72" x 80" | Pemko |

**Hardware Set 112**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - LHR | Corbin-Russwin |
| 1 | Exit Device, Rim_Key_DC | ED5202 - M110 - N955 (Double Cylinder) - 630 - RHR | Corbin-Russwin |
| 2 | Cylinder, Mortise | Cylinder - Mortise - 626 | Section 087100 |
| 1 | Cylinder, Mortise | Cylinder - Mortise - 626 ( Removeable Mullion ) | Section 087100 |
| 2 | Cylinder, Rim | Cylinder - Rim - 626 | Section 087100 |
| 1 | Mullion, Removable_Key | 910 - M57 - M96 (Alum Frame Bracket) - 689 - 84" | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500-T - 689 ( At 90 Degrees ) @ RHR Leaf | Norton |
| 1 | Closer, Par Arm - HO | PR7500 - H ( LHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) @ LHR Leaf | Norton |
| 2 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Astragal, Adjustable | 351CV/351C - 2 Pc Unit (Sound Seals - Astragal) x 84" | Pemko |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 72" x 84" | Pemko |

**Hardware Set 201**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom | CLX3355 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 211**

| | | | |
|---|---|---|---|
| 1 | Hinge, Continuous Geared | 780 - 112 HD - 83" - CLEAR - Conc. Leaf | Roton |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( LHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Armor Plate | K1050 - 34" x 42" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 212**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( HD / Stop Arm to 90 Degrees ) ( Install "PUSH" Side ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 213**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Holder/Stop, Overhead - Surf. | 9ADJ-326 - Hold Open - (33-1/16" - 38' Door) - 689 | Rixson |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 214**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 215**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 216**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 231**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 232**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 233**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - "T" STRIKE | Corbin-Russwin |
| 1 | Holder/Stop, Overhead - Surf. | 9ADJ-326 - Hold Open - (33-1/16" - 38' Door) - 689 | Rixson |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 234**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 235**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 236**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Classroom Security | CLX3352 - ( Security Function ) - NZD - 626 - "MODIFY STRIKE PREP" | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 301**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Holder/Stop, Overhead - Surf. | 9ADJ-326 x 5458 LH - Hold Open - (33-1/16" - 38' Door) - 689 | Rixson |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 302**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 | Corbin-Russwin |
| 3 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Armor Plate | K1050 - 34" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |

**Hardware Set 303**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Holder/Stop, Overhead - Surf. | 9ADJ-326 x 5458 LH - Hold Open - (33-1/16" - 38' Door) - 689 | Rixson |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 304**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Holder/Stop, Overhead - Surf. | 9ADJ-326 - Hold Open - (33-1/16" - 38' Door) - 689 | Rixson |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 305**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 311**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 312**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Entrance or Office | CLX3351 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 401**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 402**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 403**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 404**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 405**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 406**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 407**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 36" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 38" x 84" | Pemko |

**Hardware Set 411**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Bolts, Flush - Automatic | 2942 - US26D (Top and Bottom Set) | Rockwood |
| 1 | Dust Proof Strike | 570 - US26D | Rockwood |
| 2 | Closer, Reg Arm | 7500 - 689 | Norton |
| 2 | Kick Plate | K1050 - 12" x 36" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Astragal, Overlapping | 357SP w/S88 x 84" (Install On "PUSH SIDE" of LH In-Active Leaf) | Pemko |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 72" x 84" | Pemko |

**Hardware Set 421**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 422**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 423**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 36" x 80" | Pemko |

**Hardware Set 424**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Par Arm | PR7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 36" x 80" | Pemko |

**Hardware Set 425**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 431**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Bolts, Flush - Automatic | 2942 - US26D (Top and Bottom Set) | Rockwood |
| 1 | Dust Proof Strike | 570 - US26D | Rockwood |
| 2 | Stop, Overhead - Surf. | 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 1 | Astragal, Overlapping | 357SP x 80" (Install On "PUSH SIDE" of LHR In-Active Leaf) | Pemko |
| 2 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 432**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Bolts, Flush - Automatic | 2942 - US26D (Top and Bottom Set) | Rockwood |
| 1 | Dust Proof Strike | 570 - US26D | Rockwood |
| 1 | Coordinator, Door | 2672 - 628 (72") + 2 Mtg Bkts | Rockwood |
| 2 | Closer, Par Arm | PR7500 - 689 | Norton |
| 1 | Astragal, Overlapping | 357SP w/S88 x 80" (Install On "PUSH SIDE" of LHR In-Active Leaf) | Pemko |
| 1 | Smoke Gasket | S88D (Smoke Gasket) - 72" x 80" | Pemko |

**Hardware Set 441**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - M21 (KLO) - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - H - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 442**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - M21 (KLO) | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 451**

| | | | |
|---|---|---|---|
| 2 | Hinge, Continuous Geared | 780 - 112 HD - 79" - CLEAR - Conc. Leaf | Roton |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - M21 (KLO) | Corbin-Russwin |
| 1 | Bolts, Flush - Automatic | 2842 - US26D (Top and Bottom Set) | Rockwood |
| 1 | Dust Proof Strike | 570 - US26D | Rockwood |
| 1 | Coordinator, Door | 2696 - BLK / 628 (96") + 2 Mtg Bkts | Rockwood |
| 1 | Closer, Par Arm - HO | PR7500 - H ( LHR ) - 689 ( HD - Hold Open Arm to 90 Degrees ) | Norton |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 90 Degrees ) | Norton |
| 1 | Astragal, Overlapping | 357SP w/S88 x 80" (Install On "PUSH SIDE" of LHR In-Active Leaf) | Pemko |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 96" x 80" | Pemko |

**Hardware Set 452**

| | | | |
|---|---|---|---|
| 6 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Lockset, Storeroom/Closet | CLX3357 - NZD - 626 - M17 - M21 (KLO) | Corbin-Russwin |
| 1 | Bolts, Constant Latching Flush | 2945 - US26D (Top and Bottom Set) | Rockwood |
| 1 | Dust Proof Strike | 570 - US26D | Rockwood |
| 1 | Coordinator, Door | 2672 - 628 (72") + 2 Mtg Bkts | Rockwood |
| 1 | Closer, Par Arm - HO | PR7500 - H ( LHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Closer, Par Arm - HO | PR7500 - H ( RHR ) - 689 ( HD - Hold Open Arm to 180 Degrees ) | Norton |
| 1 | Astragal, Overlapping | 357SP w/S88 x 80" (Install On "PUSH SIDE" of LHR In-Active Leaf) | Pemko |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 72" x 80" | Pemko |

**Hardware Set 501**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Latchset, Passage | CLX3310 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Stop, Overhead - Surf. | 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 | Rixson |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 502**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Latchset, Passage | CLX3310 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 503**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D - NRP | Hager |
| 1 | Latchset, Passage | CLX3310 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 601**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 - "T" STRIKE | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 602**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( Max Swing is 90 Degrees ) - (Install Push Side) | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 603**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 604**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 605**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 606**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm | PR7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 607**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Lockset, Privacy | CLX3320 - NZD - 626 - M17 | Corbin-Russwin |
| 1 | Closer, Par Arm | PR7500 - 689 | Norton |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 84" | Pemko |

**Hardware Set 701**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Push Plate | 70C - 4" x 16" - US32D | Rockwood |
| 1 | Pull Plate | BF-107 - 70C - 4" x 16" - US32D | Rockwood |
| 1 | Closer, Reg Arm | 7500 - 689 | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 3 | Silencer, HM Dr. Frame | 608 - Gray | Rockwood |

**Hardware Set 702**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Push Plate | 70C - 4" x 16" - US32D | Rockwood |
| 1 | Pull Plate | BF-107 - 70C - 4" x 16" - US32D | Rockwood |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

**Hardware Set 703**

| | | | |
|---|---|---|---|
| 3 | Hinge, Ball Bearing | BB1279 - 4.5 x 4.5 - US26D | Hager |
| 1 | Push Plate | 70C - 4" x 16" - US32D | Rockwood |
| 1 | Pull Plate | BF-107 - 70C - 4" x 16" - US32D | Rockwood |
| 1 | Closer, Par Arm - Cush/Stop | CPS-7500 - 689 ( At 90 Degrees ) | Norton |
| 1 | Mop Plate | K1050 - 04" x 35" - 18 ga. - US32D ( Pull Side of Door ) | Rockwood |
| 1 | Kick Plate | K1050 - 12" x 34" - 18 ga. - US32D | Rockwood |
| 1 | Stop, Wall | 409 - US26D | Rockwood |
| 1 | Sound Gasket | S773D x S44D (Gasket, Sound Seals) - 36" x 80" | Pemko |

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END OF SECTION 08 71 00

# SECTION 08 80 00 - GLAZING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Interior and exterior doors.
2. Glazed curtain walls.
3. Glazed entrances and storefronts.
4. Interior borrowed lites.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 08 Section “Hollow Metal Doors and Frames.”
3. Division 08 Section “Flush Wood Doors.”
4. Division 08 Section “Aluminum-Framed Entrances and Storefronts.”
5. Division 08 Section “Aluminum Windows” for factory glazed aluminum windows.

### 1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

### 1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads", and the Connecticut State Building Code.

1) Ultimate Design Wind Speed: 135 mph.
2) Risk Category: III.
3) Exposure Category: B.

b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 3 seconds or less.

c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. Center-of-Glass Values: Based on using LBL-35298 WINDOW 5.2 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
b. Solar Heat Gain Coefficient: NFRC 200.
c. Solar Optical Properties: NFRC 300.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

C. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Fire-resistive (safety) glazing products.
2. Insulating glass for each designation indicated.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers.

B. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

C. Product Test Reports: For each of the following types of glazing products:

1. Coated float glass.
2. Insulating glass.
3. Glazing sealants.

D. Warranties: Special warranties specified in this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass, and insulating glass.

D. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

E. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

F. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

G. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201**.**

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Construction Manager.
2. Build glass mockups by installing the following kinds of glass in mockups specified in Division 08 Section "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods:

a. Coated insulating glass.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Laminated Security Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Ceramic-Coated Spandrel Glass for use in Insulated Units: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.

1. Basis-of-Design Product: Subject to compliance with requirements provide **Oldcastle Building Envelope; Opaci-Coat 300** or one of the following:

a. Guardian Industries Corporation; Spandrel.
b. Viracon; Spandrel.

2. Glass: Clear float.
3. Ceramic Coating Color: As selected by Architect from manufacturer’s full range.

D. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

2.2 INSULATING GLASS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Guardian Glass; SunGuard SN 68** or comparable product by one of the following:

1. Viracon, Inc.
2. Vitro Architectural; Solarban 60.

B. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
2. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Polyisobutylene and silicone.

3. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

    a. Spacer Material: Aluminum with mill or clear anodic finish.
    b. Desiccant: Molecular sieve or silica gel, or blend of both.
    c. Corner Construction: Manufacturer's standard corner construction.

## 2.3 LAMINATED SECURITY (SAFETY) GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

    **a. LTI Smart Glass, Inc.; School Guard Glass SG4.**

2. Construction: Proprietary construction consisting of outer layers of glass with a custom security strengthened substrate core.
3. Physical Characteristics:

    a. No more than 4.1 lbs. per square foot
    b. 5-aa1 rated for a minimum of 6 minutes
    c. Glass clad on interior and exterior surfaces
    d. Optical Haze of no more than 1.8%

4. Interlayer Color: Clear.

B. Security Glazing: Security glass and surrounding frames shall demonstrate the ability, through independent third party testing, to provide the following attributes:

1. Products will be tested as a whole system, including glass and doors or frames.
2. Products tested shall be tested in full size, actual doors and framing members usable in a commercial setting, as applicable to project requirements, with security glazing installed as prescribed by the security glazing manufacturer. Testing shall not be done in framing other than what is specified in regards to quality or manufacturer as stated in the Contract Documents.
3. Glass bite during testing shall be no more than the allowable glass bite in the specified door or framing system for this project.
4. The security glass shall resist attack for a minimum of 6 minutes or greater to meet the desired level of protection required by the owner.

5. Attack duration shall be continuous. Breaks between testing phases shall not be counted or timed for total duration.
6. Security glass will be integrated into a framing system in such a way that the frame and glass are able to withstand a constant attack for 6 minutes.
7. Attack resistance shall mean the security glazing is subjected to the following without failure:

    a. Withstand a minimum of 5 shots from a military style assault rifle with a minimum caliber of 7.62mm.
    b. Withstand a minimum of abuse as applied by a single assailant at full force and including strikes with feet, bricks, hammers, baseball bats, and sledgehammers without stoppage for 6 or 12 minutes.

8. Failure is defined as a tear in the security glass large enough to allow an object 4-inches in diameter or more to pass through or separation made between the glass and surrounding door frame, storefront or curtain wall framing materials.
9. Product shall not be damaged or scratched by scissors, writing implements, razor blades or the use of any similar sharp object.
10. Glass shall not have an optical haze of more than 1.8% so glass is indistinguishable from standard tempered glass.

C. Test reports from a recognized independent testing company shall show testing means and methodology consistent or similar to the 5-aa1 assault test.

## 2.4 FIRE-RATED SAFETY GLAZING PRODUCTS

A. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252, including hose stream test.

B. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257, including hose stream test.

C. Laminated Ceramic Glazing (Fire Rated Safety Glazing): Proprietary Category II safety glazing product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces, transparent; weighing 4 lb/sq. ft.; complying with testing requirements in 16 CFR 1201 for Category II materials, and as follows:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
    b. SAFTI *FIRST*; Pyran Platinum L.
    c. Schott North America, Inc.; Pyran Platinum L.
    d. Vetrotech Saint-Gobain; Keralite FR-L.

2. Fire-Protection Rating: 45, 60 and 90 minutes as indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

## 2.5 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Corning Corporation; 795.
   b. GE Advanced Materials - Silicones; SilPruf SCS2000.
   c. Pecora Corporation; 895.
   d. Tremco Incorporated; Spectrem 2.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

   a. Use O Glazing Substrates: Coated glass and aluminum coated with a high-performance coating.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Product: Subject to compliance with requirements, provide the following:

   a. Dow Corning Corporation; DOW CORNING® 995 SILICONE STRUCTURAL SEALANT.

2. Application: For use in exterior aluminum framing systems with insulated, laminated security glazing.

D. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

## 2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

## 2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

## 3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

## 3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

## 3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

## 3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

## 3.7 MONOLITHIC FLOAT-GLASS SCHEDULE

A. **Glass Type A**: Clear fully tempered float glass.

1. Thickness: 6.0 mm (1/4 inch.).
2. Provide safety glazing labeling.

3.8 FIRE-RESISTANT GLAZING SCHEDULE

A. **Glass Type B**: 45-, 60-, or 90-minute fire-protection-rated glazing; laminated ceramic glazing.

3.9 INSULATING-GLASS SCHEDULE

A. **Glass Type C**: Low-E Insulating-Glass Units.

1. Overall Unit Thickness and Thickness of Each Lite: 1-inch unit thickness and 1/4-inch each lite.
2. Interspace Content: Argon.
3. Outdoor Lite: Clear fully tempered float glass.
4. Indoor Lite: Clear fully tempered float glass.
5. Low-E1 Coating: Sputtered on second surface.
6. Visible Light Transmittance: 70 percent minimum.
7. Winter Nighttime U-Factor: 0.24 maximum.
8. Solar Heat Gain Coefficient: 0.39 maximum.
9. Outdoor Visible Reflectance: 11 percent maximum.
10. Provide safety glazing labeling.

B. **Glass Type E**: Ceramic-coated, low-E, insulating spandrel glass, in locations indicated.

1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Interspace Content: Argon.
4. Outdoor Lite: Clear fully tempered float glass.
5. Indoor Lite: Clear fully tempered float glass.
6. Low-E1 Coating: Sputtered on second surface.
7. Opaque Coating Location: Fourth surface.
8. Winter Nighttime U-Factor: 0.24 maximum.

3.10 INSULATING-LAMINATED-GLASS SCHEDULE

A. **Glass Type D**: Low-E Insulating-Laminated-Glass Units for use in aluminum-framed entrances and storefront systems where indicated.

1. Overall Unit Thickness: 1-1/16-inch.
2. Thickness of Outdoor Lite: 6.0 mm.
3. Interspace Content: Argon.
4. Outdoor Lite: Clear fully tempered float glass.
5. Indoor Lite: Clear laminated security glass.
6. Low-E1 Coating: Sputtered on second surface.
7. Visible Light Transmittance: 70 percent minimum.
8. Winter Nighttime U-Factor: 0.24 maximum.
9. Solar Heat Gain Coefficient: 0.39 maximum.
10. Outdoor Visible Reflectance: 11 percent maximum.
11. Provide safety glazing labeling.

END OF SECTION 08 80 00

**SECTION 08 91 19 – FIXED LOUVERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

B. Related Sections:

1. Division 07 Section "Joint Sealants."
2. Division 23 Sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings, and in accordance with the Connecticut State Building Code.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to the Connecticut State Building Code.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

## 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of metal finish required.

F. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

G. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

## 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

## 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

D. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide subsills made of same material as louvers for recessed louvers.

F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Airolite Company, LLC (The); Model SCH601** or comparable product by one of the following:

a. American Warming and Ventilating, Inc.; a Mestek company.
b. Construction Specialties, Inc.
c. Industrial Louvers, Inc.
d. Ruskin Company; Tomkins PLC.

2. Louver Depth: 6 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.080 inch for frames.
4. Louver Performance Ratings:

a. Free Area: Not less than 7.58 sq. ft. (47%) for 48-inch- wide by 48-inch- high louver.
b. Air Performance: Not more than 0.32-inch wg static pressure drop at 1250-fpm free-area intake velocity.
c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 8 inches per hour and a wind speed of 50 mph at a core-area intake velocity of 295 fpm.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screen Location for Adjustable Louvers: Interior face unless otherwise indicated.
3. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Mill finish unless otherwise indicated.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

## 2.5 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.

## 2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

## 2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: Custom to match Architect’s sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Furnish and install spray foam sealants in accordance with Division 07 Section “Spray Foam Sealants.”

H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

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# SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing wall framing.
2. Non-load-bearing steel framing members for the following applications:
    a. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
    b. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
3. Interior gypsum board.
4. Exterior gypsum sheathing.
5. Tile backing panels.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking built into gypsum board assemblies.
3. Division 07 Section "Thermal Insulation" for thermal and sound attenuation insulation installed in assemblies that incorporate gypsum board.
4. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
5. Division 09 Section "Gypsum Board Shaft-Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
6. Division 09 Section “Tiling.”
7. Division 09 Section “Wall Coverings.”
8. Division 09 Section “Painting” for primers applied to gypsum board surfaces.

C. Products installed, but not furnished, under this Section include the following:

1. Access doors and frames, furnished by Fire Protection, Plumbing, Mechanical, and Electrical Subcontractors in accordance with Division 08 Section “Access Doors and Frames.”

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide interior and exterior non-load-bearing metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: In accordance with the Connecticut State Building Code and as indicated on Structural Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing for Rainscreen Assemblies: Horizontal deflection of 1/360 of the wall height.
b. Exterior Non-Load-Bearing Framing for Brick Veneer: Horizontal deflection of 1/600 of the wall height.
c. Interior Framing Systems:

1) Maximum Deflection: L/240 at 5 psf, stud spacing at 16 inches o.c.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
2. Provide interior framing systems sized to accommodate maximum deflection using limiting heights of metal studs without contribution of gypsum wallboard (non-composite).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For non-load-bearing metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

a. Include calculations for span capabilities of cold-formed metal framing for deflection criteria specified.

D. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

E. Welding certificates.

F. Qualification Data: For professional engineer.

G. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.

H. Research/Evaluation Reports: For cold-formed metal framing.

I. Warranty: Special warranty included in this Section.

## 1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer for the following:

1. Interior and exterior non-load bearing metal stud framing.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Connecticut and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

G. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

H. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

I. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

    a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

C. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## 1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace exterior gypsum sheathing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. ClarkDietrich Building Systems.
2. MarinoWare; a division of Ware Industries.
3. SCAFCO Steel Stud Company.

## 2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized.

B. Steel Studs: ASTM C 645, manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required by structural performance.
2. Flange Width: 1-5/8 inches.

C. Steel Track: ASTM C 645, manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required by structural performance.
2. Flange Width: 1-1/4 inches.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: As required by structural performance.
2. Flange Width: 1 inch plus the design gap for 1-story structures and 1 inch plus twice the design gap for other applications.

## 2.3 INTERIOR NON-LOAD-BEARING STEEL FRAMING

A. Interior Framing Members, General: Comply with ASTM C 645 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: Comply with ASTM C 645; roll-formed from hot-dipped galvanized steel; complying with ASTM A 1003/A 1003M and ASTM A 653/A 653M G40 or having a coating that provides equivalent corrosion resistance. A40 galvannealed products are not acceptable.

    a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authority having jurisdiction.

B. Steel Studs and Runners: ASTM C 645.

1. Non-Structural Studs: Cold-formed galvanized steel C-studs as per ASTM C 645 for conditions indicated below:

    a. Flange Size: 1-1/4-inch.
    b. Web Depth: As indicated on Drawings.

        1) Minimum Thickness: 0.033 inch.
        2) Minimum Design Thickness: 0.0346 inch.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Slotted steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ClarkDietrich Building Systems; BlazeFrame.
b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Posi Clips.
c. Metal-Lite, Inc.; The System.
d. Sliptrack Systems; SLP-TRK.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Design Thickness: 0.018 inch.
2. Depth: 7/8 inch.

## 2.4 SUSPENSION SYSTEM COMPONENTS

A. Grid Suspension System for Ceilings: ASTM C 645, direct-hung, double-web suspension system composed of main beams and cross-furring members that interlock.

1. Basis of Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Drywall Grid Systems** or one of the following:

a. CertainTeed Corporation; 1-1/2” Drywall Suspension System.
b. Rockfon; Chicago Metallic 660 Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2. Furring Runners: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2-inches high.
3. Furring Tees: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2-inches high with staked-on clip couplings, factory punched cross tee slots, and hanger holes.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

   a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

## 2.5 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed.
   b. G-P Gypsum.
   c. National Gypsum Company.
   d. USG Corporation.

B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

C. Recycled Content of Gypsum Panel Products:

1. Postconsumer recycled content not less than 5 percent.
2. Postindustrial recycled content not less than 94 percent.

D. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

E. Gypsum Ceiling Board: ASTM C 1396.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

F. Moisture- and Mold-Resistant Gypsum Board, ASTM C 1396/C 1396M. With moisture- and mold-resistant core and coated surfaces.

1. Thickness: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.
4. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed; M2Tech.
b. G-P Gypsum; ToughRock Fireguard X Mold-Guard Gypsum Board.
c. National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board.
d. USG Corporation; Mold Tough Firecode X Panels.

G. Abuse-Resistant and Moisture- and Mold-Resistant Gypsum Board (A.R.G.B.): Manufactured to produce greater resistance to surface indentation and abrasion than standard, regular-type and Type X gypsum board.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.
4. Abuse-Resistant Performance: Comply with ASTM C 1629 and the following:

a. Surface Abrasion: ASTM D 4977 modified with 25 lbs of additional weight, 0.059" maximum (Level 2 minimum).
b. Surface Indentation: ASTM D 5420, 0.10" maximum (Level 1).
c. Soft-Body Impact: ASTM E 695, surface failure at 195 ft.-lbs minimum (Level 2).
d. Hard-Body Impact: ASTM E 1629 Annex A.1, surface failure at 50 ft.-lbs minimum (Level 1).

5. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed; AirRenew Extreme Abuse Resistant Gypsum Board.
b. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Gypsum Board.
c. USG Corporation; Mold Tough AR Panels.

## 2.6 EXTERIOR SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Product: Subject to compliance with requirements, provide one of the following:

a. CertainTeed; GlasRoc Sheathing.
b. G-P Gypsum Corporation; Dens-Glass Sheathing.
c. National Gypsum; Gold Bond Brand e²XP Sheathing.
d. USG Corporation; Securock Glass-Mat Sheathing Panels.

2. Type and Thickness: Regular, 1/2 inch thick.

B. Sealant for Glass-Mat Gypsum Sheathing Board: Single component, nonsag sealant type compatible with exterior gypsum sheathing and with fluid-applied membrane air barriers specified in Division 07 "Fluid-Applied Membrane Air Barriers", and as recommended by sheathing manufacturers for covering exposed fasteners.

## 2.1 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. National Gypsum; PermaBase Cement Board.
   b. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.

## 2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

## 2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Sound Attenuation Blankets: As specified in Division 07 Section “Thermal Insulation.”

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

C. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

D. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

E. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## 2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of areas and substrates.

### 3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

## 3.4 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs for all applications at 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

## 3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, and to bottom track only where deflection track is indicated. Space studs as follows:

1. Stud Spacing: 16 inches o.c.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at 96-inch centers.

E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure, where indicated.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

## 3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

## 3.7 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: Walls and ceilings, as indicated on Drawings.
2. Abuse-Resistant Type: Walls, as indicated on Drawings.
3. Tile Backing Board: At all locations indicated to receive tile.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels either vertically (parallel to framing) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

## 3.8 GYPSUM SHEATHING INSTALLATION, GENERAL

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

D. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

## 3.9 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

## 3.10 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal exterior gypsum sheathing joints according to sheathing manufacturer's written instructions and to comply with Division 07 Section “Fluid Applied Membrane Air Barriers” for exterior gypsum sheathing to receive fluid applied membrane air barrier.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

## 3.11 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

B. Provide openings in backer panels which are coordinated with accessories and access door locations.

## 3.12 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

D. Aluminum Trim: Install in locations indicated on Drawings.

## 3.13 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
3. Level 5: At panel surfaces indicated to receive wall covering.

## 3.14 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

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# SECTION 09 21 16.23 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes gypsum board shaft-wall assemblies for the following:

1. Shaft-wall enclosures.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board shaft-wall assemblies.

### 1.3 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of non-load bearing metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For non-load bearing metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For professional engineer licensed in the State of Connecticut.

## 1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As follows:

a. Lateral Design Load (Sustained Air Pressure): 5 psf.
b. Dead Loads: Weights of materials and construction for horizontal applications.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Interior Non-Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
b. Horizontal Framing: Vertical deflection of 1/240 of the span, and twice the dead load weight.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

## 1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Connecticut and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of non-load bearing metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119, designated in the UL Fire Resistance Directory or Warnock Hersey.

D. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

E. Single Source Responsibility: Obtain gypsum liner panels and gypsum board products from a single manufacturer to maintain fire-resistance ratings of testing and inspecting agency for a complete gypsum board shaft-wall assembly.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:

1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
2. Wiring devices in shaft-wall assemblies.
3. Doors and other items penetrating shaft-wall assemblies.
4. Items supported by shaft-wall-assembly framing.
5. Mechanical work enclosed within shaft-wall assemblies.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed.
2. G-P Gypsum.
3. National Gypsum Company.
4. USG Corporation.

2.2 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Recycled Content of Gypsum Panel Products:

1. Postconsumer recycled content not less than 5 percent.
2. Postindustrial recycled content not less than 94 percent.

2.3 PANEL PRODUCTS

A. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.

1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.

a. Core: 1 inch thick.
b. Long Edges: Double bevel.

B. Gypsum Board: As specified in Division 09 Section "Gypsum Board Assemblies."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

1. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

## 2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 09 Section "Gypsum Board Assemblies" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

C. Gypsum Board Joint-Treatment Materials: As specified in Division 09 Section "Gypsum Board Assemblies."

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

E. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool. Comply with requirements in Division 07 Section “Thermal Insulation.”

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

G. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

## 2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: 51, minimum.

C. Studs: Manufacturer's standard, C-T profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: 2-1/2 inches, 4 inches, or 6 inches as required to comply with structural performance requirements.
2. Minimum Base-Metal Thickness: 25 gauge minimum, as required to comply with structural performance requirements.

D. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 3 inches long and in depth matching studs.

1. Minimum Base-Metal Thickness: Matching steel studs.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ClarkDietrich Building Systems; BlazeFrame.
b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Posi Clips.
c. Metal-Lite, Inc.; The System.
d. Sliptrack Systems; SLP-TRK.

F. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 20 gauge.

G. Room-Side Finish: As indicated by wall type designation on Drawings.

H. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

I. Insulation: Sound attenuation blankets.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, *elevator hoistway door frames*, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Notify Construction Manager and proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work acknowledges acceptance of substrates.

## 3.2 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Division 09 Section "Gypsum Board Assemblies" for applying and finishing panels.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.

H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

## 3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16.23

**SECTION 09 30 00 - TILING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Porcelain tile.
2. Ceramic tile.
3. Crack-suppression membrane for thin-set tile installations.
4. Metal edge strips installed as part of tile installations.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 02 Section “PCB Abatement” for existing CMU and glazed CMU to be abated prior to tile installation by this Section.
3. Division 03 Section “Concrete Moisture Vapor Reduction Admixture” for integral waterproofing installed in new concrete slabs.
4. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
5. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
6. Division 09 Section “Gypsum Board Assemblies” for tile backing panels.
7. Division 09 Section “Water Vapor Emission Control System.”

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

D. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 PERFORMANCE REQUIREMENTS

A. Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per the DCOF AcuTest in accordance with ANSI A137.1 – 2012 standard.

1. Level Surfaces: Minimum 0.42 wet.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives, grouts and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Indicate locations of all piping penetrations and penetrations for all accessories and access doors.

D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

E. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch lengths.

## 1.7 INFORMATIONAL SUBMITTALS

A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Qualification Data: For Installer.

D. Material Test Reports: For each tile-setting and -grouting product.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

## 1.9 QUALITY ASSURANCE

A. Sample Panel: Build sample panel to verify selections made under Sample submittals and to demonstrate aesthetic effects.

1. Build sample panel for each wall tile pattern indicated, in sizes approximately 36 inches long by 36 inches high. Include the following:

a. One outside corner for each unique condition, including metal edge.
b. One exposed top edge of tile wainscot condition.
c. One exposed end of tile condition, including metal edge.

2. Approval of sample panels is for color, texture, and blending of tile; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

B. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup of each type of floor tile installation.

2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preconstruction Testing Service: Moisture testing on new concrete slabs on grade to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section "Concrete Moisture Vapor Reduction Admixture."

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform moisture vapor emission testing indicated below.

1. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
2. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

## 1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Crack suppression membrane.
2. Metal edge strips.

## 2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. ISO 13007 Standards for Ceramic Tile, Adhesives and Grouts.

D. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As indicated by manufacturer's designations.

E. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

F. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

G. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

## 2.3 TILE PRODUCTS

A. Products, General: Performance requirements are indicated for basis of design products for the purpose of comparing equal or comparable products by listed manufacturers.

B. Tile Products: As indicated on Finish Legend.

C. Ceramic Floor Tile **(CFT-1):** Flat tile as follows:

D. Ceramic Floor Tile **(CFT-2):** Flat tile as follows:

E. Ceramic Wall Tile **(CWT-1):** Flat tile as follows:

## 2.4 CRACK-SUPPRESSION MEMBRANES FOR LARGE FORMAT, THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane.
b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
c. MAPEI Corporation; Mapelastic AquaDefense.

## 2.5 SETTING AND GROUTING MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.

a. Product: Subject to compliance with requirements, provide one of the following:

1) Custom Building Products; Versa Bond.
2) LATICRETE International, Inc.; 253 Gold.
3) MAPEI Corporation; Ultraflex 2.

2. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4 and ISO 13007 C2TES1.

a. Product: Subject to compliance with requirements, provide one of the following:

1) Custom Building Products; LFT.
2) LATICRETE International, Inc.; 254 Platinum.
3) MAPEI Corporation; Ultraflex LFT.

C. Medium-Bed (LHT), Polymer Modified, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4 and A118.15.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; MegaLite Crack Prevention Mortar.
b. LATICRETE International, Inc.; 3701 Fortified Mortar.
c. MAPEI Corporation; Kerabond T/Keralastic System.

D. Primer: Synthetic, acrylic resin-based primer with bond-promoting silica aggregates suspended in a dispersion.

1. Product: Subject to compliance with requirements, provide one of the following, or equal:

**a.** Custom Building Products; MBP Primer.
b. MAPEI Corporation; ECO Prim Grip.

E. Epoxy Based Tile Grout: ANSI A118.33, and ISO 13007 RG for floors, RG and RGT for walls including base tile.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; Ceg-Lite.
b. LATICRETE International Inc.; Laticrete SpectraLOCK Pro.
c. MAPEI Corporation; MAPEI Kerapoxy CQ.

2. Colors: As selected by Architect from manufacturer’s full range for each tile indicated.

## 2.6 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

## 2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Shape indicated, height to match tile and setting-bed thickness, metallic, designed specifically for flooring and wall applications, exposed-edge material as indicated.

1. Basis of Design Products: Subject to compliance with requirements, provide products indicated by **Schluter Systems**, or the following:

   a. Profilitec.

2. Provide the following metal edge strips at all conditions indicated:

   a. Cove base transition at wall tile to floor tile

      1) Schlüter-DILEX-EKE:

         a) Material: Satin nickel anodized aluminum.
         b) Height: 5/16-inch, not less than required to suit tile thickness indicated.

   b. Vertical transition at outside corner, wall tile to wall tile:

      1) Schlüter-DIADEC:

         a) Material: Satin anodized aluminum.
         b) Height: 3/8-inch, not less than required to suit tile thickness.

C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## 2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
4. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
5. Moisture Testing for new concrete slabs on grade that contain integral waterproofing in accordance with Division 03 Section “Concrete Moisture Vapor Reduction Admixture.”

    a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.

6. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Existing Masonry Substrates: For existing masonry surfaces indicated to receive tile, comply with the following:

1. Paint on existing CMU and glazed CMU to be abated in accordance with Division 02 Section “PCB Abatement.”
2. Clean the entire surface with a hot water degreasing solution in accordance with SSPC-SP1.
3. Rinse the entire area with clean hot water and allow it to dry.

C. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

## 3.3 INSTALLATION, GENERAL

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in wet areas.
b. Tile floors consisting of tiles 8 by 8 inches or larger.
c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

E. Lay out tile wainscots to next full tile beyond dimensions indicated.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

G. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

## 3.4 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Ceramic Tile: 1/8 inch.

## 3.5 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:

1. Ceramic Tile: 1/8 inch.

C. Metal Edge Strips: Install at locations indicated.

## 3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

## 3.7 FLOOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation: TCNA F125A; interior floor installation on crack-suppression membrane over concrete; medium-bed mortar (LHT Mortar).

   a. Tile Type: Porcelain paver tile.
   b. Mortar: Medium bed (LHT), latex-portland cement mortar.
   c. Grout: Epoxy based grout.

2. Tile Installation: Interior floor installation on concrete; thin-set mortar; TCA F113 and ANSI A108.5.

   a. Tile Type: Unglazed mosaic tile.
   b. Thin-Set Mortar: Latex-portland cement mortar.
   c. Grout: Epoxy based grout.

## 3.8 WALL TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs:

1. Tile Installation: TCNA W244C; thinset mortar on cementitious backer units.

    a. Tile Type: Ceramic wall tile.
    b. Thin-Set Mortar: Latex-portland cement mortar.
    c. Grout: Epoxy based grout.

B. Interior Wall Installations, Masonry:

1. Ceramic Tile Installation: TCNA W202; thinset mortar.

    a. Tile Type: Glazed wall tile.
    b. Thin-Set Mortar: Latex-portland cement mortar.
    c. Grout: Epoxy based grout.

C. Interior Wall Installations, Existing Glazed Block:

1. Ceramic Tile Installation: TCNA W202; thinset mortar.

    a. Tile Type: Glazed wall tile.
    b. Primer: Synthetic resin based primer.
    c. Thin-Set Mortar: Latex-portland cement mortar.
    d. Grout: Epoxy based grout.

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# SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes:

1. Acoustical panels and exposed suspension systems for ceilings.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 07 Section “Linear Metal Soffits” for exterior metal linear plank ceiling/soffits.
3. Division 07 Section “Joint Sealants” for acoustical sealants furnished and installed by this Section in acoustical panel ceiling assemblies.
4. Division 09 Section “Gypsum Board Assemblies” for drywall suspension system for suspended gypsum board ceilings and soffits.
5. Division 09 Section “Sound-Absorbing Units” for sound absorbing ceiling units.
6. Division 21 Sections for sprinkler heads in acoustical panel ceilings.
7. Division 23 Sections for diffusers.
8. Division 26 Sections for lighting.
9. Division 27 Sections for security devices.
10. Division 28 Sections for technology devices.

### 1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/8 inch = 1 foot.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

F. Research/Evaluation Reports: For each acoustical panel ceiling and components.

G. Maintenance Data: For finishes to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## 1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

## 1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 10 percent of quantity installed, for each ceiling panel type.
2. Suspension System Components: Quantity of each exposed component equal to 10 percent of quantity installed, for each suspension system type.

## 1.10 WARRANTY

A. Special Warranty for Acoustical Panel Ceilings and Suspension Systems: Manufacturer’s standard form in which manufacturer agrees to replace acoustical panel ceilings and suspension systems that fail in materials or workmanship within specified warranty period.

1. Failure of ceiling panels includes sagging and warping, and growth of mold, mildew and stain causing bacteria.
2. Failure of suspension systems includes rusting.
3. Warranty does not cover damages that may occur from vibrations, fire, water, freezing temperatures, accident or any form of abuse or exposure to abnormal conditions.
4. Warranty Period, Typical: 30 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Connecticut State Building Code.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 450 or less.

### 2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

C. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

E. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide products as indicated by **Armstrong World Industries, Inc.** or a comparable product by one of the following:

1. CertainTeed, Inc.
2. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

**1. Ceiling Type C-1:**

a. Basis of Design Product: **Armstrong World Industries, Inc.; Ultima #1910.**

1) Type and Form: Type IV, mineral base with membrane-faced overlay; Form 1, nodular; with glass-fiber cloth overlay.
2) Pattern: E (lightly textured)
3) Color: White.
4) LR: Not less than 0.88.
5) NRC: Not less than 0.75.
6) CAC: Not less than 35.
7) Edge/Joint Detail: Square.
8) Thickness: 3/4 inch.
9) Modular Sizes: 24 x 24 inches.
10) Antimicrobial Treatment: BioBlock + and HumiGuard Plus.

**2. Ceiling Type C-2:**

a. Basis of Design Product: **Armstrong World Industries, Inc.; Ultima #1913.**

1) Type and Form: Type IV, mineral base with membrane-faced overlay; Form 1, nodular; with glass-fiber cloth overlay.
2) Pattern: E (lightly textured)
3) Color: White.
4) LR: Not less than 0.88.
5) NRC: Not less than 0.75.
6) CAC: Not less than 35.
7) Edge/Joint Detail: Square.
8) Thickness: 3/4 inch.
9) Modular Sizes: 24 x 48 inches.
10) Antimicrobial Treatment: BioBlock + and HumiGuard Plus.

3. **Ceiling Type C-3:** Washable, USDA certified.

   a. Basis of Design Product: **Armstrong World Industries, Inc.; Ultima Health Zone #1448.**

      1) Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with factory applied latex paint on acoustically transparent membrane.
      2) Pattern: E (lightly textured)
      3) Color: White.
      4) LR: Not less than 0.86.
      5) NRC: Not less than 0.80.
      6) CAC: Not less than 35.
      7) AC: Not less than 170.
      8) Edge/Joint Detail: Square.
      9) Thickness: 3/4 inch.
      10) Modular Size: 24 x 24 inches.
      11) Antimicrobial Treatment: BioBlock + and HumiGuard Plus.
      12) Grid: 15/16 inch.

4. **Ceiling Type C-4:** Exterior linear metal plank. Comply with Division 07 Section "Linear Metal Soffits."
5. **Ceiling Type C-5:** Gypsum board soffits. Comply with Division 09 Section "Gypsum Board Assemblies."
6. **Ceiling Type C-6A:**

   a. Basis-of-Design Product: Subject to compliance with requirements, provide the following or equal:

      **1) Armstrong World Industries, Inc.; Tectum Shapes.**

   b. Core: Cementitious-fiber board consisting of aspen wood fibers bonded with inorganic hydraulic cement.
   c. Nominal Overall Panel Thickness: 1-1/2 inches.
   d. Edge Profile: T-slot for cloud application.
   e. Panel Sizes: As indicated on Drawings.

      1) Concave: 41 x 46 inches.
      2) Convex: 43-1/2 x 46 inches.

   f. Color: Custom.
   g. Mounting: Suspended.

7. **Ceiling Type C-6B:**

   a. Basis-of-Design Product: Subject to compliance with requirements, provide the following or equal:

      **1) Armstrong World Industries, Inc.; SoundScapes Acoustical Canopies.**

b. Type: Mineral fiber preformed in canopy shape.
c. Modular Sizes:

1) 6258 Hill Canopy, 46-1/2 x 75 x 1-1/4 inches.
2) 6259 Valley Canopy, 46-1/2 x 75 x 1-1/4 inches.

d. Color: Custom.
e. Mounting: Complete installation hardware kit and cable for each canopy.

8. **Ceiling Type C-7:** Exposed structure.
9. **Ceiling Type C-8:** Gypsum ceiling board. Comply with Division 09 Section "Gypsum Board Assemblies."
10. **Ceiling Type C-9:**

a. Basis of Design Product: **USG; Billo 3-Dimensional Panels.**

1) Type: Preformed polycarbonate panels with USG Compasso Slim trim.
2) Color: White Opaque.
3) Modular Size: 24 by 24 inches.
4) Grid: 9/16"

11. **Ceiling Type C-10:** Wood fiber composite panels. Comply with Division 09 Section "Sound Absorbing Units."
12. **Ceiling Type C-11:** Gypsum ceiling board. Comply with Division 09 Section "Gypsum Board Assemblies."
13. **Ceiling Type C-12:** Painted CMU.
14. **Ceiling Type C-13:** Painted CMU.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

## 2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

I. Hold-Down Clips: Provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

1. Provide hold down clips in Vestibules.

## 2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation, with prefinished, cold-rolled, 15/16-inch-wide, metal caps on flanges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Prelude XL 15/16" Exposed Tee System** or a comparable product by one of the following:

a. CertainTeed; 15/16" Classic Stab System.
b. USG Interiors, Inc.; Donn DX/DXL.

2. Structural Classification: Intermediate duty system.
3. Face Design: Flat, flush.
4. Face Finish: White, typical.

## 2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Ceiling and Trim Transitions:

a. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Axiom Classic Trim,** or comparable product by one of the following:

1) Gordon Architectural; Contura Acoustical Trim.
2) USG Interiors, Inc.; Compasso Suspension Trim.

b. Sizes: 4” Axiom trim and 6”, 8” and 10” Axiom transitions.
c. Color: As selected by Architect from manufacturer’s full range.

2. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
3. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

## 2.7 ACOUSTICAL SEALANT

A. Products: Comply with Division 07 Section “Joint Sealants.”

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

## 3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

    a. Install moldings in one piece at all walls 12 feet or less in length. Minimize quantity of pieces at longer walls.
    b. Use factory edges where joining lengths of molding. Abut moldings where joined; do not overlap.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
3. Install hold-down clips in areas indicated.

## 3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

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**SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 02 Section “Selective Demolition” for removal of existing finishes.
3. Division 09 Section "Resilient Tile Flooring” for resilient tile flooring and flooring preparation requirements.
4. Division 09 Section “Tile Carpeting.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For resilient flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

## 1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Preconstruction Testing Service: Moisture testing on new concrete slabs on grade to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section “Concrete Moisture Vapor Reduction Admixture.”

C. Preconstruction Testing Service: Engage a qualified independent testing agency to perform moisture vapor emission testing indicated below.

1. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
2. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to flooring installation including, but not limited to, the following:

1. Review substrate conditions, moisture and pH test results, manufacturer’s installation instructions, and warranty requirements.
2. Document proceedings, including required corrective measures.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

## 1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.

3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 percent (50 linear feet for every 500 linear feet) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## 1.8 WARRANTY

A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Limited Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resilient flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.
2. Exclusions from warranty include the following:

a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
b. Damage to flooring products from high heels or spiked shoes.

C. Material Only Warranty: Additional written wear warranty, signed by manufacturer agreeing to repair or replace resilient flooring that fails in performance, materials, or workmanship within specified warranty period.

1. Rubber Stair Treads: Five years.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Basis-of-Design Product (**RB**): Subject to compliance with requirements, provide **Tarkett; BaseWorks** or a comparable product by one of the following:

a. Mannington Commercial; Optimum Edge.
b. Roppe; Pinnacle Base.

2. Style: Cove (base with toe).
3. Minimum Thickness: 0.125 inch.
4. Height: 6 inches, typical.
5. Lengths: Coils in manufacturer's standard length.
6. Inside and Outside Corners: Job formed, field cut mitered.
7. Colors: As indicated on Finish Legend.

2.2 RESILIENT STAIR ACCESSORIES

A. Treads:

1. Basis-of-Design Product (**RT)**: Subject to compliance with requirements, provide **nora systems, Inc.; norament stairtreads** or a comparable product by one of the following:

a. Roppe.
b. Tarkett.

2. Material Requirement: Type TS (rubber, vulcanized thermoset).
3. Surface Design: Type 2 design (designed).

a. Type 2 Design: Hammered.
b. Colors: As indicated on Finish Legend.

4. Manufacturing Method: Group 2, tread with contrasting color for the visually impaired.

a. Provide a 2-inch wide contrasting solid rubber color insert strip on each tread.
b. Color: As selected by Architect from manufacturer’s full range.

B. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

C. Nosing Height: 2- inches.

D. Thickness: 0.210- inch tapering to 0.153- inch.

E. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

F. Risers: Smooth, flat, toeless, height and length to cover risers; manufactured in one piece with treads.

## 2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Basis of Design Product: Subject to compliance with requirements, provide **Tarkett; Wheeled Traffic Transitions** for conditions indicated, or comparable product by one of the following:

   a. Mannington Commercial.
   b. Roppe Corporation.

2. Material: Rubber.
3. Provide manufacturer's standard reducer strip for conditions indicated.
4. Colors: As selected by Architect from full range of industry colors.

## 2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. Comply with Division 09 Section "Resilient Tile Flooring."

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates:

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Comply with floor preparation and underlayment requirements in Division 09 Section "Resilient Tile Flooring."

D. Comply with testing requirements in Division 09 Section "Resilient Tile Flooring", including moisture, and alkalinity and adhesion testing.

E. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

F. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

## 3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

## 3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

## 3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

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# SECTION 09 65 19 - RESILIENT TILE FLOORING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl tile.
2. Rubber floor tile.
3. Floor preparation.

B. Related Sections:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 02 Section “Selective Demolition” for removal of existing finishes.
3. Division 03 Section “Concrete Moisture Vapor Reduction Admixture” for integral waterproofing installed in new concrete slabs.
4. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
5. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and metal edge strips installed with resilient floor coverings.
6. Division 09 Section “Water Vapor Emission Control System” for topical moisture vapor emission control system installed on existing concrete slabs.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For resilient tile flooring, documentation from an independent testing agency indicating compliance with the FloorScore standard.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Samples for Initial Selection: For each type of floor tile indicated.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For each type of floor tile to include in maintenance manuals.

G. Warranty: Special warranties specified in this Section.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required. Provide one Master Installer for each product specified.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Preconstruction Testing Service for New Concrete Slabs: Moisture testing on new concrete slabs to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section “Concrete Moisture Vapor Reduction Admixture.”

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.

1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
2. ASTM F 3191, Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to flooring installation including, but not limited to, the following:

1. Review substrate conditions, moisture and pH test results, manufacturer’s installation instructions, and warranty requirements.
2. Document proceedings, including required corrective measures.

F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for each type of resilient flooring including resilient base and accessories.

a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

## 1.6 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

## 1.8 WARRANTY

A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resilient flooring and adhesives that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: Commencing from date of Substantial Completion:

a. Luxury Vinyl Tile: 15 years.
b. Rubber Tile: 10 years.

2. Exclusions from warranty include the following:

a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
b. Damage to flooring products from high heels or spiked shoes.

C. Installer Warranty: Written warranty, signed by Installer agreeing to repair or replace resilient flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 LUXURY VINYL FLOOR TILE

A. Luxury Vinyl Tile:

1. Basis of Design Product (**LVT-**): Subject to compliance with requirements, provide the following, or equal:

**a. Mannington Commercial; Color Anchor LVT.**

2. Tile Standard: ASTM F 1700.

a. Class: Class III, printed vinyl tile.
b. Type: A, smooth surface.

3. Thickness: 0.098 inch (2.5 mm) with 20 mil wear layer.
4. Edge Profile: Micro bevel.
5. Size: 12 by 24 inches.
6. Colors: As indicated on Finish Legend.

### 2.2 RUBBER FLOOR TILE

A. Tile Standard: ASTM F 1344, Class I-B, homogeneous rubber tile, through mottled.

1. Basis-of-Design Product (**RT**): Subject to compliance with requirements, provide **nora flooring Inc.; norament grano Article 1880** or a comparable product by one of the following:

    a. Mannington Commercial.
    b. Roppe.
    c. Tarkett.

2. Wearing Surface: Hammered.
3. Thickness: 0.14 inch (3.5 mm).
4. Static Load Limit: ASTM F 970, 800 psi.
5. Size: 40 inch by 40 inches.
6. Colors: As indicated on Finish Legend.

## 2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Provide manufacturer's recommended trowel-applied, full-spread, high moisture adhesive for each flooring product specified as required to maintain manufacturer and installer warranty requirements. Comply with manufacturer's requirements for installation on porous or non-porous substrates, and for maximum relative humidity and alkalinity in accordance with testing procedures indicated.
2. Adhesives shall have a VOC content of 50 g/L or less.
3. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.4 SUBSTRATE PREPARATION

A. Substrate Preparation for New Concrete: Comply with compatibility requirements of the manufacturer of integral waterproofing product specified in Division 03 Section "Concrete Moisture Vapor Reduction Admixture."

B. Substrate Preparation for Existing Concrete: For concrete slabs scheduled to receive water vapor emission control system, underlayment preparation is furnished and installed by Division 09 Section "Water Vapor Emission Control System."

C. Primer: ASTM C1059, Type I, latex formulation for use with underlayments.

1. Product: Subject to compliance with requirements, provide one of the following:

    a. Ardex; P 51 Primer.
    b. Koster; VAP 1-06.
    c. Laticrete; NXT Primer.
    d. MAPEI Corporation; Primer T for underlayments.

D. Underlayment: ASTM A118.4, 5000 psi compressive strength at 28 days; trowel applied cementitious underlayment for filling holes, depressions, and damaged areas of concrete slabs in excess of 1/2-inch depth.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Ardex; SD-P.
b. Koster; Repair Mortar.
c. Laticrete; NXT Patch.
d. MAPEI Corporation; Mapecem Quickpatch

E. Self-Leveling Underlayment: ASTM C109, minimum 4,200 psi compressive strength at 28 days; cementitious powder mixed with water to produce a free-flowing self-leveling underlayment for rapid leveling of concrete slabs that have been shot-blasted.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Ardex; K 15.
b. Koster; LevelStrong.
c. Laticrete; NXT Level Plus.
d. MAPEI Corporation; Novoplan 2 Plus.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 PREPARATION FOR NEW CONCRETE SLABS

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Test concrete slabs for moisture following installation of underlayment(s), but do not test surface of self-leveling underlayment for moisture or pH.

1. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
2. Moisture testing for new concrete slabs that contain integral waterproofing in accordance with Division 03 Section "Concrete Moisture Vapor Reduction System."

    a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound ("underlayment") and remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

## 3.3 PREPARATION FOR EXISTING CONCRETE SLABS

A. Prepare existing substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Prime all existing concrete surfaces. Allow primer to dry for 2 to 3 hours at 70 deg F, but not more than 24 hours before installation of underlayment. Areas of primer that have dried for more than 24 hours must be re-primed prior to application of underlayment. Comply with manufacturer's written recommendations and the following:

1. Primer: Pour, mop or spray primer onto the surface. Apply an even thickness of primer to the prepared substrate using a bristle broom. Remove any puddles or thick areas.
2. Underlayment: Apply underlayment to existing holes, depressions, and cracks in substrate as required for preparation of installation of self-leveling underlayment.

3. Self-Leveling Underlayment: Prime surface and install self-leveling underlayment within 24 hours. Pour or pump self-leveling underlayment over the primed substrate and spread with a spike roller or gauging rake. Use a smoothing paddle to combine pours and to obtain a flat smooth surface.

    a. Furnish and install self-leveling underlayment on all existing concrete slabs to receive new flooring, including those that have had existing VAT, VCT and/or mastic removed by the shot-blast method.

        1) Floor preparation work includes installation of underlayment as required and self-leveling underlayment in 1/4-inch thickness.
        2) Additional floor preparation work required in excess of 1/4-inch thickness for self-leveling underlayment, will be included in a Unit Price.

    b. Self-leveling underlayment is not required on existing terrazzo substrates.

D. Test concrete slabs for moisture following installation of underlayment(s), but do not test surface of self-leveling underlayment for moisture or pH.

1. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
2. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
    b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
    c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.

3. Porosity Testing: Perform tests as follows prior to installation of flooring.

    a. Perform water absorption testing in accordance with ASTM F 3191 to determine if the substrate surface is porous or non-porous.
    b. Substrate and ambient temperature: 75 +/- 10 degrees F.
    c. Ambient humidity: 50 +/- 10 percent relative humidity.

E. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

## 3.4 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

1. Installation is not to begin until the HVAC system is operational, and the following conditions are maintained for at least 48 hours before, during and 72 hours after completion:

a. Ambient Temperature: Between 65 and 85 degrees F, unless otherwise stated by installed products manufacturer.
b. Ambient Humidity: Between 35 and 55 percent, unless otherwise stated by installed products manufacturer.
c. Substrate Temperature: Not less than 65 degrees F or more than 85 degrees F before, during and after installation, unless otherwise stated by installed products manufacturer.

1) Do not install flooring unless substrate temperature is at least 5 degrees above dew point with temperature rising.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay rubber tiles with arrows in one direction.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Rubber Flooring:

1. Scrub rubber floor tiles with manufacturer’s standard surface cleaner to remove silicone mold release.
2. Remove solution with wet/dry vacuum; rinse with clear water and allow the floor to dry.
3. Apply one coat of manufacturer’s recommended sealer or dry buff as recommended by manufacturer.

D. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

**SECTION 09 67 23 - RESINOUS FLOORING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes:

1. High-performance resinous flooring systems.
2. Floor preparation.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 02 Section “Selective Demolition” for removal of existing flooring materials.
3. Division 03 Section “Concrete Moisture Vapor Reduction Admixture” for integral waterproofing installed in new concrete slabs.
4. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
5. Division 07 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.
6. Division 09 Section “Schedules for Finishes.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Samples for Initial Selection: For each type of exposed finish required.

D. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Material Test Reports: For each resinous flooring component.

G. Material Certificates: For each resinous flooring component, signed by manufacturer.

H. Maintenance Data: For resinous flooring to include in maintenance manuals.

I. Warranty: Special warranty included in this Section.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.
2. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- square floor area selected by Architect.

   a. Include 48-inch length of integral cove base.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preconstruction Testing Service for Existing Concrete: Engage a qualified independent testing agency to perform moisture vapor emission testing indicated below.

1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

E. Preinstallation Conference: Prior to installation of resinous flooring, conduct preinstallation meeting at Project site in accordance with Division 01 Section "Project Management and Coordination."

1. Meet with Architect and Owner's Representative.
2. Review substrate conditions, moisture testing reports, manufacturer's installation instructions, and warranty requirements.
3. Document proceedings, including corrective measures or actions required, and furnish copy to each participant.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

## 1.7 WARRANTY

A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Limited Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resinous flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.
2. Exclusions from warranty include the following:

a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
b. Damage to flooring products from high heels or spiked shoes.

## PART 2 - PRODUCTS

### 2.1 RESINOUS FLOORING, GENERAL

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

B. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM C 267 for immersion in the following reagents for not less than 7 days:

1. Acetic Acid 5 percent
2. Acetone
3. Amonimum Hydroxide 10 percent
4. Citric Acid 10 percent
5. Cola
6. Ethylene Glycol
7. Formaldehyde 10 percent
8. Gasoline
9. Hydrochloric Acid 10 percent and 20 percent
10. Lactic Acid 10-50 percent
11. Mineral Spirits
12. Nitric Acid 10 percent
13. Phosphoric Acid 10-80 percent
14. Salad Oil
15. Sodium Carbonate 2 percent and 20 percent
16. Sodium Chloride 10 percent
17. Syrup
18. Urine
19. Xylene

## 2.2 CEMENTITIOUS URETHANE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, epoxy/urethane -based, monolithic floor surfacing including preparation, primers and finish coats, designed to produce a seamless floor and integral cove base.

1. Basis of Design Product (**PRF-1**): Subject to compliance with requirements, provide **Dur-A-Flex, Inc; Polycrete MDB** or comparable product by one of the following:

a. Florock.
b. General Polymers Corporation, a division of the Sherwin-Williams Company.
c. Tnemec Company, Inc.

B. System Characteristics:

1. Color: As indicated on Finish Legend.
2. Wearing Surface: Slip resistant, standard.
3. Integral Cove Base (**PRB-1**): 4 to 6 inches.
4. Overall System Thickness: 1/4 inch.

C. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Topping: Dur-A-Flex, Inc, Poly-Crete MD resin, hardener and aggregate.
2. The aggregate shall be Dur-A-Flex, Inc. Flintshot quartz aggregate.
3. Topcoat: Dur-A-Flex, Inc. Poly-Crete Color-Fast resin, hardener and powder aggregate.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 7,800 per ASTM C 579.
2. Tensile Strength: 4,200 per ASTM C 307.
3. Flexural Strength: 1,000 psi per ASTM D 790.
4. Impact Resistance: 160 in. lbs per ASTM D 1709.
5. Abrasion Resistance: 30 mg maximum weight loss per ASTM C 501.
6. Flammability: Self-extinguishing per ASTM D 570.
7. Hardness: 65 per ASTM D 2240.
8. Coefficient of Friction (Topcoat): >0.60, (not less than 0.5) per ASTM D 2047.

## 2.3 EPOXY RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, epoxy-based, monolithic floor surfacing including preparation, primers and finish coats, designed to produce a seamless floor and integral cove base.

1. Basis of Design Product (**PF-1**): Subject to compliance with requirements, provide **Dur-A-Flex, Inc.; Shop Floor** or one of the following:

a. Florock; FloroShop.
b. Sherwin Williams; General Polymers Trafficote 105.
c. Tnemec Company, Inc.; System Series 241, 238 and 256 Topcoat.

B. System Characteristics:

1. Color: As indicated on Finish Legend.
2. Application: Broadcast aggregate.
3. Wearing Surface: Orange peel.
4. Overall System Thickness: 1/8- inch.

C. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer: Transparent, epoxy primer/sealer as recommended by manufacturer for substrate and body coat(s) indicated (Dur-a-Glaze #4).

a. Thickness of coat: 8 mils.

2. Body Coat: Shop Floor.

a. Resin: 100% solids epoxy with natural quartz aggregates.
b. Thickness of coat: 1/8- inch.

3. Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coat(s) indicated and that prevents substrate cracks from reflecting through resinous flooring.
4. Topcoat: Manufacturer’s standard pigmented topcoat (Dur-a-Glaze Shop Floor).

a. Formulation: High solids.
b. Type: Clear.
c. Thickness of coat: 15 mils.

5. Performance Topcoat: Manufacturer’s standard aliphatic urethane, high performance protective topcoat (Armor Top).

a. Formulation: High solids.
b. Type: Semi-gloss clear.
c. Thickness of coat: 3 mils.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Hardness: 75-80 Shore D per ASTM D 2240.
2. Compressive Strength: 17,500 psi per ASTM D 695.
3. Tensile Strength: 4,000 psi per ASTM D 638.
4. Flexural Modulus of Elasticity: $6.2 \times 10^5$ per ASTM D 790.
5. Water Absorption: 0.04% per ASTM D 570.
6. Indentation: .025 percent maximum per MIL-D-3134.

7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
9. Abrasion Resistance: 4 mg maximum weight loss per ASTM C 501.
10. Flammability: Self-extinguishing per ASTM D 570.
11. Bond Strength: 400 psi, 100 percent concrete failure per ASTM D 4541.
12. Coefficient of Friction: 0.8 per ASTM D 2047.

## 2.4 EPOXY RESINOUS FLOORING (SEALER)

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, epoxy/urethane -based, monolithic floor surfacing including preparation, primers and finish coats, designed to produce a seamless floor and integral cove base.

1. Basis of Design Product (**SC-1**): Subject to compliance with requirements, provide **Dur-A-Flex, Inc; Dur-A-Gard MR** or comparable product by one of the following:

a. Florock.
b. General Polymers Corporation, a division of the Sherwin-Williams Company.
c. Tnemec Company, Inc.

B. System Characteristics:

1. Color: As indicated on Finish Legend.
2. Wearing Surface: Slip resistant
3. Overall System Thickness: 40 mils.

C. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer: Dur-A-Flex, Inc, Elast-O-Coat resin and hardener.
2. Base Coat: Dur-A-Flex, Inc, Dur-A-Gard resin and hardener
3. Topcoat: Dur-A-Flex, Inc. Armor Top pigmented resin and hardener and pigment.

## 2.5 ACCESSORY MATERIALS

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Existing Tile Substrates: Shot-blast surfaces of existing tile with an apparatus that abrades the surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

C. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen new concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 to 5 lb. of water/1000 sq. ft. in 24 hours, as required by manufacturer’s written recommendation for maximum moisture content.
b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

5. Moisture testing for new concrete slabs that contain integral waterproofing in accordance with Division 03 Section “Concrete Moisture Vapor Reduction System.”

a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.
b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

## 3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Integral Cove Base: Apply cove base mix, 6 inches high, to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

E. Apply topcoats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

## 3.3 FLOOR SYSTEM INSTALLATION

A. System Installation (**PRF-1)**: Install specified system in three distinct steps as follows:

1. Substrate preparation
2. Topping/overlay application with quartz aggregate broadcast.
3. Topcoat application with anti-slip aggregate broadcast.

B. Topping:

1. The topping shall be applied as a self-leveling system as specified. The topping shall be applied in one lift with a nominal thickness of 3/16 inch.

2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using a pin rake, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a 15/16 inch spiked roller.
6. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 1 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

C. Topcoat:

1. The topcoat shall be mixed and applied per manufacturer recommended procedure.
2. The topcoat shall be comprised of three components, a resin, hardener and filler as supplied by the manufacturer.
3. The topcoat will be applied at the rate of 100 sf/kit.
4. Non-Skid is broadcast at the rate of 1 lb per 100 sf and back rolled into the coating.
5. The finish floor will have a nominal thickness of 1/4 inch.

## 3.4 FLOOR SYSTEM INSTALLATION

A. System Installation (**PF-1):**

1. The system shall be applied in seven distinct steps as listed below:

    a. Substrate preparation
    b. Priming
    c. First broadcast coat application with first aggregate broadcast
    d. Second broadcast coat with second aggregate broadcast
    e. Grout coat application, sand floor (if required)
    f. Topcoat application, urethane

2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer:

1. The primer shall consist of a liquid resin and hardener that is mixed at the ratio of 1 parts resin to 4 part hardener per the manufacturer’s instructions.

2. The primer shall be applied by flat squeegee and back rolled at the rate of 200-250 sf/gal to yield a dry film thickness of 4 mils.

C. Broadcast Coats:

1. The broadcast coat shall be applied as a double broadcast system as specified by the Architect.
2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The broadcast coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 90-100 sf/gal.
5. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 0.5 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
7. Apply a second coat of resin with a coverage rate of 90-100 sf/gal and broadcast aggregate to excess at the rate of 0.5 lbs/sf.
8. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout Coat:

1. The grout coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
2. The grout coat shall be squeegee applied with a coverage rate of 90 sf/gal (flintshot).
3. The grout coat will be back rolled and cross rolled to provide a uniform texture and finish.
4. Orange peel texture: Sand screen the floor and apply a second grout coat of epoxy. The epoxy shall be applied by squeegee and back-roll with a coverage rate of 200 sf/gal (Flintshot).

E. Topcoat:

1. The topcoat of Armor Top shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin, hardener and grit that is mixed per the manufacturer's instructions.
3. The finished floor will have a nominal thickness of 1/8 inch.

## 3.5 FLOOR SYSTEM INSTALLATION

A. System Installation (**SC-1):**

1. The system shall be applied in four distinct steps as listed below:

   a. Substrate preparation
   b. Priming

c. Base coat application.
d. Topcoat application

2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Membrane

1. The Elast-O-Coat membrane shall consist of a liquid resin and hardener that is mixed at the ratio of 2 parts resin to 1 part hardener per the manufacturer’s instructions.
2. The Elast-O-Coat membrane shall be applied by flat squeegee and back rolled at the rate of 80 sf/gal to yield a dry film thickness of 20 mils.

C. Base Coat

1. The base coat shall be comprised of two component Dur-A-Gard, a resin, and hardener as supplied by the Manufacturer.
2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The base coat shall be applied over horizontal surfaces using “v” notched squeegee and back rolled at the rate of 100 sf/gal to yield a dry film thickness of 16 mils.

D. Topcoat

1. The topcoat shall be comprised of three components, a resin, hardener, and pigment as supplied by the Manufacturer.
2. The resin and pigment shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The topcoat shall be applied over horizontal surfaces at the rate of 500 sf/gal to yield a dry film thickness of 3-4 mils.
4. The finish floor will have a nominal thickness of 40 mils.

## 3.6 FIELD QUALITY CONTROL

A. The following tests shall be conducted by the Applicator:

1. Temperature: Air, substrate temperatures and, if applicable, dew point.
2. Coverage Rates: Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.7 CLEANING AND PROTECTING

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

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# SECTION 09 67 66 - FLUID-APPLIED ATHLETIC FLOORING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes:

1. Polyurethane flooring fluid-applied over base mats.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 09 Section "Resilient Base and Accessories" for wall base and accessories installed with fluid-applied athletic flooring.
3. Division 09 Section “Water Vapor Emission Control System” for topical moisture vapor emission control system installed on existing concrete slabs.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For flooring, documentation from an independent testing agency indicating compliance with the FloorScore standard.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show installation details for flooring including layout, colors, widths, and dimensions of game lines and markers and locations of athletic equipment floor inserts.

D. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for flooring and game-line and marker paints.

E. Samples for Verification: For each color, gloss, and texture of flooring required, 12 inches square, applied to a rigid backing. Include sample sets showing the game-line and marker paint colors applied to the flooring.

## 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Warranty: Special warranty included in this Section.

## 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fluid-applied athletic flooring to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An Installer (Applicator) who is approved, trained, or certified by fluid-applied athletic flooring manufacturer.

1. The Installer and Manufacturer of fluid applied athletic flooring system shall have a minimum of ten years' experience in the application of polyurethane surfacing for athletic interior applications, and in manufacturing two-component polyurethane.
2. The Installer shall have installed a minimum of ten (10) zero-mercury, cast in place, two-component polyurethane athletic floors with a resilient base mat.

B. Preconstruction Testing Service for Existing Concrete: Engage a qualified independent testing agency to perform moisture vapor emission testing indicated below.

1. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
2. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to flooring installation including, but not limited to, the following:

1. Review substrate conditions, moisture and pH test results, manufacturer's installation instructions, and warranty requirements.
2. Document proceedings, including required corrective measures.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with flooring manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting flooring application.

1. Do not apply flooring until spaces are enclosed and weatherproof; wet work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete.
2. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 65 deg F or more than 95 deg F, and relative humidity at a maximum of 50 percent, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
3. After installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 65 deg F or more than 95 deg F, with a relative humidity at a maximum of 50 percent.
4. Close spaces to traffic during flooring installation.

1.8 COORDINATION

A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.9 WARRANTY

A. Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace fluid applied athletic flooring that fails in performance, materials, or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide flooring systems tested by a qualified testing agency according to DIN V 18032-2 and/or EN 14904 and shown to meet the following requirements:

1. Shock Absorption: Minimum 28 percent.
2. Vertical Deformation: Minimum 1.4 mm.
3. Ball Bounce: Minimum 98 percent.
4. Linear Friction (Dry): 98.
5. Rolling Loads: No damage when subjected to ≥ 1500 N.
6. Resistance to Impact: ≥ 800 gr @ 10 deg C.

B. Low-Emitting Materials: Flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 FLOORING APPLIED OVER BASE MATS

A. Basis of Design Product (**AF-1**): Subject to compliance with requirements, provide **Robbins Sports Surfaces; Pulastic Classic 110** or one of the following:

1. Aacer Sports Flooring, LLC; MP Sport.
2. Action Floor Systems; Herculan MF 9+2.
3. Dynamic Sports Construction; DynaForce.
4. Icon; MultiSport 9+2 Fluid Applied Athletic Flooring.
5. Tarkett Sports Indoor; Polyturf Plus Pad and Pour 9+2.

B. Description: A cast in place, zero-mercury, fluid-applied athletic flooring system consisting of resilient base mat adhered to substrate, base mat sealer, and a two-component fluid-applied polyurethane body and top coats.

1. Low-Emitting Materials: Products shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

a. Base Mat Adhesive: VOC content of not more than 60 g/L.
b. Base Mat Sealer: VOC content of not more than 200 g/L.
c. Body and Topcoats: VOC content of not more than 100 g/L.

C. Materials:

1. Base Mat: Manufacturer's standard base mats of granulated recycled rubber in polyurethane binder.

a. Total Thickness: 11 mm.

2. Base-Mat Adhesive: Manufacturer's standard two-component polyurethane.
3. Base-Mat Sealer: Manufacturer's standard two-component polyurethane compound formulated for sealing base mat.
4. Body Coats: Two-component, self-leveling, pigmented, polyurethane containing no rubber fillers and no mercury.

a. Finished Thickness of Wear Layer: 2 mm.
b. Properties:

1) Tensile Strength (DIN 53455): 1160 psi minimum.
2) Elongation at Break (DIN 53455): 150 percent.
3) Tear Strength (DIN 53455): 25 $N/mm^2$

5. Topcoat (Finish Coat): Manufacturer's standard pigmented polyurethane.

D. Finishes:

1. Color: As selected by Architect from manufacturer's full range.
2. Surface Texture: Manufacturer's standard matte.

## 2.3 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

B. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.

1. VOC Content: Not more than 500 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

## 3.2 PREPARATION

A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.

1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

B. Concrete Substrates: Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Remove contaminants using mechanical means.
2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
3. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Treat nonmoving substrate cracks and control joints to prevent cracks from telegraphing (reflecting) through flooring according to manufacturer's written instructions.

F. Protect substrate voids and joints to prevent flooring resins from flowing into or leaking through them.

G. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.

1. Do not install flooring until it is same temperature as space where it is to be installed.

H. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

I. Proceed with installation only after unsatisfactory conditions have been corrected.

J. Protect walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions during installation. Cover floor and wall areas at mixing stations.

## 3.3 FLOORING INSTALLATION, GENERAL

A. General: Mix and apply flooring components according to manufacturer's written instructions.

1. At substrate expansion, isolation, and other moving joints, install continuous joint of same width through flooring.

## 3.4 INSTALLATION OF FLOORING APPLIED OVER BASE MATS

A. Adhesively apply resilient base mats to substrate according to manufacturer's written instructions.

1. Do not compress mats when fitting into place. Leave gap of width recommended in writing by manufacturer at butted base-mat sheets, walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions.
2. Roll base mats to set them into adhesive and eliminate air pockets.
3. Repair ridges at seams, loose areas, and air pockets according to manufacturer's written instructions.

B. Apply seal coat to base mats before applying body coat(s).

C. Smooth ridges and high spots in seal coat before applying body coat(s).

D. Apply body coats and topcoat to produce a uniform surface and finish.

## 3.5 GAME LINES AND MARKERS

A. Mask flooring at game lines and markers, and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.

B. Lay out game lines and markers to comply with rules and diagrams published by National Federation of State High School Associations for athletic activities indicated.

## 3.6 PROTECTION

A. Close spaces to traffic for seven days after flooring installation unless manufacturer recommends longer period in writing.

B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 67 66

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**SECTION 09 68 13 –TILE CARPETING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes:

1. Modular carpet tile
2. Modular tile entrance mats.
3. Floor preparation.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 02 Section “Selective Demolition” for removal of existing floor finishes.
3. Division 03 Section “Concrete Moisture Vapor Reduction Admixture” for integral waterproofing installed in new concrete slabs.
4. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
5. Division 09 Section “Resilient Tile Flooring” for underlayment and floor preparation requirements.
6. Division 09 Section "Resilient Base and Accessories" for resilient wall base and molding accessories installed with carpet tile.
7. Division 09 Section “Water Vapor Emission Control System” for topical moisture vapor emission control system installed on existing concrete slabs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Product Data for Credit 5d:

    a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
    b. For installation adhesive, documentation including printed statement of VOC content.

4. Laboratory Test Reports for Credit 5d: For carpet and installation adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

1. Provide test reports indicating that carpet tile is suitable for installation over hydronic radiant heating system in new concrete slabs on grade where the temperature of the slab does not exceed 85 deg F.

H. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

I. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.

1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
2. ASTM F 3191, Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

E. Preconstruction Testing Service for New Concrete Slabs: Moisture testing on new concrete slabs to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section “Concrete Moisture Vapor Reduction Admixture.”

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to carpet tile installation including, but not limited to, the following:

1. Review delivery, storage, and handling procedures.
2. Review ambient conditions and ventilation procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

B. Indoor Air Quality Management Plan: The following practices shall be implemented in accordance with the Construction Indoor Air Quality Management Plan as required in Division 01 Section "Indoor Air Quality Requirements."

1. Carpeting to be stored per manufacturer's recommendations for allowable temperature and humidity range. Products shall not be allowed to become damp.
2. Where feasible, remove carpeting from packaging and store in unoccupied, ventilated areas (100% outside air supply, minimum of 1.5 air changes per hour, and no recirculation) for 24-72 hours prior to installation. Carpeting shall not be stored with materials which have high emissions of VOCs or other contaminants. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.

## 1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

## 1.7 WARRANTY

A. Special Warranty for Carpet Tile: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
3. Warranty Period: Lifetime.

## 1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide the named product or comparable product by one of the following:

1. Mannington Commercial.
2. Shaw Contract.

B. Carpet Tile, General:

1. Performance Characteristics: As follows:

a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
b. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
c. Dimensional Stability: 0.10 percent or less per ISO 2551 (Aachen Test).
d. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC 16, Option E.
e. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
f. Electrostatic Propensity: Less than 3.0 kV per AATCC 134.
g. CRI Indoor Air Quality Control Green Label Plus certified.

**C. Carpet Type CPT-1,2,3,4,5: As indicated on Finish Legend.**

*1. Manufacturer:*
*2. Style:*
*3. Color: As indicated on Finish Legend.*
*4. Pile Characteristic: Tufted sheared.*
*5. Fiber Type: Post Consumer Content Nylon.*
*6. Dye Method: solution dyed.*
*7. Face Weight: 26 oz/sq. yd.*
*8. Pile Thickness: 0.14 inches.*
*9. Gauge: 1/10.*
*10. Stitches: 9.0 per inch.*
*11. Primary Backing System: Synthetic non woven.*
*12. Size:*

**D. Carpet Type: Entry Mat.**

1. Manufacturer: Tarkett.
2. Style: Assertive Action 04837.
3. Color: As indicated on Finish Legend.
4. Fiber Type: TDX Nylon.
5. Pile Characteristic: Symtex.
6. Dye Method: Solution dyed.
7. Face Weight: 29 oz/sq. yd.
8. Gauge: 1/10 inch.
9. Stitches: 9.0 per inch.
10. Pile Height: 0.187 inch.
11. Primary Backing System: Synthetic non woven.
12. Size: 24" x 24".

## 2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

1. Comply with requirements in Division 09 Section "Resilient Tile Flooring" for floor preparation requirements for new and existing concrete slabs.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Transition Strips: Vinyl, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Comply with Division 09 Section "Resilient Base and Accessories" for resilient moldings.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Test concrete slabs for moisture following installation of underlayment(s), but do not test surface of self-leveling underlayment for moisture or pH.

1. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
2. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
    b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
    c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.

3. Moisture testing for new concrete slabs that contain integral waterproofing in accordance with Division 03 Section "Concrete Moisture Vapor Reduction System."

    a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Porosity Testing: Perform tests as follows prior to installation of flooring.

    a. Perform water absorption testing in accordance with ASTM F 3191 to determine if the substrate surface is porous or non-porous.
    b. Substrate and ambient temperature: 75 +/- 10 degrees F.
    c. Ambient humidity: 50 +/- 10 percent relative humidity.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

1. Comply with Division 09 Section “Resilient Tile Flooring” for preparation of new and existing concrete slabs.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

1. Installation is not to begin until the HVAC system is operational, and the following conditions are maintained for at least 48 hours before, during and 72 hours after completion:

a. Ambient Temperature: Between 65 and 85 degrees F, unless otherwise stated by installed products manufacturer.
b. Ambient Humidity: Between 35 and 55 percent, unless otherwise stated by installed products manufacturer.
c. Substrate Temperature: Not less than 65 degrees F or more than 85 degrees F before, during and after installation, unless otherwise stated by installed products manufacturer.

1) Do not install flooring unless substrate temperature is at least 5 degrees above dew point with temperature rising.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

## 3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

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**SECTION 09 72 00 – WALL COVERINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes:

1. Digital wall covering.

B. Related Sections include the following:

1. Division 09 Section "Painting" for priming wall surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Samples for Initial Selection: For each type of wall covering indicated.

D. Samples for Verification: Full width by 36-inch- long section of wall covering from lot to be used for each type of wall covering indicated for each color, texture, and pattern required.

1. With specified treatments applied.
2. Show complete pattern repeat.
3. Mark top and face of material.

E. Schedule: For wall coverings. Use same designations indicated on Drawings.

F. Maintenance Data: For wall coverings to include in maintenance manuals.

G. Warranties: Sample of special warranty.

## 1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: As follows, Class A per ASTM E 84:

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

1. Provide a mockup for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install wall coverings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

## 1.6 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Material: Full-size units equal to 5 percent of amount of each type installed.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace wall coverings that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VINYL WALL-COVERING

A. Digital Wall Covering: Smooth finish, Class A.

1. Basis of Design Product: Subject to compliance with requirements, provide **Level Digital Wallcoverings (distributed by Surface Materials)** or comparable product by one of the following:

a. Koroseal.
b. MDC Interior Solutions.

2. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:

a. FS CCC-W-408 and CFFA-W-101 for Type II, Medium-Duty products.

3. Finish: Vinyl Stipple.
4. Backing: Osnaburg.
5. Width: 54 or 60 inches.
6. Total Weight Excluding Coatings: 20.0 oz./lineal yd.
7. Pattern:
8. Mural Size: As indicated.

2.2 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Division 09 Section "Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Gypsum Board: Prime with primer recommended by wall-covering manufacturer.
2. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 DIGITAL WALL-COVERING INSTALLATION

A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install wall covering without lifted or curling edges and without visible shrinkage.

D. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

E. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

F. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

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**SECTION 09 84 13 – FIXED SOUND-ABSORPTIVE PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes:

1. Acoustical wall panels.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 09 Section "Acoustical Panel Ceilings" for acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.
3. Division 09 Section “Sound Absorbing Units” for acoustical ceiling mounted units.

1.3 DEFINITIONS

A. NRC: Noise reduction coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For acoustical wall panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Include elevations showing panel sizes. Indicate panel edge and core materials.

D. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.

1. Fabric: Full-width by 36-inch- long Sample from dye lot to be used for the Work, and as follows:

a. With specified treatments applied.
b. Show complete pattern repeat.
c. Mark top and face of fabric.

2. Panel Edge: 12-inch- long Sample showing edge profile, corner, and finish.
3. Core Material: 12-inch- square Sample showing corner.
4. Mounting Device: Full-size Sample.

E. Product Certificates: For each type of acoustical wall panel, signed by product manufacturer.

F. Qualification Data: For fabricator and testing agency.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of acoustical wall panel.

H. Maintenance Data: For acoustical wall panels to include in maintenance manuals. Include manufacturers' written cleaning and stain-removal recommendations.

I. Warranty: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations: Obtain acoustical wall panels through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Install mockups in the location as directed by Architect.
2. Install mockup of typical wall area as shown on Drawings.

    a. Include intersection at wall and ceiling.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with acoustical wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Protect panel edges from crushing and impact.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical wall panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install acoustical wall panels until a permanent level of lighting is provided on surfaces to receive acoustical wall panels.

C. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of acoustical wall panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical wall panels that fail in performance, materials, or workmanship within specified warranty period.

1. Failure in performance includes, but is not limited to, acoustical performance.
2. Failures in materials include, but are not limited to facing distorting, or releasing from panel edge; or warping of core.
3. Warranty Period: Three years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Wall Panel Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than 5 attachment devices.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Core Materials: Manufacturer's standard.

1. Glass-Fiber Board: ASTM C 612; Type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 ACOUSTIC WALL PANELS

A. Acoustic Wall Panels: Polyester molded tiles mounted to a plastic base, with infill core.

1. Basis of Design Product (**AWP-1,2,3**): Subject to compliance with requirements, provide the following, or equal:

**a. Unika Vaev; Ecoustic Panel 50MM.**

2. Acoustical Performance: NRC rating of not less than 1.00.
3. Panel Size: 3’-11-1/2”W by 8-11”H, cut to shapes as indicated on Drawings.
4. Thickness: 1.97 inches (50 mm).
5. Mounting Device: Manufacturer’s standard polycarbonate base.
6. Trim: Manufacturer’s standard aluminum edge trim for bottom edge as indicated.
7. Colors: As indicated on Finish Legend.

## 2.3 SOUND-ABSORBING WALL UNITS

A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction.

1. Basis of Design Product (**AWP-4**): Subject to compliance with requirements, provide **Acoufelt; Fracture Panel FilaSorb 24** or one of the following:

   a. Kirei.
   b. MDC Interior Solutions.

2. Panel Size: As indicated on Drawings.
3. Nominal Thickness: 24 mm.
4. Pattern:
5. Color: As indicated on Finish Schedule.
6. Mounting: Adhesive.
7. Core: Manufacturer's standard.
8. Edge Profile: Square.

## 2.4 FABRICATION

A. Sound-Absorption Performance: Provide acoustical wall panels with minimum NRCs indicated, as determined by testing per ASTM C 423 for mounting type specified.

B. Acoustical Wall Panels: Panel construction consisting of facing material adhered to face, edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.

1. Glass-Fiber Board: Resin harden areas of core for attachment of mounting devices.

C. Core-Face Layer and Core Overlay: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

D. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.

1. Where square corners are indicated, tailor corners.
2. Where fabrics with directional or repeating patterns or directional weave are indicated, mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.

E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, blocking, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of acoustical wall panels.

1. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 INSTALLATION

A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

1. Cut units to be at least 50 percent of unit width, with facing material extended over cut edge to match uncut edge. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.

B. Comply with acoustical wall panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.

C. Installation Tolerances: As follows:

1. Variation from Level and Plumb: Plus or minus 1/16 inch.
2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.3 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that acoustical wall panels are without damage or deterioration at time of Substantial Completion.

B. Replace acoustical wall panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 09 84 13

**SECTION 09 84 36 - SOUND-ABSORBING UNITS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes shop-fabricated panel units tested for acoustical performance, including:

1. Sound-absorbing ceiling panels.
2. Acoustical ceiling baffles.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 09 Section "Acoustical Panel Ceilings" for acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.
3. Division 09 Section “Fixed Sound-Absorptive Panels” for wall panels.
4. Division 26 Electrical Sections for electrical connections to acoustical ceiling baffles.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For sound-absorbing units.

1. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
2. Include reflected ceiling plans showing panel sizes.

D. Samples for Verification: For the following products, prepared on Samples of size indicated below:

1. Core Material: 12-inch- square Sample at corner.
2. Mounting Devices: Full-size Samples.
3. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

## 1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Items penetrating or covered by sound-absorbing units including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Alarms.
e. Sprinklers.
f. Access panels.

B. Product Certificates: For each type of sound-absorbing unit, from manufacturer.

C. Delegated-Design Submittal: For design of ceiling suspension system, seismic restraints and attachment devices.

D. Warranty: Sample of special warranty.

## 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound-absorbing units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain sound-absorbing ceiling units from single source from single manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Build mockup of typical ceiling area in location as directed by Construction Manager.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

C. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with sound-absorbing unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install sound-absorbing units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install sound-absorbing units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect sound-absorbing units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

## 1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

a. Acoustical performance.
b. Warping of core.

2. Warranty Period: 5 years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Panels shall meet the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

## 2.2 SOUND-ABSORBING CEILING UNITS

A. Sound-Absorbing Ceiling Panel: Manufacturer's standard panel construction.

1. Basis-of-Design Product (**C-10**): Subject to compliance with requirements, provide the following or equal:

**a. Armstrong World Industries, Inc.; Tectum Finale Ceiling Panels.**

2. Core: Cementitious-fiber board consisting of aspen wood fibers bonded with inorganic hydraulic cement.
3. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
4. Edge Profile: Chamfered (beveled).

5. Corner Detail in Elevation: Square with continuous edge profile indicated.
6. Acoustical Performance: Sound absorption NRC of 0.85 according to ASTM C 423 for Type A mounting according to ASTM E 795.
7. Nominal Overall Panel Thickness: 1-inch panel with 1-inch furring (2 inches at edge), including SoniCor fiber core between furring.
8. Panel Sizes: Custom, as indicated on Drawings.
9. Color: Custom, to match Architect's sample.
10. Mounting: Ceiling mount to existing bulb tees supporting roof deck by utilizing 7/8" metal furring and factory-finished White (TWH) screws if appropriate for attachment to furring. Do not attach directly to the roof deck. Fasteners shall be as recommended by the manufacturer. Where it is unavoidable to conceal metal furring, it shall be painted to match the roof deck.

    a. Fastener/screw spacing shall be per manufacturer's installation recommendations.

11. Field Cutting: Exposed edges do not come factory painted. Cut panel edges and factory exposed edges shall be field painted.

    a. Field touch up and color match to custom color.

B. Acoustical Ceiling Baffles: Manufacturer's standard polyester PET felt.

1. Basis-of-Design Product (**C-14)**: Subject to compliance with requirements, provide the following:

    **a. Turf Design; Beam LED Ceiling Baffle.**

2. Acoustical Performance: Sound absorption NRC of 0.80 according to ASTM C 423 for Type J mounting according to ASTM E 795.
3. Felt Thickness: 9 mm baffle, 27 mm stiffener.
4. Baffle Thickness: 3 inches.
5. Panel Depth: 8 inches.
6. Panel Size: As indicated on Drawings.
7. Corners: Square, exposed felt, machined edge.
8. Color: As selected by Architect from manufacturer's full range.
9. Mounting Method: Cable suspension, horizontally suspended from ceiling.

    a. Suspended with 3/64" steel aircraft cable, inserted into integral spring clips, supplied by manufacturer.

10. Fixture: Beam LED.

## 2.3 FABRICATION

A. General: Use manufacturer's standard construction except as otherwise indicated; with dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing units.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install sound-absorbing units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with sound-absorbing unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

### 3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch.

B. Variation from Level or Slope: Plus or minus 1/16 inch.

C. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

### 3.4 CLEANING

A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 84 36

**SECTION 09 91 00 - PAINTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following substrates:

1. Concrete masonry units (CMU).
2. Steel.
3. Galvanized metal.
4. Hollow metal doors and frames.
5. Metal railings.
6. Interior metal ladders.
7. Interior wood trim.
8. Hardboard flooring.
9. Gypsum board.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts, conduits, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural casework.
b. Phenolic toilet enclosures.
c. Kitchen appliances.
d. Prefinished wood doors.
e. Elevator entrance doors.
f. Elevator equipment.
g. Finished mechanical and electrical equipment.

h. Light fixtures and wiring devices.
i. Switchgear.
j. Distribution cabinets in closets or equipment rooms.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Pipe spaces.
e. Duct shafts.
f. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized or coated aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper and copper alloys.
e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 02 Section "PCB Abatement" for existing CMU and glazed CMU to be abated prior to field finishing by this Section.
3. Division 05 Section "Structural Steel" for shop priming structural steel.
4. Division 05 Section "Metal Fabrications" for shop priming ferrous metal.
5. Division 05 Section "Pipe and Tube Railings" for shop priming ferrous metal.
6. Division 06 Section "Interior Architectural Woodwork" for items indicated to be field finished by this Section.
7. Division 06 Section "Miscellaneous Rough Carpentry" for hardboard flooring to be field finished by this Section.
8. Division 06 Section "Wood Stairs" for finishing wood stair treads and risers.
9. Division 08 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
10. Division 09 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

11. Divisions 23 and 26 Sections for painting of mechanical and electrical equipment.

## 1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

## 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.
5. Submit 2 Samples on the following substrates for Architect's review of color and texture only:

a. Stained Wood: 4-by-8-inch. Samples of natural- or stained-wood finish on representative wood surfaces.

D. Qualification Data: For firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.

E. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

## 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coatings to include in maintenance manuals. Include the following:

1. Area summary with Finish Schedule and area detail designating where each product, color, and finish is used.
2. Product data pages.
3. Material safety data sheets.
4. Care and cleaning instructions.
5. Touch-up procedures.
6. Color samples of each color and finish (gloss level) used.

B. Manual: Provide Sherwin Williams; “Custodian Project Color and Product Information” manual, or equal.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 1 gallon of each material and color applied.

## 1.7 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Wall Surfaces: Provide samples of at least 100 sq. ft. for each color and accent color.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on benchmark samples.

    a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

## 1.9 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co., including affiliate the following affiliate brands:

    a. Coronado Paint.
    b. Lenmar Wood Finishes.

2. PPG Industries Inc. (PPG).
3. Sherwin-Williams Co.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content for Interior Paints and Coatings:

1. Provide paints and coatings used on the interior of the building that are certified as low-VOC products by one of the following organizations:

a. Scientific Certification Systems – Indoor Advantage Gold.
b. GREENGUARD Certification Program.
c. Green Seal Standard for Paints and Coatings GS-11:

1) Interior Flat Topcoat: 50 g/L.
2) Interior Non-flat Topcoat: 100 g/L.
3) Primer or Undercoat: 100 g/L.
4) Floor Paint: 100 g/L.
5) Anti-Corrosive Coating: 250 g/L.

d. If paints or coatings are not certified by any of the above organizations, the product must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.

1) Clear Wood Finishes; Varnish: 275 g/L.
2) Clear Wood Finishes; Sanding Sealers: 275 g/L.
3) Clear Wood Finishes; Lacquer: 275 g/L.
4) Dry Fog Coatings: 150 g/L.
5) Waterproofing sealers: 100 g/L.
6) Stains: 100 g/L.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers **(50 g/L).**

1. Benjamin Moore; Ultra Spec Hi-Build Masonry Block Filler 571: Applied at a dry film thickness of not less than 10 mils.
2. PPG; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 7.1 mils.
3. Sherwin-Williams; Prep Rite Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

2.4 EXTERIOR PRIMERS

A. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Super Spec HP Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 2.0 mils.
2. PPG; 90-912 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer: Applied at a dry film thickness of not less than 2.0 mils.

2.5 INTERIOR PRIMERS

A. General: Provide tinted primers as required for dark colors.

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application (**100 g/L)**.

1. Benjamin Moore, Ultra Spec 500 Interior Latex Primer N534: Applied at a dry film thickness of not less than 1.8 mils.
2. PPG; 6-2 Speedhide Interior Latex Sealer Quick-Drying: Applied at a dry film thickness of not less than 1.0 mil.
3. Sherwin-Williams; ProMar 200 Zero VOC Primer B28W2600: Applied at a dry film thickness of not less than 1.5 mils.

C. Interior Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application (**100 g/L**).

1. Benjamin Moore; Ultra Spec Masonry Interior/Exterior Acrylic Sealer 608: Applied at a dry film thickness of not less than 1 mil.
2. PPG; 4-2 Perma-Crete High Build 100% Acrylic Primer: Applied at a dry film thickness of not less than 2.6 mils.
3. Sherwin-Williams; Loxon Concrete & Masonry Primer A24W8300: Applied at a dry film thickness of not less than 3.2 mils.

D. Interior Metal Primer: Factory-formulated metal primer (**250 g/L**).

1. Benjamin Moore; Ultra Spec HP DTM Acrylic Metal Primer No. HP04: Applied at a dry film thickness of not less than 1.7 mils.
2. PPG; 90-912 Series Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer B66 Series: Applied at a dry film thickness of not less than 2.0 mils.

## 2.6 EXTERIOR PAINTS

A. Exterior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior metal application.

1. Benjamin Moore; Ultra Spec HP DTM Acrylic Gloss Enamel, HP28: Applied at a dry film thickness of not less than 2.3 mils.
2. PPG; 90-374 Series Pitt-Tech Interior/Exterior High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
3. Sherwin-Williams; Acrylic Coating Gloss (Waterborne) B66 Series: Applied at a dry film thickness of not less than 2.4 mils.

## 2.7 INTERIOR PAINTS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application ceilings and soffits (**50 g/L**).

1. Benjamin Moore, Ultra Spec 500 Interior Flat T535: Applied at a dry film thickness of not less than 1.8 mils.
2. PPG; 6-70 Series Speedhide Interior Latex Flat: Applied at a dry film thickness of not less than 1.3 mils.
3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat Wall Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel for walls **(100 g/L).**

1. Benjamin Moore, Ultra Spec 500 Interior Eggshell T538: Applied at a dry film thickness of not less than 1.8 mils.
2. PPG; 6-411 Series Speedhide Interior Enamel Latex Eggshell: Applied at a dry film thickness of not less than 1.5 mils.
3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Egg-Shell Enamel B20-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.

C. Interior Semi-Gloss Acrylic Enamel for Metal Surfaces: Factory-formulated semi-gloss acrylic interior enamel (**250 g/L**).

1. Benjamin Moore; Ultra Spec HP DTM Acrylic Semi-Gloss Enamel HP29: Applied at a dry film thickness of not less than 1.5 mils.
2. PPG; 4216HP Series Pitt-Tech Plus High Performance Waterborne DTM Acrylic Semi-Gloss: Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; Pro Industrial Acrylic B66 Series Semi-Gloss: Applied at a dry film thickness of not less than 2.5 mils.

D. Interior Acrylic Enamel (Flat Dryfall): Factory-formulated enamel for overhead interior application ceilings and structural framing (**150 g/L**).

1. Coronado Paint; Super Kote 5000 Latex Flat Dry Fall 110 Line: Applied at a dry film thickness of not less than 1.5 mils.
2. PPG; SpeedHide Super Tech WB Interior Dry-Fog Flat Latex 6-725XI: Applied at a dry film thickness of not less than 2.2 mils.
3. Sherwin-Williams; Low VOC Waterborne Acrylic Dryfall Flat B42W00081: Applied at a dry film thickness of not less than 1.7 mils.

E. Interior Acrylic Latex for Hardboard Flooring: Factory-formulated satin acrylic latex enamel (**50 g/L**).

1. Benjamin Moore; Latex Floor & Patio Low Sheen Enamel N122: Applied at a dry film thickness of not less than 1.0 mil.
2. Sherwin-Williams Porch & Floor A32W00251 Applied at a dry film thickness of not less than 1.5 mils.

## 2.8 INTERIOR WOOD STAINS AND VARNISHES

A. Interior Wood Stain: Factory-formulated penetrating wood stain for interior application applied at spreading rate recommended by manufacturer **(100 g/L)**

1. Fuhr; ZVOC Sap Stain 135.
2. Gemini; Stain Blending Station.
3. Sansin; Purity Interior Stain Zero VOC, in full range of colors selected from Naturals, Translucents, Saturated and Ultra-Saturated.

B. Clear Sanding Sealer: Factory-formulated fast-drying acrylic polyurethane clear wood sealer applied at spreading rate recommended by manufacturer. **(275 g/L)**

1. Benjamin Moore; Benwood Stays Clear Acrylic Polyurethane Gloss N422.
2. Pittsburgh Paints; Olympic Premium Interior Water Based Sanding Sealer 41061.

C. Interior Polyurethane-Based Clear Varnish: Factory- formulated polyurethane-based clear varnish **(275 g/L).**

1. Benjamin Moore; Benwood Stays Clear Acrylic Polyurethane Low Lustre N423.
2. Pittsburgh Paints; Olympic Premium Interior Water Based Polyurethane Clear Satin 42786.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMU): 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Construction Manager about anticipated problems when using the materials specified over substrates primed by others.

E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

## 3.2 MAINTENANCE REPAINTING

A. Maintenance Repainting Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from painted surface.

B. Execution of the Work: In repainting surfaces, disturb them as minimally as possible and as follows:

1. Remove failed coatings and corrosion and repaint.
2. Verify that substrate surface conditions are suitable for repainting.
3. Allow other trades to repair items in place before repainting.

C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use gentle methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail.

D. Heat Processes: Do not use torches, heat guns, or heat plates.

E. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material.

1. At existing Stairs, remove all paint from existing guardrails, handrails, stringers and other painted surfaces down to bare metal.
2. Prepare surfaces for primer application.

3.3 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Existing Masonry Substrates: For existing painted masonry and glazed masonry surfaces indicated to receive paint, comply with the following:

1. Paint on existing CMU and glazed CMU to be abated in accordance with Division 02 Section “PCB Abatement.”
2. Clean the entire surface with a hot water degreasing solution in accordance with SSPC-SP1.
3. Rinse the entire area with clean hot water and allow it to dry.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.

3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

## 3.4 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 EXTERIOR PAINTING SCHEDULE

A. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over galvanized metal.

a. Primer: Exterior metal primer.
b. Finish Coats: Exterior full-gloss acrylic enamel.

## 3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Unit Masonry:

1. Provide the following finish system over new interior concrete masonry:

a. Low-Luster Acrylic-Enamel Finish: Two finish coats over a filled surface.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Interior low-luster acrylic enamel.

2. Provide the following finish system over existing interior concrete masonry:

a. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer over block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Primer: Masonry primer.
3) Finish Coats: Interior low-luster acrylic enamel.

3. Provide the following finish system over existing interior glazed concrete masonry:

a. Low-Luster Acrylic-Enamel Finish: Two finish coats over two coats of block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Interior low-luster acrylic enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish (ceilings): Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish (Walls): Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior low-luster acrylic enamel.

C. Ferrous and Zinc-Coated Metal: Provide the following finish systems over ferrous metal:

1. Semi-Gloss Acrylic-Enamel Finish: Two finish coats.

a. Primer: Metal primer, including surfaces with factory prime coat.
b. Finish Coats: Interior semi-gloss acrylic enamel for metal surfaces.

D. Exposed Structure: Provide the following finish system over exposed metal roof deck and steel structure:

1. Flat Dryfall Acrylic-Enamel Finish: One finish coat.

a. Primer: None required for DTM products.
b. Finish Coats: Interior acrylic dryfall.

E. Hardboard Flooring: Provide the following paint finish systems over hardboard flooring:

1. Satin Acrylic-Enamel Finish: Two finish coats.

a. Finish Coats: Interior acrylic enamel for wood floor surfaces.

## 3.8 INTERIOR STAIN-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

1. Stain Satin-Varnish Finish: Two finish coats of alkyd-based clear satin varnish over a sealer coat and interior wood stain.

a. Stain Coat: Interior wood stain.
b. Sealer Coat: Clear sanding sealer.
c. Finish Coats: Interior polyurethane-based clear satin varnish.

END OF SECTION 09 91 00

**SECTION 09 96 00 – HIGH-PERFORMANCE COATINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates:

a. Steel columns.

B. Related Sections include the following:

1. Division 05 Section "Structural Steel" for surface preparation and shop priming structural steel to be field finished by this Section.
2. Division 09 Section "Painting" for general field painting.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

C. Samples for Initial Selection: For each type of finish-coat product indicated.

D. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.

1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

## 1.4 QUALITY ASSURANCE

A. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

A. Basis of Design Product: Subject to compliance with requirements, provide products indicated by **Tnemec Company** or one of the following:

1. RD Coatings USA.
2. Sherwin Williams; Protective and Marine Coatings.

B. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

2.2 EXTERIOR POLYURETHANE COATINGS

A. Provide the following system:

1. Steel:

a. Surface Preparation: SSPC-SP6 Commercial Blast
b. Coat 1: Tnemec Series 94 HydroZinc at 2.5-3.5 mils DFT (shop applied)
c. Coat 2: Tnemec Series L69 Epoxoline at 4-6 mils DFT
d. Coat 3: Tnemec Series 750 UVX at 2-3 mils DFT

B. Colors: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:

1. Owner may engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with specified requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 09 96 00

# SECTION 09 96 66 – WATER VAPOR EMISSION CONTROL SYSTEM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes the following:

1. Topical water vapor reduction system on existing concrete slabs.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 09 flooring Sections for floor preparation requirements following application of water vapor emission control system.

### 1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Division 01 Section "Unit Prices."

1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

C. Qualification Data: For qualified Installer.

D. Warranty: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer approved by the manufacturer who employs workers for this Project who are competent in techniques required by manufacturer for installation indicated. Installer must have a minimum of five years' experience installing fluid based systems.

B. Manufacturer Qualifications: Manufacturer shall have no less than ten (10) years' experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum period of five (5) years.

1. Manufacturer must provide independent lab test reports documenting performance per the following:

a. ASTM E 96, Water Vapor Transmission (wet method) Performance shall be documented by an independent testing laboratory at a minimum of 97% water vapor transmission reduction compared to untreated concrete.
b. ASTM E 96, Perm Rating - Standard Test Method for Water Vapor Transmission of Materials: Perm Rate results must not exceed 0.1 Perms (when tested under laboratory conditions).
c. ASTM F 3010: Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.
d. ASTM D 1308; Insensitivity to alkaline environment up to, and including, pH 14. A 14 day test is required with no degradation of sample reported.
e. Certify acceptance and exposure to continuous topical water exposure after final cure.

C. Moisture Tests: Submit concrete floor moisture test results required by floor covering manufacturer. Perform moisture testing as described in ASTM Practice F 710.

1. Testing shall be performed according to the floor covering manufacturer's specified ASTM Standard Test Method by an independent Testing Agency.
2. Testing shall be performed by ICRI Tier 2 Certified Moisture Testing Technician.

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform moisture vapor emission and relative humidity testing indicated below.

1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
2. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to installation including, but not limited to, the following:

1. Review substrate conditions, moisture and pH test results, manufacturer's installation instructions, and warranty requirements.

2. Document proceedings, including required corrective measures.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in a dry, well ventilated area at minimum 50 deg F and maximum 90 deg F.

B. Deliver materials in manufacturer's unopened containers fully identified with brand, type, grade, class and all other qualifying information. Provide Material Safety Data Sheets for each product.

C. Handle product in a manner that will prevent breakage of containers and damage products.

1.7 PROJECT CONDITIONS

A. Do not apply moisture vapor reduction system to surfaces that may be exposed to excessive weather conditions (such as rain, wind, etc) until the material has fully cured, or when water is accumulated on the surface of the concrete.

B. Do not apply water vapor reduction system when temperature is lower than 50 degrees F or higher than 90 degrees F or expected to fall outside this temperature range within 24 hours from time of application.

C. Protect water vapor reduction system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to retreat and/or recoat the affected areas; including replacement of the floor covering in the affected areas within specified warranty period. Failures include, but are not limited to, flooring failure due to moisture and/or alkalinity emanating from the concrete.

1. Warranty Period: **15** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATER VAPOR REDUCTION SYSTEM

A. Basis of Design Product: Subject to compliance with requirements, provide **Koster American Corporation; VAP I 2000 System**, or one of the following:

1. ARDEX; ARDEX MC Rapid.
2. Mapei; Planiseal VS.

B. Epoxy coating, 100 percent solids, containing specifically formulated chemicals and resins to provide the following characteristics and properties in a one-coat system:

1. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum 97% water vapor transmission reduction compared to untreated concrete.
2. ASTM E 96 Permeance Rating: Product cannot exceed a 0.1 permeance rating (when tested under laboratory conditions).
3. ASTM F 3010 Water Vapor Permeance: Product cannot exceed a 0.1 permeance rating when tested under laboratory conditions.
4. ASTM D 1308; Insensitivity to alkaline environment up to, and including, pH 14 in a bath test.
5. Certify acceptance and exposure to continuous topical water exposure after final cure.
6. Water Vapor reduction system shall be a single coat, stand alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
7. System must reduce Calcium Chloride readings of up to 25lbs/1000 $ft^2$/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.

C. VOC Content for Interior Paints and Coatings:

1. Interior products as follow shall comply with Rule 1113 – "Architectural Coatings", amended 7/9/04: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov.

a. Waterproofing sealers: 100 g/L.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

B. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer's representative prior to application of moisture reduction system.

1. Confirm that surfaces to be treated with moisture vapor reduction system have not previously been treated with other materials such as underlayments, screeds, and penetrating sealants. If so, consult with the Manufacturer's Representative prior to any application of moisture vapor reduction system.
2. Confirm that the substrate surface does not deteriorate due to the presence of sulphurous compounds or alkaline aggregate/silica reaction encountered in certain areas.
3. Any testing for concrete deficiencies / contamination like alkaline silica reaction, untreated silicates, and organic residue, is the responsibility of the Owner.
4. Only a surface substrate that remains uncontaminated, absorptive, and sound is fit to receive a water vapor reduction system. Comply with all requirements as listed in Manufacturer's technical data information.

C. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors to a Concrete Surface Profile (CSP) #3 and clean surfaces with an industrial vacuum to remove all residue off the substrate. Remove all defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and shot blast beeds. Repair all cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with manufacturer's recommendations.

1. Shot blast a small test area and review surface profile with the finished flooring applicator. Comply with Division 09 Section "Resilient Tile Flooring" for leveling requirements.
2. Inform vapor reduction system manufacturer if concrete additives such as chlorides or any other soluble compounds that can contaminate surfaces have been used in the concrete mix. Reinforcing fibers must be burned off, scraped and vacuumed, after shot blasting, leaving no fibers left on the concrete surfaces. Provide uncontaminated, absorptive, sound surface. **DO NOT ACID ETCH**.
3. Reinforcing fibers that become visible after shot blasting must be removed and vacuumed leaving no fibers exposed above the concrete surfaces. Provide an uncontaminated, clean, sound surface

D. Repair concrete prior to moisture vapor reduction system installation by utilizing manufacturer's approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. Consult with vapor reduction manufacturer.

1. Repair non-movement cracks, control joints, and large surface defects such as spalls, holes, and voids in accordance with manufacturer's recommendations. Use low-viscosity, gravity-fed crack mending resin for non-movement cracks and joints. Crack repair compound can be mixed with not more than 3 parts clean, washed, dry silica sand for sawcut control joints and wide cracks. Brush interior walls of crack or joint with neat crack repair epoxy resin before applying sand-resin mixture. After curing, grind surface flush with surrounding concrete.

2. Repair spalls or excessively rough concrete surface using manufacturer's fiber thickening agent mixed 1:1 by volume with moisture control resin. Mix thickening agent and resin thoroughly to uniform creamy consistency and apply by trowel, working material tightly against clean, roughened concrete surface.
3. Do not fill designed movement joints with moisture control epoxy resin. Fill movement joints with manufacturer's recommended flexible joint filling compound or mechanical movement joint cover

E. Remove residual dust and debris by vacuum and dry sweeping. Do not use sweeping compound. Remove all foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and shot blast beads.

F. Test concrete surface tensile strength after abrasive preparation in accordance with requirements of ASTM F3010 following Test Method C1583. If test results are less than 200 psi, repair concrete or repeat surface preparation to achieve required concrete surface tensile strength.

## 3.2 APPLICATION

A. System Application: Install moisture vapor emission control system in number of coats required by system, and in accordance with manufacturer's written instructions.

1. Provide coverage rates as required based on moisture testing prior to time of application, but not less than 100 s.f./gallon.

B. Allow to cure a minimum of 12 hours before installing flooring system.

C. When water based adhesives are used in the floor covering installation, use an approved underlayment system together with a non-porous substrate primer prior to the installation of the flooring system. Consult the adhesive manufacturer for their minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive.

## 3.3 FIELD QUALITY CONTROL

A. Inspect cured moisture control coating for complete, uniform coverage. Repair or install additional coats as necessary to produce a uniform, flat, smooth, coating surface that meets manufacturer's minimum thickness requirements in all areas.

B. Test adhesion of the moisture control coating to the concrete substrate in accordance with ASTM F 3010 following Test Method D 7234. Tensile bond strength of the coating must be at least 200 psi with failure in the concrete. Repair or replace areas that do not meet this requirement.

3.4 PROTECTION

A. Protect each coat during specified cure period from traffic, topical water and contaminants.

END OF SECTION 09 96 66

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# SECTION 10 11 00 - VISUAL DISPLAY SURFACES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Markerboards.
2. Tackboards.
3. Visual display rails (tack strips).
4. Tackboard panels.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
3. Division 10 Section “Display Cases” for tackable surfaces in display cases.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 DEFINITIONS

A. Tackboard: Framed tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Show locations of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

D. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of the following:

a. Porcelain-enamel face sheet, with each surface indicated.
b. Linoleum resilient tackboard assembly.

2. Include accessory Samples to verify color selected.

E. Samples for Verification: For each type of visual display surface indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.

F. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

C. Warranties: Sample of special warranties.

## 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of each type of typical visual display unit as directed by Architect. Include accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.11 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

B. Special Warranty: Manufacturer agrees to repair or replace visual display wall covering that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.0236-inch uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F.

1. Gloss Finish (Markerboard): Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser, suitable as a projection surface.

a. Color: LCS[3] No. 100 White.

B. Resilient Tackable Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto a natural jute backing; with washable vinyl finish and integral color throughout.

C. Hardboard: AHA A135.4, tempered.

D. Extruded Aluminum: ASTM B 221, Alloy 6063.

## 2.2 VISUAL DISPLAY BOARDS, GENERAL

A. General: Provide visual display boards in sizes and configurations indicated.

B. Basis of Design Product: Subject to compliance with requirements provide **Claridge Products and Equipment, Inc.; Series 5** or comparable product by one of the following:

1. AARCO Products, Inc.
2. Best-Rite Manufacturing.

## 2.3 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch- thick, porcelain-enamel face sheet with low-gloss finish.

1. Particleboard Core: 3/8 inch thick; with 0.015-inch- thick, aluminum sheet backing.
2. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
3. Perimeter Trim: 1-1/2 inches wide.

## 2.4 TACKBOARD ASSEMBLIES

A. Tackboard Assembly: 1/4-inch-thick minimum, plastic-impregnated-cork sheet, factory laminated to 1/4-inch- thick hardboard backing.

## 2.5 MARKERBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.

1. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and end closure.

## 2.6 VISUAL DISPLAY RAILS (TACK STRIPS)

A. General: Manufacturer's standard, tackable visual display surface fabricated into narrow rail shape and designed for displaying material, with colored cork insert.

1. Basis of Design Product (**TS-1**): Subject to compliance with requirements, provide the following, or equal:

   **a. Claridge Products and Equipment, Inc.; EDR Exhibit Rail.**

2. Color: As selected by Architect from manufacturer's full range.

## 2.7 TACKBOARD PANELS

A. Tackboard Panels:

1. Basis of Design Product (**TBS-1,2**): Subject to compliance with requirements, provide the following, or equal:

   **a. Claridge Products and Equipment, Inc.; Tack Walls.**

2. Panel Sizes: As indicated on Drawings.
3. Thickness: 1/4 inch.
4. Tack Surfaces:

   a. **TBS-1**: TW1F, edge wrapped Fabricork on duracore and 16A adhesive.
   b. **TBS-2**: TW2D, Designer Fabric on duracore panel, 1016FC fabric covered trim, H-bar, and 16A adhesive.

5. Fabricork:
6. Designer Fabric:

B. Aluminum Trim: Manufacturer's standard J-trim, clear satin anodized aluminum, 1/4 inch trim.

## 2.8 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall covering manufacturer.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Division 09 Section "Painting" and recommended in writing by wall covering manufacturer for intended substrate.

## 2.9 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
2. Provide manufacturer's standard vertical-joint H-trim system between abutting sections of markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
5. Mounting: Provide steel mounting clips at top, angle clips at bottom of board; spaced at 24 inches on center.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

## 2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.11 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

3.5 INSTALLATION OF FIELD-FABRICATED TACKABLE SURFACES

A. Field-Assembled Visual Display Units: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

2. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

## 3.6 INSTALLATION OF VISUAL DISPLAY RAILS

A. Display Rails: Install rails in locations and at mounting heights indicated on Drawings. Attach to wall surface with fasteners at not more than 16 inches o.c.

## 3.7 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

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# SECTION 10 12 00 - DISPLAY CASES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Illuminated display cases.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 26 Electrical Sections for wiring and other electrical work associated with illuminated display cases.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.

1. Show location of seams and joints in visual display surfaces.
2. Include sections of typical trim members.
3. Wiring Diagrams: For power, signal, and control wiring.

D. Samples for Initial Selection: For units with factory-applied color finishes, and as follows:

1. Actual sections of visual display surfaces.

E. Samples for Verification: For each type of product indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- long sections of each trim profile including corner section.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

G. Maintenance Data: For visual display surfaces, operating hardware[, and illuminated units] to include in maintenance manuals.

## 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain display cases from single source from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.

B. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.

C. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering, and 6 mm thick unless otherwise indicated.

D. High-Pressure Plastic Laminate: NEMA LD 3.

E. Linoleum Resilient Tackboard Assembly: 1/4-inch-thick minimum, linoleum resilient tackable surface material, factory laminated to 1/4-inch- thick hardboard backing.

1. Provide linoleum resilient homogeneous tackable surface material of natural materials consisting of linseed oil, granulated cork, rosin binders and dry pigments, mixed and calendered onto a natural jute backing. Uni-color shall extend through thickness of material.
2. Color: As selected by Architect from manufacturer's full range of colors.

F. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.2 DISPLAY CASES

A. Basis of Design Product: Subject to compliance with requirements, provide products by **The Tablet & Ticket Co.,** or comparable product by one of the following:

1. Claridge Products and Equipment.
2. Waddell.

B. Recessed Display Case: Factory-fabricated display case; with finished interior, glazed doors at front, and trim on face to cover edge of recessed opening.

1. Cabinet Box: Factory assembled aluminum cabinet, 0.090" aluminum walls with ¾-inch AC plywood backing. Provide plastic laminate finish on sides and bottom panels.
2. Cabinet Frame and Trim: Aluminum.
3. Aluminum Finish: Clear anodic.

C. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.

1. Thickness: Not less than 6 mm thick.
2. Number of Doors: Two.

D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.

1. Shelf Width: As indicated.
2. Number of Shelves: As indicated.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.

F. Fabric-Faced Tackboard Panel: 1/4-inch- thick, fabric-faced-cork sheet factory laminated to 1/4-inch- thick, hardboard backing.

1. Color: As selected by Architect from manufacturer’s full range of fabric selections.

G. Illumination System: Concealed top-lighting system consisting of LED fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.

H. Width, Depth and Height: As indicated on Drawings.

## 2.3 FABRICATION

A. Fabricate bulletin boards and display cases to requirements indicated for dimensions, design, and thickness and finish of materials.

B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil-canning, and to impart strength for size, design, and application indicated.

C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

## 2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated units.

C. Examine walls and partitions for proper backing for display cases.

D. Examine walls and partitions for suitable framing depth where recessed units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.

C. Comply with requirements in Division 26 for connecting illuminated display cases.

1. After installation is complete, install new LED lamps.

D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 10 12 00

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# SECTION 10 14 00 - SIGNAGE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Panel signs.
2. Dimensional characters.
3. Plaques.
4. Reflective vinyl signs.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
3. Division 23 Mechanical Sections for labels, tags, and nameplates for mechanical equipment.
4. Division 26 Electrical Sections for labels, tags, and nameplates for electrical equipment.
5. Division 26 Section for illuminated exit signs.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation details for signs.

1. Include fabrication and installation details and attachments to other work.

2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
4. Provide vector images or other digital media that may be required to enlarge small format logos, images, symbols, etc. furnished by Architect for application on all sign types including project identification and temporary signs included in Division 01 Section "Temporary Facilities and Controls."

D. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

1. Include representative Samples of available typestyles and graphic symbols.

E. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Panel Signs: Not less than 12 inches square.
2. Plaque: 6 inches square including border.
3. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
4. Vinyl Reflective Signs: Full-size Sample.

F. Sign Schedule: Use same designations indicated on Drawings.

## 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Warranty: Special warranty specified in this Section.

## 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Handicapped Accessibility Guidelines: Comply with the handicapped accessibility requirements of ICC/ANSI A117.1 and the 2010 ADA Standards.

## 1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

## 1.8 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

## 1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of screen printed products for indoor and outdoor use that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 PANEL SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **ASI Sign Systems; InTouch,** or a comparable product by one of the following:

1. Advance Corporation; Braille-Tac Division.
2. Best Sign Systems, Inc.
3. Mohawk Sign Systems, Inc.

4. Southwell Co. (The)

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Provide manufacturer's standard one-piece construction:

   a. Phenolic-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face-layer, and base-layer thickness of 1/8-inch; and a Type D Shore durometer hardness of 80.

2. Edge Condition: Square cut.
3. Corner Condition: Square.
4. Mounting: Unframed.

   a. Wall mounted with mechanical fasteners or two-face tape required by substrate.
   b. Provide backing plate for signs mounted to glass substrate.

5. Color: Custom, to match Architect's sample.
6. Font: As selected by Architect from manufacturer's full range.
7. Character proportion: Width to height ratio between 3:5 and 1:1, and a stroke-width-to-height ratio between 1:5 and 1:10.
8. Size of characters and symbols:

   a. Room numbers: As indicated on Drawings.
   b. Room letters: As indicated on Drawings.

9. Pictograms: Accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram to be no less than 6 inches in height.
10. Finish and Contrast: Characters, symbols and background to be matte or other non-glare finish. Characters and symbols to be in contrasting color to the background; either light characters on a dark background or dark characters on a light background.
11. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors. Glue-on characters or etched backgrounds are not permitted.

    a. Manufacturer's standard process for producing text and symbols complying with ICC/ANSI A117.1 and 2010 ADA Standards. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
    b. Braille to be separated from corresponding raised characters or symbols by 1/2-inch.

C. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.

D. Interior Emergency Exit Maps: Provide one map per occupied space, as indicated.

E. Carbon Monoxide Notice Signage: Provide one carbon monoxide warning sign at each room or space that contains fuel-burning heating equipment and CO detectors.

2.3 DIMENSIONAL CHARACTERS

A. Basis of Design Products: Subject to compliance with requirements, provide products by **ASI Sign Systems** or comparable product by one of the following:

1. Gemini Incorporated.
2. Southwell Co. (The).

B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.

1. Product: Subject to compliance with requirements, provide the following:

**a. ASI Sign Systems; LC Series.**

2. Character Material: Clear anodized aluminum.
3. Thickness: 1 inch.
4. Mounting: Concealed studs, noncorroding for substrates encountered.

C. Dimensional Character Schedule:

1. Character Sizes: As indicated on Drawings.
2. Font: Arial Narrow, unless otherwise indicated in the Sign Schedule.
3. Text: As indicated on Drawings.

D. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

2.4 PLAQUES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gemini Incorporated.
2. Matthews International Corporation, Bronze Division.
3. Southwell Co. (The).

B. General: Provide castings free from pits, scale, sand holes, and other defects. Comply with requirements specified for metal, border style, background texture, and finish and in required thickness, size, shape, and copy.

1. Provide the following:

a. Interior: Dedication Plaque.

1) Copy: Provide copy in format furnished by the Architect.
2) Size: As indicated on Drawings.
3) Furnish and install one plaque in location as determined by the Architect.
4) Mounting: Concealed fasteners matching plaque finish for substrates encountered.

2. Plaque Material: Cast aluminum.
3. Background Texture: Manufacturer's standard sand finish.

a. Colors: A minimum of three standard colors for each plaque.

4. Border Style: Plain bevel.

C. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.

## 2.5 REFLECTIVE VINYL SIGNS

A. Reflective Vinyl Signs: Adhesive backed film, enclosed lens, retroreflective, engineer grade film for die cut characters applied over black (opaque) background film, and adhered to metal and glass in exterior locations indicated.

1. Basis of Design Product (Reflective): Subject to compliance with requirements, provide the following, or equal:

**a. 3M; Scotchlite Reflective Graphic Film Series 680-10.**

2. Basis of Design Product (Background): Subject to compliance with requirements, provide the following, or equal:

**a. 3M; Scotchcal Graphic Film Series 50.**

3. Film Thickness:

a. Reflective: 7 mils.
b. Background: 3 mils.

4. Sign Sizes: As indicated.
5. Numeral Size:

a. Windows: 4 inches minimum height with 3/8-inch stroke.
b. Doors: 3 inches minimum height with 1/2-inch stroke.

6. Numeral Color: Reflective white.
7. Background Color: Black gloss, 1/4 inch minimum around numerals at all sides.

8. Substrates: Metal and glass, exterior.

B. Provide two reflective vinyl signs for each room with exterior windows, applied to the upper right-hand corner of the first and last window in each room.

C. Provide one reflective vinyl sign for exterior exit doors at grade as follows:

1. Single Door: Provide one sign applied to the upper corner, hinge side.
2. Double Door: Provide one sign applied to the upper corner, hinge side of active leaf only.
3. Bank of doors allowing access to same space: Provide one sign applied to the upper corner of the first and last door of the corresponding space, hinge side.

## 2.6 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors.

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.7 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.

C. Dimensional Characters: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
2. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
4. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

5. Create signage to required sizes and layout.

D. Plaques: Provide manufacturer's standard plaques according to requirements indicated.

1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

## 2.8 FINISHES, GENERAL

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: Manufacturer's standard Class 1 integrally colored or electrolytically deposited color anodic coating, 0.018 mm or thicker, in color as selected applied over a satin (directionally textured) mechanical finish, complying with AAMA 611.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
4. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls.

    a. Locate top of sign at height indicated on Drawings, with tactile characters 48 inches minimum above finish floor. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

    a. Mount signs to glass only. Do not use this method for any other substrate.

3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Plaques: Mount plaques using standard fastening methods recommended in writing by manufacturer for type of wall surface indicated.

1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

D. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

E. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

## 3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

## 3.4 SIGNAGE SCHEDULE

A. Refer to Signage Schedule attached at the end of this Section.

END OF SECTION 10 14 00

# Signage Schedule

**NOTES:**

REFER TO SIGNAGE DETAILS IN A9 SERIES
INSERT TEXT TEMPLATE TO BE PROVIDED BY SIGNAGE COMPANY TO OWNER
TEXT | TEXT: " | " = LINE BREAK IN TEXT
HC: INTERNATIONAL SYMBOL OF ACCESSIBILITY
M/F: MALE & FEMALE SYMBOLS
EAR: ASSISTED LISTENING SYMBOL PER 2010 ADA STANDARDS
EXTERIOR: PANEL SIGN FOR EXTERIOR
REFLECTIVE: VINYL REFLECTIVE EXTERIOR WINDOW OR DOOR MOUNT EXTERIOR

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| **PLASTIC PANEL SIGNS** | | | | | | | |
| **ELEVATOR** | | | | | | | |
| 1 | ELEVATOR | 2 | ELEVATOR | | G | | |
| 1 | ELEVATOR | 1 | IN FIRE EMERGENCY, DO NOT USE ELEVATOR | STAIR / PERSON / FIRE | E | | |
| **LOWER LEVEL AREA A** | | | | | | | |
| A001 | PASSAGE | 0 | - | - | - | - | |
| A02 | STAIR A2 | 1 | STAIR | STAIR | A SIM. | | |
| A002 | PASSAGE | 1 | COURTYARD ACCESS | | G | INSIDE DOOR A002A | |
| A003 | UNUSABLE | 0 | - | - | - | - | |
| A004 | P.E. OFFICE | 1 | P.E. OFFICE | | J | | |
| A005 | P.E. STORAGE | 1 | P.E. STORAGE | | G | | |
| A005 | P.E. STORAGE | 1 | P.E. STORAGE/OFFICE | | G | | |
| A005 | P.E. STORAGE | 1 | EXIT ACCESS | | G | | |
| A006 | MECHANICAL | 4 | MECHANICAL | | G | A004B, A006A, A006B, A02 | |
| A006 | MECHANICAL | 4 | FUEL BURNING \| EQUIPMENT AND \| CO DETECTORS \| ARE LOCATED \| INSIDE \| THIS ROOM | | E SIM. | A004B, A006A, A006B, A02 | Center text on this sign. |
| A006 | MECHANICAL | 2 | EXIT ACCESS | | G | Locate signs in room at doors leading out | |
| A007 | STORAGE | 2 | STORAGE/WATER SERVICE | | G | | |
| **MAIN LEVEL AREA A** | | | | | | | |
| A11 | STAIR A1 | 0 | - | - | - | - | |
| A12 | STAIR A2 | 1 | STAIR | STAIR | A SIM. | | |
| A101 | VESTIBULE | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | | EXTERIOR |
| A101 | VESTIBULE | 1 | ACCESSIBLE ENTRANCE | HC | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| A101 | VESTIBULE | 1 | EXIT | HC | C | LEADING TO EXTERIOR | |
| A102 | LOBBY | 1 | COURTYARD ACCESS | - | G | INSIDE DOOR A103 | |
| A102 | LOBBY | 1 | AED \| AUTOMATED \| EXTERNAL \| DEFIBRILLATOR | | M | BELOW AED | CONFIRM LOCATION WITH ARCHITECT |
| A103 | CORRIDOR | 0 | - | - | - | | |
| A104 | CORRIDOR | 0 | - | - | - | | |
| A105 | CORRIDOR | 0 | - | - | - | | |
| A106 | CAFETORIUM | 1 | CAFETORIUM | | G | | |
| A106 | CAFETORIUM | 2 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOORS A106B AND A106C | EXTERIOR |
| A106 | CAFETORIUM | 2 | ACCESSIBLE ENTRANCE | HC | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| A106 | CAFETORIUM | 2 | EXIT | HC | C | LEADING TO EXTERIOR | |
| A106 | CAFETORIUM | 1 | ASSISTIVE LISTENING DEVICES AVAILABLE | EAR | D | | |

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| A106 | CAFETORIUM | 1 | NOTICE \| OCCUPANCY FOR THIS \| AREA NOT TO EXCEED \| #### \| PERSONS \ PER: FIRE MARSHAL \| TOWN OF NEWINGTON | | L | LOCATION TO BE DETERMINED BY FIRE MARSHAL | OCCUPANT LOAD TO BE ACCEPTED BY FIRE MARSHAL PRIOR TO FABRICATION |
| A107 | PLATFORM | 1 | MUSIC ROOM | | G | | CONSULT WITH ARCHITECT ON ATTACHMENT TO CAFETORIUM SIDE OF OPERABLE PARTITION |
| A108 | STORAGE | 1 | STORAGE | | G | | |
| A109 | PTO STORAGE | 1 | STORAGE | | G | | |
| A110 | KITCHEN | 2 | KITCHEN / SERVERY | | G | | |
| A111 | STORAGE | 1 | STORAGE | | G | | |
| A112 | STORAGE | 1 | STORAGE | | G | | EXTERIOR |
| A113 | PASSAGE | 1 | PASSAGE | | G | | |
| A113 | PASSAGE | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR A113 | EXTERIOR |
| A113 | PASSAGE | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| A113 | PASSAGE | 1 | EXIT | HC | C | LEADING TO EXTERIOR | |
| A114 | STORAGE | 1 | STORAGE | | G | | |
| A115 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| A116 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| A117 | CUSTODIAN | 1 | CUSTODIAL | | G | | |
| A118 | PASSAGE | 0 | - | - | - | | |
| A119 | ELEV. MECH. ROOM | 1 | ELEVATOR MACHINE ROOM | | G | | |
| A120 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| A121 | MUSIC CLASSROOM | 2 | CLASSROOM # | | F | | |
| A122 | MAIN OFFICE | 2 | MAIN OFFICE | | G | | |
| A123 | PASSAGE | 1 | MAIN OFFICE | | G | | |
| A124 | PRINCIPAL'S OFFICE | 2 | PRINCIPAL | | J | | |
| A125 | CONFERENCE | 1 | CONFERENCE | | G | | |
| A126 | STORAGE | 1 | STORAGE | | G | | |
| A127 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| A128 | MDF | 1 | MDF | | G | | |
| A129 | NURSE | 1 | OFFICE | | J | | |
| A130 | HEALTH SERVICES | 1 | HEALTH SERVICES | | G | | |
| A131 | H.C. TOILET | 1 | RESTROOM | M/F, HC | B | | |
| A132 | CUSTODIAN | 1 | CUSTODIAL | | G | | |
| A133 | SECURITY | 1 | SECURITY | | G | | |
| A134 | MULTIPURPOSE ROOM | 1 | STAFF ROOM | | G | | |
| A135 | ELECTRICAL | 1 | ELECTRICAL | | G | | |
| A136 | BOY'S TOILET | 1 | BOYS' RESTROOM | M, HC | A | | |
| A137 | GIRL'S TOILET | 1 | GIRLS' RESTROOM | F, HC | A SIM. | | |
| A138 | STORAGE | 1 | STORAGE | | G | | |
| **MAIN LEVEL AREA B** | | | | | | | |
| B101 | CORRIDOR | 0 | - | - | - | | |
| B102 | CORRIDOR | 0 | - | - | - | | |
| B103 | BREAKOUT | 1 | BREAKOUT | | G | | |
| B103 | BREAKOUT | 1 | COURTYARD ACCESS | | G | INSIDE DOOR B103A | |
| B104 | TEACHER PLANNING | 1 | TEACHER PLANNING | | G | | |
| B105 | INTERVENTIONIST | 1 | CLASSROOM # | | F | | |
| B106 | INTERVENTIONIST | 1 | CLASSROOM # | | F | | |
| B107 | FIRST GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| B108 | FIRST GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| B109 | FIRST GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| B110 | FIRST GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| B112 | VESTIBULE | 2 | COURTYARD ACCESS | | G | | |
| B113 | LEARNING CENTER I | 1 | CLASSROOM # | | F | | |
| B114 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| B115 | ZEN | 1 | ZEN ROOM | | G | | |
| B116 | STUDENT COMMONS | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR B116 | EXTERIOR |
| B116 | STUDENT COMMONS | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| B116 | STUDENT COMMONS | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| B117 | KINDERGARTEN | 1 | CLASSROOM # | | F | | |
| B118 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| B119 | KINDERGARTEN | 1 | CLASSROOM # | | F | | |
| B120 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| B121 | KINDERGARTEN | 1 | CLASSROOM # | | F | | |
| B122 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| B123 | KINDERGARTEN | 1 | CLASSROOM # | | F | | |
| B124 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| **MAIN LEVEL AREA C** | | | | | | | |
| C101 | VESTIBULE | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | C101A | |
| C101 | VESTIBULE | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| C101 | VESTIBULE | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| C102 | CORRIDOR | 0 | - | - | | - | |
| C103 | THERAPY (FUTURE SPED) | 1 | CLASSROOM # | | F | | |
| C104 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| C105 | RELATED SERVICES | 1 | STUDENT SERVICES | | J | | |
| C106 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| C107 | OT/PT (FUTURE PRE-K) | 1 | CLASSROOM # | | F | | |
| C108 | PRE-K | 1 | CLASSROOM # | | F | | |
| C109 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| C110 | TESTING | 1 | STUDENT SERVICES | | J | | |
| C111 | PRE-K | 1 | CLASSROOM # | | F | | |
| C112 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| **MAIN LEVEL AREA D** | | | | | | | |
| D101 | CORRIDOR | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR D101 | EXTERIOR |
| D101 | CORRIDOR | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| D101 | CORRIDOR | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| D102 | CORRIDOR | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR D102A | EXTERIOR |
| D102 | CORRIDOR | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| D102 | CORRIDOR | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| D102 | CORRIDOR | 1 | COURTYARD ACCESS | | G | INSIDE DOOR AD102C | |
| D103 | CORRIDOR | 0 | - | - | - | - | |
| D104 | CORRIDOR | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR D104A | EXTERIOR |
| D104 | CORRIDOR | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| D104 | CORRIDOR | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| D104 | CORRIDOR | 1 | COURTYARD ACCESS | | G | INSIDE DOOR D104B | |
| D105 | SECOND GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| D106 | SECOND GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| D107 | TEACHER WORKROOM | 1 | TEACHER WORKROOM | | G | | |
| D108 | SECOND GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| D109 | SECOND GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| D110 | BOY'S TOILET | 1 | BOYS' RESTROOM | M, HC | A | | |
| D111 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| D112 | ELECTRICAL | 1 | ELECTRICAL | | G | | |
| D113 | MEDIA CENTER CLASSROOM | 2 | CLASSROOM # | | F | | |

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| D114 | MEDIA CENTER | 3 | LIBRARY / MEDIA CENTER | | G | | |
| D114 | MEDIA CENTER | 1 | COURTYARD ACCESS | | G | INSIDE DOOR D114B | |
| D115 | MEDIA CENTER OFFICE | 1 | OFFICE | | J | | |
| D116 | WORKROOM | 1 | WORKROOM | | G | | |
| D117 | INSTR. COACH | 1 | OFFICE | | J | | |
| D118 | LITERACY COACH | 1 | OFFICE | | J | | |
| D119 | ZEN | 1 | ZEN ROOM | | G | | |
| D120 | TECHNOLOGY | 2 | CLASSROOM # | | F | | |
| D121 | GIRL'S TOILET | 1 | GIRLS' RESTROOM | F, HC | A SIM. | | |
| **MAIN LEVEL AREA E** | | | | | | | |
| E101 | VESTIBULE | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR E101A | EXTERIOR |
| E101 | VESTIBULE | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| E101 | VESTIBULE | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| E102 | CORRIDOR | 0 | - | - | - | - | |
| E103 | CORRIDOR | 0 | - | - | - | - | |
| E104 | CORRIDOR | 0 | - | - | - | - | |
| E105 | THIRD GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| E106 | THIRD GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| E107 | THIRD GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| E108 | THIRD GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| E109 | LEARNING CENTER II | 1 | CLASSROOM # | | F | | |
| E110 | ART CLASSROOM | 1 | CLASSROOM # | | F | | |
| E111 | KILN | 1 | KILN | | G | | |
| E112 | STORAGE | 1 | STORAGE | | G | | |
| E113 | MEETING ROOM | 1 | CONFERENCE | | G | | |
| E114 | CUSTODIAN | 1 | CUSTODIAL | | G | | |
| **MAIN LEVEL AREA F** | | | | | | | |
| F101 | CORRIDOR | 1 | AED \| AUTOMATED \| EXTERNAL \| DEFIBRILLATOR | | M | BELOW AED | CONFIRM LOCATION WITH ARCHITECT |
| F102 | CORRIDOR | 0 | - | - | - | - | |
| F103 | CORRIDOR | 0 | - | - | - | - | |
| F104 | VESTIBULE | 2 | COURTYARD ACCESS | | G | INSIDE DOOR F104A, PUSH SIDE OF F104 B | |
| F105 | FOURTH GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| F106 | FOURTH GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| F107 | CUSTODIAN / STORAGE | 1 | CUSTODIAL | | G | | |
| F108 | BOY'S TOILET | 1 | BOYS' RESTROOM | M, HC | A | | |
| F109 | VESTIBULE | 1 | ACCESSIBLE ENTRANCE | | D SIM. | OUTSIDE DOOR F101A | 9" HIGH SIGN, EXTERIOR |
| F109 | VESTIBULE | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| F110 | PE STORAGE | 1 | OFFICE | | J | | |
| F111 | PASSAGE | 1 | ELEVATOR ACCESS | | G | | |
| F112 | HC TOILET | 1 | RESTROOM | M/F, HC | B | | |
| F113 | GYMNASIUM | 1 | GYMNASIUM | | G | | |
| F113 | GYMNASIUM | 1 | ALL VISITORS MUST REPORT TO THE MAIN OFFICE | | K | OUTSIDE DOOR F113A | EXTERIOR |
| F113 | GYMNASIUM | 1 | ACCESSIBLE ENTRANCE | | D SIM. | | 9" HIGH SIGN, EXTERIOR |
| F113 | GYMNASIUM | 1 | EXIT | | C | LEADING TO EXTERIOR | |
| F113 | GYMNASIUM | 1 | NOTICE \| OCCUPANCY FOR THIS \| AREA NOT TO EXCEED \| #### \| PERSONS \ PER: FIRE MARSHAL \| TOWN OF NEWINGTON | | L | LOCATION TO BE DETERMINED BY FIRE MARSHAL | OCCUPANT LOAD TO BE ACCEPTED BY FIRE MARSHAL PRIOR TO FABRICATION |
| F113 | GYMNASIUM | 1 | ASSISTIVE LISTENING DEVICES AVAILABLE | EAR | D | | |

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| F115 | RELATED SERVICES | 1 | STUDENT SERVICES | | J | | |
| F116 | RELATED SERVICES | 1 | STUDENT SERVICES | | J | | |
| F117 | GIRL'S TOILET | 1 | GIRLS' RESTROOM | F, HC | A SIM. | | |
| F118 | ELECTRICAL | 1 | ELECTRICAL | | G | | |
| F119 | FOURTH GRADE CLASSROOM | 1 | CLASSROOM # | | E | | |
| F120 | FOURTH GRADE CLASSROOM | 1 | CLASSROOM # | | F | | |
| F121 | BREAKOUT | 1 | CLASSROOM # | | F | | |
| F122 | TEACHER PLANNING | 1 | TEACHER PLANNING | | G | | |
| F123 | ZEN | 1 | ZEN ROOM | | G | | |
| F124 | MATH INT. | 1 | STUDENT SERVICES | | J | | |
| F125 | BREAKOUT | 1 | CLASSROOM # | | G | | |
| F126 | LEARNING COMMONS | 0 | | | | | |
| **UPPER LEVEL AREA A** | | | | | | | |
| A21 | STAIR A1 | 0 | - | - | - | - | |
| A201 | ROOF ACCESS | 1 | ROOF ACCESS | | G | A12A | |
| **REFLECTIVE SIGNS (EXTERIOR DOORS)** | | | | | | | |
| **MAIN LEVEL AREA A** | | | | | | | |
| A101 | VESTIBULE | 1 | 1 | - | N | A101C | |
| A106 | CAFETORIUM | 1 | 2 | - | N | A106A | |
| A113 | PASSAGE | 1 | 3 | - | N | A113 | |
| **MAIN LEVEL AREA B** | | | | | | | |
| B116 | STUDENT COMMONS | 1 | 11 | - | N | B116 | |
| **MAIN LEVEL AREA C** | | | | | | | |
| C101 | VESTIBULE | 1 | 12 | - | N | C101A | |
| **MAIN LEVEL AREA D** | | | | | | | |
| D101 | CORRIDOR | 1 | 10 | - | N | D101 | |
| D102 | CORRIDOR | 1 | 9 | - | N | D102A | |
| D104 | CORRIDOR | 1 | 8 | - | N | D104A | |
| **MAIN LEVEL AREA E** | | | | | | | |
| E101 | VESTIBULE | 1 | 7 | - | N | E101 | |
| **MAIN LEVEL AREA F** | | | | | | | |
| F101 | CORRIDOR | 1 | 6 | - | N | F101A | |
| F113 | GYMNASIUM | 1 | 5 | - | N | F113A | |
| **REFLECTIVE SIGNS (EXTERIOR WINDOWS)** | | | | | | | |
| **MAIN LEVEL AREA A** | | | | | | | |
| A121 | MUSIC CLASSROOM | 2 | 1 | - | N | ON WINDOWS | |
| **MAIN LEVEL AREA B** | | | | | | | |
| B103 | BREAKOUT | 1 | 28 | - | N | ON WINDOWS | |
| B105 | MULTI-LANGUAGE | 1 | 26 | - | N | ON WINDOWS | |
| B106 | READING INT. | 1 | 25 | - | N | ON WINDOWS | |
| B107 | FIRST GRADE CLASSROOM | 2 | 24 | - | N | ON WINDOWS | |
| B108 | FIRST GRADE CLASSROOM | 2 | 22 | - | N | ON WINDOWS | |
| B109 | FIRST GRADE CLASSROOM | 2 | 21 | - | N | ON WINDOWS | |
| B110 | FIRST GRADE CLASSROOM | 2 | 23 | - | N | ON WINDOWS | |
| B113 | LEARNING CENTER I | 2 | 27 | - | N | ON WINDOWS | |
| B117 | KINDERGARTEN | 2 | 30 | - | N | ON WINDOWS | |
| B119 | KINDERGARTEN | 2 | 32 | - | N | ON WINDOWS | |
| B121 | KINDERGARTEN | 2 | 31 | - | N | ON WINDOWS | |
| B123 | KINDERGARTEN | 2 | 29 | - | N | ON WINDOWS | |
| **MAIN LEVEL AREA C** | | | | | | | |
| C103 | THERAPY (FUTURE SPED) | 2 | 33 | - | N | ON WINDOWS | |
| C107 | OT/PT (FUTURE PRE-K) | 2 | 34 | - | N | ON WINDOWS | |
| C108 | PRE-K | 2 | 35 | - | N | ON WINDOWS | |
| C111 | PRE-K | 2 | 36 | - | N | ON WINDOWS | |
| **MAIN LEVEL AREA D** | | | | | | | |
| D105 | SECOND GRADE CLASSROOM | 2 | 15 | - | N | ON WINDOWS | |
| D106 | SECOND GRADE CLASSROOM | 2 | 16 | - | N | ON WINDOWS | |
| D108 | SECOND GRADE CLASSROOM | 2 | 18 | - | N | ON WINDOWS | |
| D109 | SECOND GRADE CLASSROOM | 2 | 19 | - | N | ON WINDOWS | |
| **MAIN LEVEL AREA E** | | | | | | | |
| E105 | THIRD GRADE CLASSROOM | 2 | 12 | - | N | ON WINDOWS | |

| Const. Room Number | Room Name | Qty | Text of Sign | Symbol | Sign Type - Reference A9 Series | Locate sign at entrance to room U.O.N. | Remarks |
|---|---|---|---|---|---|---|---|
| E106 | THIRD GRADE CLASSROOM | 2 | 10 | - | N | ON WINDOWS | |
| E107 | THIRD GRADE CLASSROOM | 2 | 9 | - | N | ON WINDOWS | |
| E108 | THIRD GRADE CLASSROOM | 2 | 11 | - | N | ON WINDOWS | |
| E109 | LEARNING CENTER II | 2 | 13 | - | N | ON WINDOWS | |
| E110 | ART CLASSROOM | 2 | 14 | - | N | ON WINDOWS | |
| **MAIN LEVEL AREA F** | | | | | | | |
| F105 | FOURTH GRADE CLASSROOM | 2 | 5 | - | N | ON WINDOWS | |
| F106 | FOURTH GRADE CLASSROOM | 2 | 3 | - | N | ON WINDOWS | |
| F119 | FOURTH GRADE CLASSROOM | 2 | 2 | - | N | ON WINDOWS | |
| F120 | FOURTH GRADE CLASSROOM | 2 | 4 | - | N | ON WINDOWS | |
| F121 | BREAKOUT | 2 | 6 | - | N | ON WINDOWS | |
| **PIN LETTERS** | | | | | | | |
| - | EXTERIOR | 1 SET | ANNA M. REYNOLDS | - | | EXTERIOR | 12" PIN LETTERS |
| A106 | CAFETORIUM | 1 SET | CAFETORIUM | | | | 8" PIN LETTERS |
| A122 | MAIN OFFICE | 1 SET | OFFICE | | | | 8" PIN LETTERS |
| D114 | MEDIA CENTER | 1 SET | LIBRARY MEDIA CENTER | | | | 8" PIN LETTERS |
| F113 | GYMNASIUM | 1 SET | GYMNASIUM | | | | |
| **PLAQUE** | | | | | | | |
| A102 | LOBBY | 1 | TO BE DETERMINED | | | | 24"X36" PLAQUE WITH COLOR LOGO |

# SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section “Miscellaneous Rough Carpentry" for wood blocking.
3. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

### 1.3 REFERENCES

A. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.

D. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

F. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

## 1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

## 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

B. Warranty: Special warranty included in this Section.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.

1. Door Hinges: Two hinges with associated fasteners.
2. Latch and Keeper: Two latches and keepers with associated fasteners.
3. Door Bumper: Two bumpers with associated fasteners.
4. Door Pull: Two door pulls with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.8 QUALITY ASSURANCE

A. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.

1. Coordinate with wall finishes indicated on the Finish Schedule. Allow for thickness of ceramic wall tile and tile wainscots as required.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of phenolic partitions, including panels, doors, stiles, and continuous hinges that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Breakage, corrosion, delamination and defects in factory workmanship.

2. Warranty Period: 15 years from date of Substantial Completion.
3. Warranty Period for Stainless Steel hardware: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Hazard Classification: Fire Propagation Characteristics: Passes NFPA 286 testing.

B. Regulatory Requirements: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

A. Basis of Design Product: Subject to compliance with requirements, provide **Scranton Products; Hiny Hiders** or comparable product by one of the following:

1. Accurate Partitions Corp.; ASI Group.
2. General Partitions.

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Wall hung, flat panel.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
2. Color: As indicated on Finish Legend.

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 16 gauge stainless-steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

    a. Mount an additional door pull on inside of handicapped accessible stalls at 36 inches above the floor, located at 6 inches from hinge side of door.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.4 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

D. Stainless-Steel Castings: ASTM A 743/A 743M.

## 2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inchesinto structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

## 3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.19

# SECTION 10 21 23 - CUBICLES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Curtain tracks and curtain carriers.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 09 Section "Acoustical Panel Ceilings" for metal framing and furring for mounting items requiring anchorage.

### 1.3 PERFORMANCE REQUIREMENTS

A. Curtains: Provide curtain fabrics with the following characteristics:

1. Fabrics are launderable to a temperature of not less than 160 deg F.
2. Fabrics are flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

a. Identify fabrics with appropriate markings of applicable testing and inspecting agency.

### 1.4 SUBMITTALS

A. Product Data: Include durability, laundry temperature limits, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.

1. Include data on each type of applied curtain treatment.

B. Shop Drawings: Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.

1. Include details on blocking above ceiling.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Items penetrating finished ceiling, including the following:

a. Lighting fixtures.
b. Sprinklers.
c. Access panels.

D. Samples for Initial Selection: For each type of curtain material indicated.

E. Samples for Verification: For each type of product required, prepared on Samples of size indicated below.

1. Curtain Fabric: 12-inch- square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 4 inches square.
3. Curtain Track: Not less than 4 inches long.
4. Curtain Carrier: Full-size unit.

F. Curtain and Track Schedule: Use same designations indicated on Drawings.

G. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

H. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

## 1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical cubicle, complete with track, curtain, as directed by Construction Manager.

a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
b. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install cubicles until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 CURTAIN TRACKS

A. Basis of Design Product: Subject to compliance with requirements, provide **Construction Specialties; Cubicle Curtains** or comparable product by one of the following:

1. AR Nelson.
2. Imperial Fastener Company, Inc.
3. InPro Corporation; Clikeze.

B. Extruded-Aluminum Track: Not less than 1-1/4 inches wide by 1-inch high; with minimum wall thickness of 0.050 inch.

1. Curved Track: Factory-fabricated, 12-inch- radius bends.
2. Finish: Baked enamel, acrylic, or epoxy.

C. Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

1. End Stop: Removable with carrier hook.

D. Curtain Carriers: One-piece nylon glide with chrome-plated steel hook.

E. Exposed Fasteners: Stainless steel.

F. Concealed Fasteners: Stainless steel.

2.2 CURTAINS

A. Cubicle Curtain Fabric: Manufacturer’s standard, 100 percent polyester, inherently and permanently flame resistant, stain resistant, and antimicrobial.

1. Fabric: As selected by Architect from manufacturer’s full range.

B. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.

C. Mesh Top: No. 50 nylon mesh.

D. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

## 2.3 CURTAIN FABRICATION

A. Fabricate curtains to comply with the following requirements:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height, with 20-inch mesh top, and minus distance above the finished floor at bottom as follows:

    a. Cubicle Curtains: 12 inches.

3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched.
4. Mesh Top: Top hem not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched. Double lock stitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, double thickness and double lock stitched.
6. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with double turned edges, and single lock stitched.

B. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

## 3.2 INSTALLATION

A. General: Install tracks level and plumb, according to manufacturer's written instructions.

B. Up to 16 feet in length, provide track fabricated from 1 continuous length.

1. Curtain Track Mounting: Surface.

C. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches. Fasten support at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:

1. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.

D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.

F. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

## 3.3 PROTECTION

A. Protect installed recessed track openings with nonresidue adhesive tape to prevent construction debris from impeding carrier operation. Remove tape prior to Substantial Completion.

END OF SECTION 10 21 23

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# SECTION 10 22 26 - OPERABLE PARTITIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Manually operated, acoustical panel partitions.
2. Preparation of structure to receive operable panel partitions support systems.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.
3. Division 08 Section "Door Hardware" for cylinders for pass doors.
4. Division 09 Section "Gypsum Board Assemblies" for sound barrier construction above the ceiling at track.

### 1.3 DEFINITIONS

A. NIC: Noise Isolation Class.

B. STC: Sound Transmission Class.

### 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data for attachments, signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.
2. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

D. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed material, finish, covering, or facing indicated, prepared on Samples of size indicated below:

1. Panel Facing Material: Manufacturer's standard-size unit, not less than 3 inches square.
2. Hardware: Manufacturer's standard exposed door-operating device.

F. Delegated-Design Submittal: For operable panel partitions indicated to comply with performance requirements, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for seismic restraints.

## 1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.

B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

C. Qualification Data: For qualified Installer.

D. Seismic Qualification Certificates: For operable panel partitions**,** accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of operable panel partition, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each operable panel partition.

G. Field quality-control reports.

H. Warranty: Sample of special warranty.

## 1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
2. Seals, hardware, track, carriers, and other operating components.

## 1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to Division 01 Section "Quality Requirements" for testing indicated.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

## 1.10 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of operable panel partition openings by field measurements before fabrication.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal wear.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design operable panel partitions, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to the Connecticut State Building Code.

1. The term "withstand" means "the panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."

C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
2. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C 423, and rated for not less than the NRC indicated.
3. Acoustical Performance Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for no less than STC indicated.

D. Fire-Test-Response Characteristics: Provide panels with finishes meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

a. Flame-Spread Index: 76 to 200 (Class III).
b. Smoke-Developed Index: 450 or less.

2.2 MATERIALS

A. Steel Frame: Steel sheet, 16-gauge minimum thickness for uncoated steel, with overlapped and welded corners.

B. Steel Face/Liner Sheets: Roll formed steel sheet, 21-gauge nominal minimum thickness for uncoated steel.

2.3 OPERABLE ACOUSTICAL PANELS

A. Operable Acoustical Panels: Operable acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Modernfold, Inc.; dormakaba Group; Acousti-Seal Encore, #17 Track** or one of the following:

a. Hufcor; Model 641.
b. Moderco, Inc.
c. Panelfold Inc.

B. Panel Operation: Manually operated, single panels.

C. Panel Construction: Provide top channel reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

1. Fabricate panels so that full vertical edges of panels are of formed steel to provide concealed protection of the edges of the panel skin.
2. Panel edges shall be lock formed and welded directly to the frame for unitized construction.

D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

1. Panel Width: Standard widths, not less than 48 inches.

E. STC Rating: Not less than 54.

F. Panel Weight: 9.5 lb/sq. ft. maximum.

G. Panel Thickness: Manufacturer’s standard, 4-1/4-inches.

H. Panel Closure:

1. Final Closure: Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

I. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

1. Hinges: Manufacturer's standard, full leaf butt hinges attached directly to panel frame with welded hinge anchor plates within panel to support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal are not acceptable.

## 2.4 SEALS

A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:

1. Manufacturer's standard seals.
2. Seals made from materials and in profiles that minimize sound leakage.
3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.

B. Vertical Seals: Deep-nesting, interlocking aluminum astragals mounted on each edge of panel, with continuous PVC acoustical seal. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

C. Horizontal Top Seals:

1. Continuous-contact, extruded vinyl bulb shape with pairs of non-contacting vinyl fingers exerting uniform constant pressure on track.

D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

1. Automatically Operated for Acoustical Panels: Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less 2 inches between retracted seal and floor finish.

## 2.5 FINISH FACINGS

A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.

1. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects, with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
2. Trim: Aluminum slip-on or snap-on trim with no visible screws or exposed joints and with corners mitered to a neat, hairline joint.

B. Vinyl-Coated Fabric Wall Covering: Manufacturer's standard, mildew-resistant, washable, vinyl-coated fabric wall covering; complying with CFFA-W-101-D for type indicated; Class A.

1. Color: As selected by Architect from manufacturer’s full range.

C. Panel Finish: Full height steel markerboard work surface.

D. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

## 2.6 SUSPENSION SYSTEMS

A. Suspension Tracks: Minimum 7-gauge roll-formed steel, with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum; finished with factory-applied, decorative, protective finish.
2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.

B. Carriers: All-steel trolley system as required for configuration type, size, and weight of partition and for easy operation; with steel tired ball-bearing wheels.

C. Aluminum Finish: Manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

D. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

## 2.7 ACCESSORIES

A. Pass Doors: Fabricated to comply with recommendations in ICC/ANSI A117.1 and 2010 ADA Standards. Swinging door built into and matching panel materials, construction, acoustical qualities, finish, and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.

1. Single Pass Door: 36 by 84 inches, with the following:

a. Door Seals: Mechanically operated floor seal on panels containing pass doors, with no threshold.
b. Trim: Aluminum frame on three sides of door to form an exposed jamb of approximately 1-3/4-inch on hinge, top and sides of door.
c. Equip with friction latch and flush pulls for panic operation.

d. Concealed door closer.
e. Door Viewer: Installed with view in direction of swing.
f. Exit Sign: Recessed, self-illuminated, located on push side of door.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION OF STEEL

A. Provide open holes in structural steel from attachment of operable panel hangers and accessories.

1. Drill holes for bolts 1/16-inch larger than the nominal diameter of the bolts. Install bolts snug and draw up tight with full grip.

### 3.3 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.

B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

### 3.4 FIELD QUALITY CONTROL

A. NIC Testing: Engage a qualified testing agency to perform tests and inspections.

1. Testing Extent: Testing agency shall randomly select one of each type of operable panel partition installation for testing.
2. Testing Methodology: Perform testing of installed operable panel partition for noise isolation according to ASTM E 336, determined by ASTM E 413, and rated for not less

than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.

B. An operable panel partition installation will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

## 3.5 ADJUSTING

A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.

B. Adjust pass doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

## 3.6 FIELD QUALITY CONTROL

A. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids; adjust partitions for acceptable fit.

B. Repair or replace operable panel partitions that do not comply with requirements.

C. Prepare test and inspection reports.

## 3.7 CLEANING

A. Clean soiled surfaces of operable panel partitions to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

## 3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 10 22 26

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# SECTION 10 22 39.13 - FOLDING GLASS-PANEL PARTITIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes manually operated, glass-panel partitions.

B. Related Requirements:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 09 Section "Gypsum Board Assemblies" for sound barrier construction above the ceiling at track.
3. Division 10 Section “Operable Partitions” for manually operated, single panel partitions.

### 1.3 DEFINITIONS

A. STC: Sound Transmission Class.

### 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d9: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For operable glass-panel partitions.

1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

D. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Panel Edge Material: Not less than 3 inches long.
2. Glass: Units 12 inches square.

F. Delegated-Design Submittal: For operable glass-panel partitions.

1. Include design calculations for seismic restraints.

## 1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems are attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    a. Lighting fixtures.
    b. HVAC ductwork, outlets, and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Smoke detectors.
    f. Access panels.

6. Plenum acoustical barriers.

B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

C. Qualification Data: For qualified Installer and manufacturer.

D. Seismic Qualification Certificates: For operable glass-panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:

1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, according to ASCE/SEI 7.
2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of operable glass-panel partition.

F. Product Test Reports: For each operable glass-panel partition, for tests performed by a qualified testing agency.

G. Sample Warranty: For manufacturer's special warranty.

## 1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable glass-panel partitions to include in maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

a. Panel finish and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
b. Hardware, track, carriers, and other operating components.

## 1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable glass-panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable glass-panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design seismic bracing of tracks to structure above.

B. Seismic Performance: Operable glass-panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Connecticut State Building Code.

1. The term "withstand" means "the partition panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."

C. Acoustical Performance: Provide operable glass-panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Operable glass-panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

D. Fire-Test-Response Characteristics: Provide wood-framed panels complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2.2 OPERABLE GLASS PANELS

A. Operable Glass Panels: Frameless aluminum glass-panel partition system, including panels, suspension system, operators, and accessories.

1. Basis of Design Product: Subject to compliance with requirements, provide **Hufcor; GU Series High Acoustic Glass Wall** or one of the following:

a. Avanti Systems, Inc.; Movare Double Glazed (*STC 44*).
b. Moderco; Crystal 200 *(STC 44*).
c. NanaWall Systems, Inc.; SL64 Acoustical.

B. Panel Operation: Manually operated, single panels, top supported panels with two-piece, clamp-on top and bottom rail that fastens together from alternating sides.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Glass: The glass shall be of factory installed nominal 2-inch dual laminated insulated glass unit. For heights 10' and over, a horizontal panel splice is required for two glass units.

1. Safety Glass Standard for Partition Panels: Provide glass products complying with testing requirements in 16 CFR 1201, Category II, or ANSI Z97.1, Class A.
2. Glass: Custom safety glass and glass assemblies as indicated and complying with the following:

a. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.
b. Glass Thickness:
c. Glass Vertical Edge: Manufacturer's standard.

3. Glazing System: Manufacturer's standard factory-glazing system.

E. Dimensions: Fabricate operable glass-panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

1. Panel Width: Standard widths, not greater than 48 inches.

G. STC Rating: 45 (not less than 44).

H. Panel Weight: 9.9 lbs./sq. ft.

I. Panel Thickness: 4 inches.

J. Panel Frame Material: 16 gauge painted steel with rust inhibitor coating and integral factory applied aluminum vertical edge and face protection.

K. Panel Closure: Manufacturer's standard.

L. Hardware: Manufacturer's standard as required to operate operable glass-panel partition and accessories; with decorative, protective finish.

1. Hinges: Manufacturer's standard.

M. Horizontal Seals:

1. Top horizontal seals shall be 1" fixed, continuous contact multi-layer vinyl sweep that maintains contact with the track
2. Bottom horizontal seal shall be retractable and provide up to 2” nominal operating clearance, exerting 40 lbs. of downward force when extended.

N. Vertical Seals: Vertical sound seals shall be of tongue and groove configuration, ensure panel-to-panel alignment and prevent sound leaks between panels.

O. Operation:

1. Panels shall be manually moved from the storage area, positioned in the opening, and the seals set.

a. Retractable horizontal seals shall be activated by a removable quick-set operating handle located a nominal 42 inches from the floor in the panel edge. Activation of the seals requires approximately 180 degree turn of the removable handle.

2. Final Partition Closure: Lever Closure Panel with expanding jamb which compensates for minor wall irregularities and provides a minimum of 250 lbs. seal force against the adjacent wall for optimum sound control. The jamb activator shall be located a nominal 43" from the floor in the panel face and be accessed from either side of the panel. The jamb is equipped with a mechanical rack and pinion gear drive mechanism and shall extend 4”-6” by turning the removable operating handle.

## 2.3 SUSPENSION SYSTEMS

A. Tracks: Steel with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable glass-panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable glass-panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.

2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.

B. Carriers: Two all-steel trolleys with steel ball-bearing wheels and Delrin® tires. Automatic indexing of panels into stack area is provided by pre-programmed switches and trolleys without electrical, pneumatic, or mechanical activation.

C. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

D. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable glass-panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable glass-panel partition manufacturer's written installation instructions.

B. Install operable glass-panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

### 3.3 ADJUSTING

A. Adjust operable glass-panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Verify that safety devices are properly functioning.

## 3.4 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

## 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable glass-panel partitions.

END OF SECTION 10 22 39.13

# SECTION 10 26 00 - WALL PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Impact-resistant wall coverings.
2. Corner guards.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 08 Section "Door Hardware" for metal kick, mop, and push plates.

### 1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

D. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.

E. Samples for Verification: For each type of exposed finish required.

1. Corner Guards: 12 inches long. Include examples of joinery, corners, top caps, and field splices.
2. Abuse-Resistant Wall Covering: 6 by 6 inches square.

F. Qualification Data: For qualified Installer.

G. Material Certificates: For each impact-resistant plastic material, from manufacturer.

H. Material Test Reports: For each impact-resistant plastic material.

I. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

J. Warranty: Special warranty included in this Section.

## 1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

B. Preinstallation Conference: Conduct conference at Project site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 MATERIALS

A. Adhesive: As recommended by protection product manufacturer.

## 2.4 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Sheet Wall Covering: Fabricated from fiberglass reinforced plastic.

1. Basis-of-Design Product (**FRP-1**): Subject to compliance with requirements, provide **Marlite; Standard FRP Panels**, or one of the following:

    a. Crane Composites; Glasbord FSI.
    b. Nudo; FiberLite FRP.
    c. Panolam; FRP.

2. Size: 48 by 96 inches for sheet.
3. Sheet Thickness: 3/32 inch minimum.
4. Color: As indicated on Materials List.
5. Texture: Smooth.
6. Height: As indicated.
7. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
8. Mounting: Adhesive.

## 2.5 CORNER GUARDS

A. Surface-Mounted, Opaque-Plastic Corner Guards: Fabricated from PVC plastic, acrylic-modified vinyl sheet or opaque polycarbonate sheet; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Construction Specialties, Inc.; Model VA-200N** or comparable product by one of the following:

    a. InPro Corporation.
    b. Korogard Wall Protection Systems.

2. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
3. Corner Radius: 1/8 inch.
4. Mounting: Double-faced adhesive foam tape.
5. Colors: As indicated on Finish Legend.

## 2.6 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.

B. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

END OF SECTION 10 26 00

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# SECTION 10 28 00 – TOILET AND BATH ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

### 1.2 SUMMARY

A. This Section includes the following:

1. Washroom accessories.
2. Custodial accessories.
3. Childcare accessories.
4. Installation of Owner-furnished accessories.

B. Owner furnished accessories:

1. Paper towel dispensers.
2. Toilet paper dispensers.
3. Soap dispensers.

C. Related Sections include the following:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
2. Division 22 Section "Plumbing" for underlavatory guards, handicapped accessible and standard shower units and accessories.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.

2. Identify products using designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

B. Accessibility: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated by **Bobrick Washroom Equipment, Inc.** or a comparable product by one of the following:

1. AJW Architectural Products.
2. American Specialties, Inc.
3. Bradley Corporation.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.3 WASHROOM ACCESSORIES

A. Paper Towel Dispenser: Owner furnished.

B. Toilet Paper Dispenser: Owner furnished.

C. Soap Dispenser: Owner furnished.

D. Grab Bar (G.B.):

1. Basis-of-Design Product: **Bobrick; B-6806.99 Series**.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18 gauge.

    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Provide in straight lengths, in sizes indicated.

E. Mirror Unit (M.W.F.):

1. Basis-of-Design Product: **Bobrick; B-290 Series**.
2. Frame: Stainless-steel angle, 0.05 inch thick, 3/4 inch x 3/4 inch angle with vertical-grain satin finish, one-piece roll-formed construction.

    a. Corners: Welded and ground smooth.
    b. Backing: Galvanized steel fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. Wall bracket of 20 gauge galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Mirror: No. 1 quality, 1/4-inch select float glass, with all edges protected by plastic filler strips. Provide protective backing of full-size, shock absorbing, water resistant, nonabrasive, 3/16-inch thick polyethylene padding.
5. Sizes: As indicated.

F. Robe Hook (R.H.):

1. Basis-of-Design Product: **Bobrick; B6707.**
2. Mounting: Surface mounted.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

    a. Flange and Support Arm: 22 gauge stainless steel with concealed 16 gauge stainless steel mounting bracket, all-welded construction. Secure to wall plate with stainless steel setscrew.
    b. Concealed Wall Plate: 16 gauge stainless steel.
    c. Cap: 10 gauge stainless steel, welded to support arm.

## 2.4 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder:

1. Basis-of-Design Product: **Bobrick; B-224**.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

    a. Shelf: Not less than 18 gauge stainless steel.
    b. Rod: Approximately 1/4-inch- diameter stainless steel.

## 2.5 CHILDCARE ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Koala Kare Products, Division of Bobrick** or a comparable product by one of the following:

1. American Infant Care Products Inc.
2. American Specialties, Inc.
3. Brocar Products, Inc.

B. Diaper-Changing Station:

1. Basis-of-Design Product: **Bobrick; KB110-SSWM.**
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap, in conformance with ASTM F 2285 Standard Safety Performance Specification for Diaper Changing Tables for Commercial Use.
    a. Engineered to support a minimum of 200-lb static load when opened.
    b. Contoured changing surface with nylon safety straps and bag hooks.
3. Materials: FDA approved blow molded high-density polyethylene (HDPE) clad in 18 gauge Type 304 stainless steel, brushed finish.
4. Mounting: Surface mounted.
    a. Depth Closed: 4 inches maximum.
    b. Extension: 19 inches.
    c. Reinforced steel on steel hinge mechanism with 11 gauge steel mounting plates and hardware.
5. Operation: Concealed pneumatic cylinder providing controlled, slow opening and closing of the changing station bed.
6. Hinge Mechanism: Reinforced full-length steel-on-steel hinge with integrated steel hook plate.
7. Changing Surface: Contoured, concave and smooth, 442 sq. in.
8. Safety Straps: Replaceable, snap-lock, nylon protective holding straps.
9. Liner Dispenser: Built in, with a minimum 25 liner capacity.

## 2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

# SECTION 10 41 16 – EMERGENCY KEY CABINETS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section includes a recessed mounted key vault.

B. Related Sections:

1. Division 26 Sections for empty electrical conduit for connection to building security system.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and operating characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show operational clearances and coordination of recessed frame with designed wall thicknesses.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

E. Operation and Maintenance Data: To include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include keying and combination information.

### 1.4 QUALITY ASSURANCE

A. Key Vault Assemblies: Assemblies complying with UL for box and lock.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-rated vault door assemblies wrapped and crated to provide protection during transit and Project-site storage. Use vented plastic.

B. Deliver keys to Owner through Construction Manager.

1.6 COORDINATION

A. Coordinate installation of anchorages for recessed key vault. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the following in accordance with the Town of Newington Fire Department requirements:

**1. United Technologies Kidde; SupraSafe 2HSR.**

2.2 KEY VAULT

A. General: UL listed, high security key vault for emergency access, with single hinged door.

B. Box: Fabricated from all-welded, 1/4-inch steel case, with steel flange for recessed mounting.

1. Size: 5”H x 4”W x 3-1/4” deep with 7”H x 7”W mounting flange.

C. Door: Fabricated from 1/2-inch thick steel with interior gasket seal and stainless steel door hinge.

D. Lock Cover: Fabricated from 1/8-inch thick stainless steel with tamper seal mounting capability.

E. Lock: UL listed, double-action rotating tumblers and hardened steel pins accessed by a biased cut key. Include tamper switch connected to the building’s security system.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 PAINT FINISHES

A. Finish: Manufacturer's standard factory-applied, baked-on paint finish:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. For the record, prepare written report listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Set key vaults accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. Install according to manufacturer’s written instructions.

3.3 ADJUSTING AND CLEANING

A. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented units.

B. Test unit to demonstrate compliance with requirements. Replace units which do not operate or fail to activate alarm.

END OF SECTION 10 41 16

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# SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes the following:

1. Fire protection cabinets.
2. Portable fire extinguishers.
3. Mounting brackets for fire extinguishers.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 21 Sections for fire suppression systems.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets and fire extinguishers.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

D. Samples for Initial Selection: For each type of fire protection cabinet indicated.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Size: 6 by 6 inches square.

F. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

G. Maintenance Data: For fire protection cabinets and extinguishers to include in maintenance manuals.

## 1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

## 1.6 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Source Limitations: Provide fire extinguishers and cabinets from a single source and a single manufacturer.

C. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

D. Fire Extinguishers: Listed and labeled for type, rating, and classification.

1. Provide fire extinguishers approved, listed, and labeled by UL.

## 1.7 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.8 SEQUENCING

A. Apply decals on field-painted, fire protection cabinets after painting is complete.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION CABINETS

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis of Design Product: Subject to compliance with requirements, provide **Larsen's Manufacturing Company; Architectural Series** or comparable product by one of the following:

a. J. L. Industries, Inc., a division of Activar Construction Products Group.
b. Potter Roemer LLC.

B. Cabinet Construction: Nonrated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semi-Recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

1. Rolled-Edge Trim: 4-inch backbend depth.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

F. Cabinet Trim Material: Stainless-steel sheet.

G. Door Material: Stainless-steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Die-cut lettering.
3) Lettering Color: Red.
4) Orientation: Vertical.

L. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
2. Stainless-Steel Sheet: ASTM A 666, Type 304.
3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 6 mm thick, Class 1 (clear).

M. Finishes:

1. Interior: Manufacturer's standard baked-enamel paint.
2. Exterior: Stainless Steel: No. 4.

## 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb. nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

C. Regular Dry-Chemical Type in Steel Container: UL-rated 40-B:C, 5.5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

1. Provide regular dry-chemical type in Mechanical and Electrical Rooms.

D. Wet-Chemical Type: UL-rated 2-A:K, 2.5-gal. nominal capacity, with potassium carbonate-based chemical in stainless-steel container; with pressure-indicating gage.

1. Provide K-type extinguisher in kitchens and similar rooms where cooking media is used.
2. Include a Class K placard at each location in size and wording defined in NFPA 10.

## 2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure and to prevent accidental dislodging extinguisher, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Provide manufacturer’s optional bracket in size required to suit extinguisher, with single or double strap.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to triangular profile sign mounted above fire extinguisher at 6’-8” above finished floor to top of sign.

a. Orientation: Vertical.
b. Product: Subject to compliance with requirements, provide the following:

1) Larsen’s: PTD-182.

## 2.4 CABINET FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color: selected by Architect from manufacturer's full range.

2.7 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

1. Fire Protection Cabinets: 48 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide semi-recessed fire protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
2. Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply decals at locations indicated.

## 3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

## 3.5 FIRE EXTINGUISHER SCHEDULE

A. Provide fire extinguishers and fire extinguisher cabinets as indicated on Drawings in accordance with the following schedule:

1. Fire Extinguisher and Bracket:

    a. **FE-1:** Wall mounted UL-rated 40-B:C fire extinguisher, bracket, and label.

2. Fire Extinguisher Cabinets:

    a. **FC-1:** Semi-Recessed cabinet with UL-rated 2-A:K potassium carbonate extinguisher.
    b. **FC-2:** Semi-Recessed cabinet with UL-rated 4-A:80-B:C multipurpose dry chemical extinguisher.

END OF SECTION 10 44 00

**SECTION 10 51 13 – METAL LOCKERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary."

1.2 SUMMARY

A. Section Includes:

1. Standard metal lockers.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for concealed wood blocking, and shims required for installing metal lockers and concealed within other construction before metal locker installation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.

1. Show locker trim and accessories.
2. Include locker identification system and numbering sequence.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For metal lockers in manufacturer's standard sizes.

F. Qualification Data: For qualified Installer.

G. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

H. Warranty: Sample of special warranty.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain metal lockers and accessories from single source from single manufacturer.

C. Regulatory Requirements: Provide 5 percent of each locker type to comply with accessibility requirements, comply with the 2010 ADA Standards and ICC/ANSI A117.1.

D. Preinstallation Conference: Conduct conference at Project site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Deliver master and control keys to Owner.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than two units:

a. Locks.
b. Hooks.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

B. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

C. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.

2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

## 2.2 ACADEMIC LOCKERS

A. Product: Subject to compliance with requirements, provide one of the following:

1. Lyon Workspace Products; Heavy Duty Lockers.
2. Penco Products, Inc.; Guardian Plus Lockers.
3. Republic Storage Products, LLC; Heavy Duty Corridor Lockers.

B. Sizes: In locations as indicated on Drawings.

1. Typical: 15” x 12” x 60”H, double tier.
2. ADA: 15” x 12” x 60”H, single tier.

C. Material: Cold-rolled steel sheet.

D. Body: Assembled by riveting or bolting body components together; bolt spacing not to exceed 9” o.c. Fabricate from unperforated, cold-rolled steel sheet with thicknesses as follows:

1. Tops: 24 gauge, with single bend at sides.
2. Bottoms and Intermediate Dividers: Not less than 16 gauge, with single bend at sides.
3. Backs and Sides: 24 gauge, with full-height, double-flanged connections.
4. Shelves: 16 gauge, with double bend at front and single bend at sides and back.

E. Frames: Channel formed; fabricated from 16 gauge, cold-rolled steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical frame members.

F. Doors: One-piece; fabricated from 14 gauge minimum, cold-rolled steel sheet; formed into channel shape with double bend at vertical edges, and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or pans for doors more than 15 inches wide; welded to inner face of doors at 6” centers.
2. Door Style: Vented panel as follows:

a. Louvered Vents: Not less than six louver openings at top and bottom for single-tier; three louver openings at top and bottom for double-tier; three openings for box lockers.

G. Hinges: Welded to door and attached to door frame with not less than 2 factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five knuckle, tight pin; minimum 2 inches high; two hinges per door. Provide not less than 3 hinges for each door more than 42 inches high.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; tamper resistant decorative fastener.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic and prelocking.

a. Latch Hooks: Equip doors 48 inches and higher with 3 latch hooks and doors less than 48 inches high with 2 latch hooks; fabricated from minimum 14 gauge steel; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard rattle-free latching mechanism and moving components isolated with nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Combination Padlocks: Provided by Owner.

1. Provide handicapped accessible lock at accessible lockers.

J. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

K. Accessories:

1. Filler Panels: Fabricated from 20 gauge cold-rolled steel sheet.

a. Form fillers in an angle shape. Form slip joint angles with a double bend on one leg to form a pocket which provides adjustable mating with the angle filler. Attach with concealed fasteners.

L. Finish: Baked enamel.

1. Colors: As selected by Architect from manufacturer’s full range.

## 2.3 ACCESSORIES

A. Handicapped Accessible Locker Accessories:

1. Provide 5 percent of each locker type, but not less than one (academic and athletic) with accessible locker accessories, as follows:

a. Provide not less than one shelf located no higher than 48 inches above the finished floor.
b. Provide one shelf located at the bottom of the locker no lower than 15 inches above the finished floor.
c. Apply a decal with the international symbol of accessibility to the face of the locker door.

2. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.

a. Basis of Design Product: Subject to compliance with requirements, provide the following or equal:

**1) Zephyr Lock; Electronic RFID Locker Lock #2254/2255.**

b. Keypad access, including unique card key for each lock.
c. Engineered to work on all standard metal single point, box locker, gravity latch/multipoint lockers
d. Supervisory access and override with control and management cards.
e. Programmable for both shared use and permanent use
f. High impact polycarbonate housing
g. Audit trail allows facility to track user history
h. Battery Powered; Requires (4) AA batteries offering life cycle of 10,000 – 20,000 uses depending on programming.
i. Low battery audible warning signal
j. External battery powered emergency device to allow access to lock if low battery signal is missed and battery life ends.

## 2.4 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.

D. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

E. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

F. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

## 2.5 STEEL SHEET FINISHES

A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

B. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

## 3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor.

B. Knocked-Down Metal Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.

## 3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

# SECTION 10 51 26 – PLASTIC LOCKERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary."

### 1.2 SUMMARY

A. Section Includes:

1. Solid Plastic Lockers.

B. Related Section:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for concealed wood support base, furring, blocking, and shims required for installing lockers and concealed within other construction before metal locker installation.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of plastic locker.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For plastic lockers. Include plans, elevations, sections, details, and attachments to other work.

1. Show locker trim and accessories.
2. Include locker identification system and numbering sequence.

D. Samples for Initial Selection: For units with integral color.

E. Samples for Verification: For plastic lockers, in manufacturer's standard sizes.

F. Qualification Data: For qualified Installer.

G. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

H. Warranty: Sample of special warranty.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain plastic lockers and accessories from single source from single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver plastic lockers until spaces to receive them are clean, dry, and ready for their installation.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

## 1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that plastic lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of plastic lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Plastic Lockers: 20 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following plastic locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than two units:

a. Lock hasps.
b. Hooks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Hazard Classification: Fire Propagation Characteristics: Passes NFPA 286 testing.

B. Regulatory Requirements: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1 for plastic lockers designated as accessible.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221.

B. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

C. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

## 2.3 SOLID PLASTIC LOCKERS

A. Basis of Design Product: Subject to compliance with requirements, provide **Bradley Corporation; Lenox Locker** or comparable product by one of the following:

1. ASI Storage Solutions.
2. Scranton Products; Tufftec Lockers.

B. Locker Arrangement:

1. Size: 3-tier Locker, 48”H x 12”W x 12”D.

C. Material: High impact, high density polyethylene (HDPE) formed under pressure into solid plastic components with homogenous natural color throughout.

1. Doors: Not less than 1/2-inch thick.
2. Sides, Tops, Bottoms, Backs and Shelves: Not less than 3/8-inch thick.
3. Venting Style: Horizontal.

D. Body: Fabricate all doors, door frames, shelves, sides, back, top and bottom components from solid plastic with machined edges to accept assembly brackets.

E. Locker Tops: Flat top.

G. Hinges: Continuous piano hinges, .05 inch/18 gauge Type 304 stainless steel fabricated to wrap around edges of door and frame and attached with stainless steel tamper-resistant screws.

H. Latch: Full-height latch bar constructed of 1/2 inch HDPE plastic secured to locker with stainless steel tamper-resistant screws.

I. Combination Padlocks: Provided by Owner.

J. Accessories: Equip each plastic locker with identification plate and the following unless otherwise indicated:

1. Coat Hooks: Black polycarbonate double hook.
2. End Panels: 1/2 inch thick, with color and finish matching locker body.
3. Filler Panels: 1/2 inch HDPE filler panel, with color and finish matching locker body, attached with 3/8 inch thick HDPE solid plastic angle bracket.
4. Wall Hooks: Black powder coated, cast zinc hook, two per locker.
5. Number Plate: White acrylic with black film coating, laser etched with number specified. Provide one per locker.

K. Color: As selected by Architect from manufacturer's full range.

## 2.4 FABRICATION

A. Fabricate plastic lockers square, rigid, and without warp and scratches.

B. Manufacturer locker units for assembly in a group of no more than three lockers. Provide sloped tops at all locations.

C. Assemble locker box enclosure by means of mechanical joints, pins and tamper resistant mechanical fasteners. Locate fasteners internal to the locker box enclosure or at the rear of the unit.

1. Machine locker door frame from a single piece of solid HDPE material.
2. Machine locker doors from solid HDPE sheets, including ventilation ports positioned in an array pattern of not less than 4 x 4 grid.

D. Hooks: Manufacturer's standard ball-pointed type, high impact plastic.

E. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

### 3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required.
2. Anchor single rows of plastic lockers to walls near top of lockers and to floor.

B. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Identification Plates: Identify plastic lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Protect plastic lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace plastic lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 26

# SECTION 11 31 00 - RESIDENTIAL APPLIANCES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes the following:

1. Cooking appliances.
2. Refrigeration appliances.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 22 Plumbing Sections for services and connections to residential appliances.
3. Division 26 Section "Electrical" for services and connections to residential appliances.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. For appliances, documentation indicating that products are ENERGY STAR rated.
2. For refrigeration appliances, documentation that units are CFC free.

C. Appliance Schedule: For appliances; use same designations indicated on Drawings.

D. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each product.

F. Research/Evaluation Reports: For each product.

G. Maintenance Data: For each product to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 50 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain residential appliances through one source.

1. Provide products from same manufacturer for each type of appliance required.
2. To the greatest extent possible, provide appliances by a single manufacturer for entire Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Regulatory Requirements: Comply with provisions of the following product certifications:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
3. NAECA: Provide residential appliances that comply with NAECA standards.

F. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the 2010 ADA Standards and ICC/ANSI A117.1.

G. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.

1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

## 1.5 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:

1. Warranty Period: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:

a. General Electric Company (GE).
b. Maytag.
c. Whirlpool.

### 2.2 MICROWAVE OVENS

A. Microwave Oven:

1. Basis-of-Design Product: **General Electric Company; GE Profile Model PES7227SLSS.**
2. Mounting: Countertop.
3. Type: Conventional.
4. Dimensions:

a. Width: 21-3/4 inches.
b. Depth: 20 inches.
c. Height: 13 inches.

5. Capacity: 2.2 cu. ft.
6. Oven Door: Door with observation window and push-button latch release.
7. Microwave Power Rating: 1000 W.
8. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
9. Controls: Digital panel controls and timer display.
10. Other Features: Turntable, sound volume control, and lock-out feature.
11. Material: Stainless steel.

### 2.3 REFRIGERATION APPLIANCES

A. Refrigeration Appliances, General: Provide appliances that have 0 CFC’s.

B. Refrigerator/Freezer: Two-door, top mount freezer.

**1. Basis-of-Design Product: Frigidaire; Model FFHI1835VS.**
2. Type: Freestanding, frost-free.
3. Dimensions:

a. Width: 30 inches.
b. Depth: 26-5/8 inches.
c. Height: 65-7/8 inches.

4. Storage Capacity: 18.3 cu. ft.

a. Refrigeration Compartment Volume: 13.4 cu. ft.
b. Freezer Volume: 4.9 cu. ft.

5. Refrigerator Features:

a. Interior LED light in refrigeration compartment.
b. Compartment Storage: Two glass shelves; two adjustable.
c. Drawer Storage: Two bins with glass shelf.
d. Door Storage: Two with gallon storage.

6. Freezer Features: One freezer compartment.

a. Automatic defrost.
b. Door Shelves: Two fixed.

7. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
8. Appliance Color/Finish: Stainless Steel.

C. Undercounter Refrigerator/Freezer:

1. Basis-of-Design Product: **Summit; Model FF433ESSSHVADA**.
2. Type: Freestanding, automatic defrost, undercounter.
3. Dimensions:

a. Width: 18-3/4 inches
b. Depth: 20-1/4 inches.
c. Height: 32 inches.

4. Storage Capacity: 3.6 cu. ft.
5. Refrigerator Features:

a. Dial thermostat.
b. Two adjustable wire shelves.
c. Crisper drawer with glass cover.
d. Two full door shelves.
e. Interior light.

6. Freezer Features: One freezer compartment with door.

    a. Cycle defrost.

7. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
8. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
9. Appliance Color: Stainless steel.

## 2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Color-Coated Finish: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, color, gloss, and minimum dry film thickness for painted finishes.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

## 3.3 CLEANING AND PROTECTION

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

## 3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 11 31 00

# RESIDENTIAL APPLIANCE LOCATION SCHEDULE

| Room No. | Rm Name | Qty | Product Type/Model |
|---|---|---|---|
| **LOWER LEVEL - Area A** | | | |
| No Applicances | | | |
| **MAIN LEVEL - Area A** | | | |
| A129 | Nurse | 1 | Full Height Refrigerator |
| A134 | Multipurpose Room | 1 | Full Height Refrigerator |
| A117 | Custodian | 1 | Full Height Refrigerator |
| A117 | Custodian | 1 | Microwave |
| A123 | Passage | 1 | Microwave |
| **MAIN LEVEL - Area B** | | | |
| B104 | Teacher Planning | 1 | Full Height Refrigerator |
| **MAIN LEVEL - Area C** | | | |
| No Applicances | | | |
| **MAIN LEVEL - Area D** | | | |
| No Applicances | | | |
| **MAIN LEVEL - Area E** | | | |
| No Applicances | | | |
| **MAIN LEVEL - Area F** | | | |
| F122 | Teacher Planning | 1 | Full Height Refrigerator |
| **MAIN LEVEL - Area A** | | | |
| No Applicances | | | |
| **END OF SCHEDULE** | | | |

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**SECTION 11 40 00 – FOOD SERVICE EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 DESCRIPTION OF WORK

A. The extent of food service equipment is shown on the drawings and by schedules and equipment lists associated with the drawings. The Kitchen Equipment Contractor shall deliver and set in place all equipment shown on the food service drawings and as described in these specifications, without exception. All equipment, without exception, when set in place shall be fully assembled including all component parts and accessories and shall be left ready for final utility connections.

B. The types of food service facilities required for these projects include the following for the Cafeteria:
   1. Food Storage and Handling Areas.
   2. Kitchen and Food Preparation Areas.
   3. Combined Preparation and Serving Areas.
   4. Ware Washing Area.

C. Mechanical and Electrical Work: Refer to other sections, respectively, for mechanical and electrical services and connections for individual items of food service equipment.

D. Interrelated work not included in this section:
   1. Final plumbing connections (refer to other sections).
   2. Final electrical connections (refer to other sections).
   3. Final HVAC connections (refer to other sections.)
   4. Electrical service and connections to kitchen equipment overload protection requirements, wiring between starters and motors and also between control devices and starters, when starters and controls are not integral with equipment (refer to other sections)
   5. Plumbing work and connections, including fittings, which are not an integral part of equipment.
      a. All exposed piping to be chrome plated and to be furnished and installed by the Plumbing Contractor.
   6. Concrete, masonry and miscellaneous metals, except as otherwise specified in this section. Refer to Sections 03300 "Cast-in-Place Concrete", 04200 "Unit Masonry", 05500 "Metal Fabrications" and kitchen equipment drawings.
   7. Stainless steel corner guards attached to building structure (refer to other sections).
   8. Tables, chairs, cash registers, cashier's stools, pots, pans, dishes, glassware, trays and silverware are not included in contract.

## 1.3 QUALITY ASSURANCE

A. Standard General: Except as otherwise indicated, comply with the following standards as applicable to the manufacture, fabrication and installation of the work of this section.
   1. NSF Standards: Comply with National Sanitation Foundation standards and criteria, and provide NSF "Seal of Approval" on each manufactured item and on major items of custom-fabricated work.
   2. U.L. Standards: For electrical components and assemblies, provide either U.L. labeled products or where no labeling service is available, "recognized markings" to indicate listing in the U.L. Recognized Component Index.
   3. NFPA Standards: Comply with NFPA No. 96 for exhaust systems.
   4. ASME Code: Comply with ASME Boiler Code Requirements for steam generating and steam heated equipment; provide ASME inspection, stamp and registration with National Board.
   5. National Electrical Code: Comply with NFPA Volume 5 for electrical wiring and devices included with food service equipment.

B. Manufactured Products, Fabricate to the extent available, provide standard or custom manufactured products to comply with the requirements, otherwise shop fabricate the work to the greatest extent possible in shops which are skilled and experienced with a minimum of five (5) years of experience in the production of food service equipment.
   1. Provide each manufactured item as a complete unit manufactured by one manufacturer, including hardware, accessories, mounting and installation components.
   2. Alternatives or substitutions to items specified herein will be considered only if submitted for approval ten (10) days prior to the bid opening date.
   3. If brand names other than those specified are proposed for use, furnish the name, address and telephone number of at least 3 comparable installations which can prove the proposed products have operated satisfactorily for 5 years.
   4. Contract Closeout Submittals: Operation and Maintenance Data: Deliver two copies, covering the installed products, to the Director's Representative.
   5. The cost of any changes arising from acceptable alternatives or substitutions will be the total responsibility of the Kitchen Equipment Contractor. This includes the cost for general construction, plumbing, electrical, HVAC, etc.

## 1.4 SUBMITALS

A. Manufacturer's Data, Food Service Equipment: Submit copies of the manufacturer's or shop fabricator's product information and installation instructions for each item of food service equipment. For operating equipment include data on performance and operating characteristics, power/fuel consumption, rough-in dimensions and sizes, drainage requirements, and similar information. Provide maintenance manuals, operating instructions, spare parts lists, precaution against hazards, manufacturer's warranties, and similar information. Distribute one additional copy of installation and start-up instructions to the Installer. Mark each data sheet or brochure with the applicable project equipment item number(s). Furnish six (6) neatly bound copies of all "buy-out" or standard items of manufacture for approval. Provide lead sheets for each catalog sheet for notes, stamps, titles, etc. Lead sheets shall indicate Item No., quantity description, accessories and special conditions if any. The above must be submitted prior to or along with the shop drawing submittals, rough-in plans, HVAC requirements, etc.

B. NOTE: Included in each bound binder of manufacturer's data there shall be furnished, where applicable, color charts for the Architects review and selection.

C. Shop Drawings, Food Service Equipment: Submit shop drawings showing layouts, elevations, sections and details of custom fabricated work (work not shown by manufacturer's standard product data sheets). Show layouts, rough-in plans at 1/4" scale and elevations at 1/2" scale, sections at 1-1/2" scale and details at 3" scale, including all requirements for existing equipment. Submittals shall include dimensioned layouts of all depression requirements, concrete pads, connected HVAC units and all other food service related architectural requirements. Furnish six (6) blue or black line prints for all drawings submitted for approval or quantities required.

D. NOTE: All drawings and schedule of equipment shall conform to the formats shown on contract drawings. All layout drawings shall be based on the final Architectural drawings in coordination with the food service equipment contract drawings.

E. Samples, Food Service Equipment: Submit three (3) samples of each exposed finish on shop fabricated and field fabricated food service equipment. Submit 12" squares of sheet materials and 24" lengths of linear materials. Samples will be reviewed by the Architect for color, pattern and texture only. Compliance with other requirements is the exclusive responsibility of the Kitchen Equipment Contractor. Samples shall be submitted with shop drawings and shall be actual size of equipment. Samples shall include:
1. Leg assembly, with gusset foot and cross-rail.
2. Corner of table top.
3. Drawer assembly.
4. Section of doors.
5. Handles, hardware, and locking devices.

## 1.5 PRODUCT HANDLING

A. Protect metal finishes from damage during shipping, storage, handling, installation and construction of other work in the same spaces. Wrap and crate each item of equipment as needed for protection from damage.

B. Cover exposed stainless-steel surfaces with self-adhesive protective paper, of a type recommended by the metal manufacturer, and do not remove until work is installed and ready for cleaning and start-up.

## 1.6 MATERIALS

A. Metals:
1. Stainless steel (s/s): AISI type 302/304, hardest workable temper, No. 4 directional polish.
2. Galvanized steel sheet (Glv): ASTM A 526, except ASTM A 527 for extensive forming; ASTM A 525, G90 zinc coating, chemical treatment. Where painted finish is indicated, provide mill phosphatized treatment in lieu of chemical treatment.
3. Steel sheet: ASTM A 569 hot-rolled carbon steel.

4. Galvanized steel pipe: ASTM A 53 or ASTM A 120, welded or seamless, schedule 40, galvanized.
5. Steel structural members: Hot rolled or cold formed, carbon steel unless stainless steel is indicated.
6. Galvanized finish (Glv): ASTM A 123 hot-dipped zinc coating, applied after fabrication.
7. Aluminum: ASTM B209/B221 sheet, plate and extrusions (as indicated); alloy, temper and finish as determined by manufacturer/fabricator, except 0.40 mill natural anodized finish on exposed work unless another finish is indicated.

B. Plastic Laminate: NEMA LD1, general purpose high pressure type, 0.062" thick except 0.050" for post forming, smooth (non-textured) color to be selected at a later date by Architect. Comply with NSF No. 35 where applicable.

C. Hardwood Work Surfaces: Laminated edge-grained hard maple (acer saccharum), NHLA First Grade with knots, holes and other blemishes culled-out, kiln dried at eight percent or less moisture, water-proof glue, machine sanded and finished with NSF approved oil sealer.

D. Insulation:
1. Cooled Component Insulation: Rigid, closed cell polyurethane foam, either heat aged slab stock for adhesive lamination with face sheets, or foamed-in-place using Freon 11 as an expanding agent; k-value of 0.15, not less than 1.7 pounds per cubic foot density.
2. Heated Component Insulation: Rigid board, semi-rigid blanket or adhesively applied blanket of glass fiber or other mineral fiber insulation, certified by manufacturer to withstand long-term exposure to heat (temperature rating of each insulated equipment item) without deterioration; k-value of not more than 0.30; density of not less than 1.5 pounds per cubic foot density.

E. Joint Materials:
1. Sealants (Snt): One part or two part; polyurethane or silicone based, liquid elastomeric sealant, FS-TT-S-00227 or FS-TT-S-99230 non-solvent release type, mildew resistant, Shore A hardness of 30 except 45 if subject to traffic. Backer rod to be polyethylene rod stock, larger than joint width.
2. Gaskets (Gkt): Solid or hollow (but not cellular) neoprene or polyvinyl chloride; light gray, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

F. Paint and Coatings: Provide the types of painting and coating materials which, after drying or curing, are suitable for use in conjunction with food service and which are durable, non-toxic, non-dusting, non-flaking, mildew-resistant and comply with governing regulations for food service.
1. Galvanized Repair Paint: MIL-P-21035.
2. Pretreatment: SSPC-PT2 or PT3 or FS-TT-C490.
3. Primer Coating for Metal: FS-TT-P-86, type suitable for baking where indicated.
4. Enamel for Metal: Synthetic type, FS-TT-P-491, type suitable for baking where indicated.
5. Sound Deadening (SndDdn): Heavy bodies resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in 1/8" thick coating.

1.7 FABRICATED PRODUCTS

A. Hardware: Manufacturer's standard, not less than BHMA Std. 201 type 2 (Institutional), satin finish stainless steel or dull chrome finish on brass, bronze or steel. All hardware to be manufactured by "Component Hardware", "Standard Keil" or approved equal.
   1. Cabinet Catches: Heavy duty with adjustable spring-loaded ball tension, except as otherwise indicated.
   2. Drawer Slides: Ball bearing type, side mounting self-closing.
   3. Hinges: Secured to doors and cabinet bodies so as to eliminate exposed bolt and screw heads.
   4. Handles: Shall be brass chrome plated full grip handles.
   5. Locks: Drawer and hinged door locks to be cylinder type. Locks to be satin chrome finish, and all locks to be keyed alike.

B. Casters: Type and size indicated, or if not indicated, as recommended by caster manufacturer for the type and weight of equipment supported; but not less than 4" diameter with 15/16" tread width, with sealed self-lubricating ball bearings, cadmium-plated steel disc wheels and solid light gray synthetic rubber tires. Provide stainless steel horns and accessories. Unless otherwise indicated, equip each item with swivel type casters and two (2) fixed casters, and provide foot brakes on all casters.
   1. Caster Bumpers: Unless equipment item is equipped with another form of all around protective bumpers, provide circular rotating bumper above each caster, 5" diameter tire of light gray synthetic rubber (hollow or closed cell) on cadmium plated disc.

C. Plumbing Fittings, Trim and Accessories: Where exposed or semi-exposed, provide bright chrome plated brass or polished stainless-steel units. Provide copper or brass where not exposed.
   1. Faucets: Deck and/or splash type faucets shall be furnished wherever applicable by the Kitchen Equipment Contractor and installed by the Plumbing Contractor. Faucets to be fitted with low flow aerators. Maximum water usage rate to be 1.20 gallons per minute. Faucets to be as manufactured by "T&S Brass & Bronze Works" or approved equal.
   2. The Kitchen Equipment Contractor must provide all faucets capable of submersion with back-flow prevention.
   3. Pre-Rinse Assemblies: All pre-rinse assemblies to be furnished with backflow preventer and a low flow spray valve. Maximum water usage rate to be 1.24 gallons per minute.
   4. Vacuum Breakers: Provide with food service equipment where required by governing regulations. Vacuum breakers to be furnished by the Kitchen Equipment Contractor and installed by the Plumbing Contractor.
   5. Waste Fittings: Except as otherwise indicated, provide 2" chrome plated remote lever waste valve with strainer basket and chrome plated connected overflow on sinks. Waste assemblies to be furnished by the Kitchen Equipment Contractor and installed by the Plumbing Contractor. Waste assemblies to be as manufactured by "Component Hardware" or approved equal.
   6. P-Traps: Removable chrome plated P-traps where required shall be furnished and installed by the Plumbing Contractor.

D. Electrical Materials: Provide standard materials, devices and components as recommended by the manufacturer/fabricator, selected and installed in accordance with NEMA standards and recommendations, and as required for safe and efficient use and operation of the food service equipment, without objectionable noise, vibration and sanitation problems.

1. Controls and Signals: Provide recognized commercial grade signals, "on-off" push buttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent signs and graphics to assist the user of each item. Provide stainless steel cover plates at controls and signals.
2. Connections: Equip each item requiring electrical power with either a terminal box for permanent connection or cord and plug for interruptable connection as indicated. Provide standard grounded type plugs to match outlets to be specified in Division 16. Electrical devices necessary for the operation of any item of equipment which are not shipped as integral with any item of equipment shall be furnished by the Kitchen Equipment Contractor and installed by the Electrical Contractor.
3. Motors: Totally enclosed type, except drip-proof type where not exposed to a dust or moisture condition; ball bearings except sleeve bearings on small timing motors; windings impregnated to resist moisture; horsepower and duty cycle ratings as required for the service indicated.
4. Power Characteristics: Refer to other specifications for project power characteristics. Also refer to individual equipment requirements for loads and ratings.

## 1.8 FABRICATED PRODUCTS

A. General Fabrication Requirements: Remove burrs from sheared edges of metal work, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal at not less than the minimum radius required to avoid grain separation in the metal. Maintain flat, smooth surfaces without damage to finish.
1. Reinforce metal at locations of hardware, anchorages and accessory attachments. Wherever metal is less than 14-gauge or required mortized application, conceal reinforcements to the greatest extent possible. Weld in place on concealed faces.
2. Where fasteners are permitted, provide philips head, flat or oval head machine screws. Cap threads with acorn nuts unless fully concealed in unaccessible construction; and provide nuts and lock-washers unless metal for tapping is at least 12-gauge. Match fastener head finish with finish of metal fastened.
3. Where components of fabricated metal work are indicated to be galvanized and involve welding or machining of metal heavier than 16-gauge, complete the fabrication and provide hot dip galvanizing of each component after fabrication, to the greatest extent possible (depending upon available dip-tank sizes). Comply with ASTM A 123.
4. Provide removable panels for access to mechanical and electrical service connections which are concealed behind or within food service equipment, but only where access is not possible and not indicated through other work.

B. Metal and Gauges: Except as otherwise indicated, fabricate exposed metal work of stainless steel and fabricate the following components from the gauge of metal indicated and other components from not less than 20-gauge metal:
1. Table Tops: 14-gauge.
2. Counter Tops: 14-gauge.
3. Shelves: 16-gauge.
4. Drawer Fronts: 16gauge (double pan type).
5. Hinged Doors: 18-gauge (double pan type).
6. Single Pan Louvered Doors: 16-gauge.
7. Enclosed Base Cabinet: 18-gauge.
8. Enclosed Wall Cabinet: 18-gauge.

9. Sinks and Drainboards: 14-gauge.
10. Sink Compartment Covers: 16-gauge.
11. Exhaust Hoods: 18-gauge.
12. Pan Type Insets and Trays: 16-gauge.
13. Removable Covers, Panels: 18-gauge.
14. Skirts and Enclosure Panels: 18-gauge.
15. Closure and Trim Strips Over 4" Wide: 18-gauge.
16. Hardware Reinforcements: 12-gauge.
17. Gusset Plates: 10-gauge.

C. Work Surface Fabrication: Fabricate metal work surfaces by forming and welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide water-proof gasketed draw-type joints with concealed bolting.
1. All joints in tops of fixtures, tables, drainboards, over-shelving, sinks and other equipment shall be welded. Tops of fixtures shall be fabricated in the factory with welded joints to reduce field joints to a minimum. All field joints shall be welded and exposed welds ground smooth and polished to match factory finish.
2. Exposed surfaces shall be free from bolts, screws and rivet heads. Wherever threads of bolts and screws occur on the inside or underside of fixtures and are either visible or might come in contact with hands or wiping cloths, such bolts and screws shall be capped with suitable lock-washer and chrome-plated brass or bronze acorn nut. Wherever bolts and screws are welded to the underside of trim and tops, their spacing and intent of rivets, bolts and screws shall be such to insure proper fastening and prevent bulging of the materials fastened.
3. Reinforce work surfaces 30" o.c. both ways with galvanized or stainless concealed structural members. Reinforce edges which are not self-reinforced by formed edges.
4. Sound deaden underside of metal work surfaces, including sinks and similar units with a coating of sound deadening materials, hold coating back 3" from sanitary edges which are open for cleaning.

D. Structural Framing: Except as otherwise indicated, provide framing of minimum 1" pipe size round pipe or tube members, with mitered and welded joints and gusset plates, ground smooth. Provide 14-gauge stainless steel tube for exposed framing and galvanized steel pipe for concealed framing in areas exposed to customer view; in non-customer areas, provide either stainless steel tube or enamel finished steel pipe for exposed framing, and either galvanized or enamel finished steel pipe for concealed framing (where permitted by NSF standards and at fabricator's option).

E. Enclosures, General: Provide enclosures, including panels, housing and skirts for service lines and mechanical and electrical devices, and secondary enclosures for equipment items, where indicated and where required for compliance with governing regulations and NSF standards. Otherwise, fabricate each item to be as open as possible for ease of cleaning.
1. Where equipment is exposed to patron view, provide enclosure of service lines, operating components and mechanical and electrical devices.

F. Enclosures, General: Provide enclosures, including panels, housings and skirts for service lines, operating components and mechanical and electrical devices associated with the food service equipment, except as specifically indicated to be "open".

G. Sinks and Drainboards: Weld joints, front and ends, unless otherwise indicated on drawings, shall be extended 3", measured at sink edge and rolled 180 degrees on a 1-1/2" diameter. Raised rolled rim at front and ends of the drainboard shall be level with sink rolled rim and continuous therewith, and shall not follow with pitch of drainboard. Drainboards shall be pitched 1/8" per 1'- 0" towards sink compartments. Sinks and drainboards adjacent to walls or adjoining equipment shall have 10" high backsplash, level and continuous, not following the pitch of drainboards. Wherever drainboards are 24" or less, they may be supported on 1" diameter to sink gussets, welded around entire perimeter. Where drainboards exceed 24" in length, legs shall be rounded to a radius of approximately 1", with all intersections meeting in the spherical sections. All sinks having two or more compartments shall have double dividing partitions with fully rounded corners, both vertical and horizontal.

1. All corners of drain-boards shall be rounded on the inside of a radius of 1" where rolled rim meets front edge. The bottom of each sink compartment shall be creased to a sufficient pitch toward waste outlet. Openings for hot and cold faucets shall be cut into backsplash as required. All sinks shall be 14" deep, unless otherwise indicated on drawings.

H. Sinks set into work counters or table tops shall be constructed of the same gauge and materials as specified for counter tops as follows:

1. Top perimeter of each sink to be integrally welded to edge of opening in table or counter top. Table or counter top to be die-punched to receive faucets.
2. Sinks shall have vertical and horizontal corners rounded on a 1" radius with bottoms pitched to a 1-1/2" or 2" waste outlet, depending which is indicated on drawings. Sinks shall be finished the same as table or counter tops.
3. Water inlets shall be located in all instances above the positive water level to prevent syphoning of liquids into the water systems.
4. Construct dish-tables the same as previously specified for sinks and drainboards unless otherwise indicated on drawings.

I. Table Tops: Edges shall be rounded and free from burrs and any excess material left. Top edge shall be channel shaped and shall be turned down 2" and returned 1/2". Where tables are placed against building walls, they shall be turned up in back approximately 10", returned 2" toward wall and 1/2" down in channel shape with all exposed ends welded closed. Corners shall be rounded. Top shall be reinforced with underbracing as specified, spaced not more than 30" on center. Tables 6'-0" and longer shall have a 1-1/2" x 1/8" stainless steel angle framework reinforcing outside edge with cross channels every 30" or less.

J. Underbracing: Provide underbracing for tables, drainboards and dish-able tops and shall be 1" x 4" x 1" channels of 14-gauge stainless steel. Bracing shall be welded to the underside of fixtures in a manner suitable to seal out vermin and also to create a noise deadened top surface. All channels shall extend the full length and depth of fixtures and shall be positioned that no dimension exceeds 30" in any direction.

K. Base Cabinet Casework: Unless otherwise indicated, provide either box-type face framing or open channel type (complying with NSF requirements in either case). Cabinet work to be framed with fully boxed and welded 1-1/2" x 1-1/2" x 1-1/8" galvanized iron angles. Felt strips or equal sound absorbent material to be placed between framework and tops.

L. Legs and cross bracing: Construct legs of not less than 1-5/8" OD by 16-gauge stainless steel tubing. Legs shall be in no case spaced more than 6'-0" on centers.

1. Legs cross bracing where required shall be constructed of not less than 1" OD by 16-gauge stainless steel tubing. All cross bracing shall run horizontal and level between all legs approximately 10" above the floor, unless specified. All joints shall be completely welded around the entire perimeter.
2. Mount legs as follows: Units mounted on legs that are 14" or longer shall be provided with underbracing. Legs in such cases are to be provided with not less than 12-gauge stainless steel enclosed gussets, extending downward. Gussets shall be welded continuously around entire perimeter.

M. Feet shall be stainless steel bullet type, having an integral threaded shaft with a minimum adjustment of approximately 2". Feet shall be manufactured by "Component Hardware", "Standard Keil" or approved equal.

N. Under-shelving: Flat under-shelving shall be turned down on all sides approximately 1-1/2" and under 1/2" to form a channel shape. Undershelves shall be reinforced with underbracing as specified. Shelves shall be notched to fit the contour of legs. Shelves shall be welded to legs, crevice free.

O. Wall Shelves and Over-shelves: Wall shelves to have all exposed edges turned down in channel shape 1-1/2" x 1/2". Edges at walls to be flanged upward 2" raw. Resulting corners to be rounded, fully welded, ground and polished. Shelves to be mounted on 12-gauge stainless steel cantilever type brackets.

P. Drawers and Drawer Bodies: Drawers shall be of the telescoping self-closing slide type with completely enclosed 16-gauge stainless steel housing. Provide drawers with 20" x 20" x 5" deep inside liner, removable without untracking, gray in color, smooth finish, all thermo-plastic construction with all vertical and horizontal corners on a radius with the top edges flanged out to set into a 16-gauge stainless steel track and housing combination. The housing combination shall operate on 16-gauge stainless steel housing with the extension slide having a limit stop and 1-5/16" ball bearing rollers operating on a 16-gauge stainless steel outside locking track.
1. Fronts shall be double pan with full grip handles and key locks as specified. Fronts shall be double wall type construction with an approved sound deadener.
2. Mounted under all 5" deep drawers, furnish one (1) only removable hard rubber cutting board. Cutting board shall be approximately 20" x 20" x 3/4" thick and shall be mounted so as not to interfere with normal operation of drawer when board is in place. Board to be mounted on 2" channel shaped stainless-steel guides. Cutting board to bear NSF seal.

Q. Closed Base: Where casework is indicated to be located on raised floor base, prepare casework for support without legs, and for anchorage and sealant application, as required for a completely enclosed and concealed base.

R. Exhaust Hood Fabrication: Comply with NFPA No. 96 including Appendix A and as detailed under specification.
1. Grease Removal: Provide type indicated (removable filters if not otherwise indicated) with drip-channel gutters, drain and collection basins.
2. Light Fixtures: Fluorescent fixtures outside the hood with sealed safety lenses flush with inside of hood; stainless steel exposed conduit for wiring.
3. Fire Extinguishing System: Wet chemical complying with NFPA No. 12 and as detailed under specific item.

S. Shop Painting: Clean and prepare metal to be painted, remove rust and dirt. Apply treatment to zinc coated surfaces which have not been mill phosphatized. Coat welded and abraded areas of zinc coated surfaces with galvanize repair paint. Apply 1.5 mill (dry film thickness) metal primer coating, followed by 2, 1.0 mill (dry film thickness) metal enamel finish coatings.
1. Bake primer and finish coatings in accordance with paint manufacturer's instructions for a baked enamel finish.

1.9 PLASTIC LAMINATE CASEWORK

A. General: Fabricate plastic laminate casework (Pl-CsWk) in the types and styles indicated with hardware and accessories. Provide exposed and semi-exposed surfaces and edges (self-edged) with plastic laminate covering on particle board cores. Provide painted plywood or hardboard for concealing panels.
1. Provide adjustable standards for positioning and support of shelves.
2. Provide seamless rigid molded plastic drawer bodies or drawer liner inserts, white except as otherwise indicated.
3. Comply with applicable standards of the Architectural Woodwork Institute for not less than "Custom Grade" casework.
4. Comply with applicable standards of the Woodwork Institute of California for "Custom Grade" casework.

1.10 MISCELLANEOUS MATERIALS AND FABRICATION

A. Nameplates: Wherever possible, locate nameplates and labels on manufactured items in accessible position, but not within customer's normal view. Do not apply nameplates or labels on custom fabricated work, except as required for compliance with governing regulations, insurance requirements or operator performance.

PART 2 - PRODUCTS

2.1 ITEM NO. 1 - ONE (1) BREAK TABLE (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.2 ITEM NO. 2 - ONE (1) REACH-IN REFRIGERATOR (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.3 ITEM NO. 3 - ONE (1) WORK TABLE (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.4 ITEM NO. 4 - ONE (1) DESK (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.5 ITEM NO. 5 – TWO (2) MOBILE UTILITY CARTS (EXISTING)

A. Units are existing and be relocated to location as shown on plans.

2.6 ITEM NO. 6 - ONE (1) REACH-IN REFRIGERATOR (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.7 ITEM NO. 6A - ONE (1) REACH-IN REFRIGERATOR (EXISTING)

A. Unit is existing and be relocated to location as shown on plans.

2.8 ITEM NO. 7 - ONE (1) REACH-IN FREEZER (EXISTING)

A. Unit is existing and be relocated to location as shown on plans.

2.9 ITEM NO. 8 - ONE (1) REACH-IN FREEZER (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.10 ITEM NO. 9 - ONE (1) CONVECTION STEAMER (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.11 ITEM NO. 10 - ONE (1) WORK TABLE WITH DRAWERS (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.12 ITEM NO. 11 - ONE (1) HOT HOLDING CABINET (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.13 ITEM NO. 12 - ONE (1) DOUBLE DECK CONVECTION OVEN (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.14 ITEM NO. 13 - ONE (1) COOK'S TABLE WITH DRAWERS (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.15 ITEM NO. 14 - ONE (1) BAKER'S RACK (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.16 ITEM NO. 15 - ONE (1) 3-COMPARTMENT POT SINK (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.17 ITEM NO. 16 - ONE (1) WORK TABLE WITH UNDERSHELF (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.18 ITEM NO. 17 – SPARE NO.

2.19 ITEM NO. 18 - ONE (1) MILK CABINET (63" LONG) (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.20 ITEM NO. 19 – TWO (1) MILK CABINETS (34" LONG) (EXISTING)

A. Units are existing and shall remain in location as shown on plans.

2.21 ITEM NO. 20 - ONE (1) HOT FOOD COUNTER (4-WELL) (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.22 ITEM NO. 21 - ONE (1) PASS-OVER COUNTER (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.23 ITEM NO. 22 - ONE (1) DISPLAY FOOD COUNTER (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.24 ITEM NO. 23 - ONE (1) CASHIER COUNTER (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.25 ITEM NO. 23A - ONE (1) CASH REGISTER/P.O.S. SYSTEM (EXISTING)

A. Unit is existing and shall remain in location as shown on plans.

2.26 ITEM NO. 24 - ONE (1) LOT STORAGE SHELVING (EXISTING)

A. Units are existing and shall be removed as directed by the Owner.

2.27 ITEM NO. 25 - ONE (1) HAND SINK (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.28 ITEM NO. 26 - ONE (1) VENTILATOR WITH LIGHTS & FIRE SUPPRESSION SYSTEM (EXISTING)

A. Unit is existing and shall be removed as directed by the Owner.

2.29 ITEM NO. 27 – ONE (1) VENTILATOR WITH LIGHTS & FIRE SUPPRESSION SYSTEM

A. Ventilator to be of size, make and model as specified below and as portrayed on the drawings.

B. Ventilator battery to measure 5’-3" wide x 9’-6" deep x 2’-0" high. Ventilator to be standard equipped with two (2) 48" long LED light fixtures. Light fixtures to be factory pre-wired to a single connection point. This Manufacturer must confirm with Building Code/Health Department candle-power requirements.

C. Ventilator to be of high velocity, centrifugal grease extracting type with air inlet parallel to the cooking equipment being ventilated. Ventilator to contain removable extraction cartridges, with a grease extraction efficiency shall be 95% when operated ad design specifications and be documented as such by an independent testing laboratory. Cartridges to be constructed of stainless steel throughout, and contain full-length, self-draining baffles. Cartridges shall be easily removable from the floor level by use of a cartridge removal tool, for periodic cleaning. The grease collection trough at the bottom of the cartridge housing to be pitched to a removable stainless-steel grease collection container.

D. Ventilator shall be equipped with necessary hanger brackets at front and rear, for suspending from ceiling slab or structure above.

E. Ventilator to be constructed of all stainless steel, 18-gauge, type 304, #4 finish, all welded, grease and water tight. No sheet metal, except as described above, shall be utilized in ventilator construction. No ventilator controls shall be more than seven feet (7'-0") from floor level. Width of grease extraction chamber of ventilator shall not exceed six inches (6").

F. Ventilator to operate as designed, utilizing exhaust air volumes as shown on plans. Static pressure-drop, the hood exhaust collar sizing and CFM volumes shall match drawings’ collar chart data. Unit to be equipped with temperature sensors.

G. Ventilator shall be equipped with a supply air plenum, duct collars, 165-degree fusible link type fire dampers and full length perforated face panels or discharging tempered supply air into room space. Supply air volume not to exceed 50% of hood exhaust. Discharge velocity of supply air not to exceed 250 FPM at the discharge point of the ventilator.

NOTE: Air temperature should range from 60ºF. to 65ºF., but may be as low as 50ºF. Depending on air volume, distribution and internal heat load.

H. Ventilator to be listed by Underwriter's Laboratories, Inc., "Grease Extractors for Exhaust Ducts", U.L. 710; tested by the National Bureau of Standards, Washington DC; in compliance with all recommendations of the National Fire Protection Association's standards for kitchen cooking equipment ventilators; approved by the National Sanitation Foundation; listed by the International Conference of Building Officials; approved by Building Officials and Code Administrators/ International, Inc.; and in accordance with all local codes having jurisdiction.

I. Unit to be fully welded; grease and water tight. No material other than that described above shall be deemed acceptable. Ventilator shall be mounted at 6'-8" above finished floor (A.D.A).

J. Ventilator to be furnished wet chemical type fire protection system, Ansul R-102 3, Pyrochem or Range-guard, including means for automatic and manual activation, along with means for simultaneous automatic shutting down of protected cooking equipment upon activation of said system. All exposed piping to be stainless steel or chrome-plated. Fusible link detection system to be built into ventilators by ventilator manufacturer. Fire Protection System to be as manufactured by "Ansul Corporation, Marinette, WI" or approved equal.

NOTE: KITCHEN EQUIPMENT CONTRACTOR
VERIFICATION WITH LOCAL FIRE AUTHORITIES HAVING JURISDICTION

1. It is the total responsibility of the Kitchen Equipment Contractor and the Fire Suppression Supplier/Installer to coordinate the following with local fire authorities having jurisdiction:
   a. Coordinate requirements and location(s) for remote pull station(s).
   b. The use of dampers at all duct collars.
   c. In addition to surface protection, the need for suppression nozzles in the plenum area and at duct collars for duct protection.
   d. Verification and approval by authorities in writing must accompany all submissions for this unit.
   e. Coordinate all of the above with the Architect, Consulting Engineers and Food Service Consultant.

K. Gas valve (mechanical or electric) serving cooking equipment furnished and installed by Plumbing Contractor. Shunt trip breaker and/or contactors furnished and installed by Electrical Contractor.

L. Copies of approvals and testing laboratory data, if required, to be furnished by ventilator manufacturer.

M. All ductwork is to be provided and installed by others. All ductwork must be built and installed in accordance with the National Fire Protection Association's Standard Number 96 (NFPA 96) 2014 Edition, Chapter 4 titled Duct Systems.

N. As part of the installation of the ventilator, a Factory Engineer shall be on site, to coordinate all efforts. A Sales Representative will not be acceptable.

O. Trim strips and/or panels (as required by ceiling height) of matching material shall be furnished where ventilator abuts to walls and at ceiling. Kitchen Equipment Contractor to verify requirements and show same on Shop Drawing Submittals.

P. Ventilator to be Model No. SHBC-C-II-PA-63-ND-114 as manufactured by "Caddy Air Systems" or approved equal as manufactured by or “Halton” or “Gaylord” and in accordance with all details set forth herein including all modifications.

2.30 ITEM NO. 28 – ONE (1) HAND SINK WITH EYE WASH

A. Unit to measure approximately 15-3/4" wide x 15-1/4" deep x 13-3/8" high overall. Unit shall be wall mounted in location as shown on plans.

B. Unit to be constructed of 20-gauge stainless steel. Sink bowl to measure 9-3/4” wide x 12-1/2” long x 6” deep. Unit to be provided with single hole wall mount faucet, 1-1/2” stainless steel drain.

C. Unit to be equipped with a chrome eye washing assembly mounted to faucet with pull valve activation. Eye wash to include two (2) dust covers. In addition, unit to be provided with 15” factory installed left and right side splashes (#FG-LR2).

D. Hand sink to be Model No. HS-36 as manufactured by "Krowne" or approved equal as manufactured by “Eagle Group” or “Advance Tabco” and in accordance with all details set forth herein including all modifications. Soap and paper towel dispenser by Owner.

2.31 ITEM NO. 29 – ONE (1) PREPARATION TABLE WITH SINKS (A.D.A. ACCESSIBLE)

A. Unit to be of length as shown on plans x 30" wide x 34" high to working surface.

B. Top to be constructed of #14 gauge stainless steel having fronts and exposed ends finished in a 1/2" high marine type edge and turned down 2" and returned 1/2" in channel shape with corners welded. Rear of unit to be turned up 8" and returned 1-1/2" at 45 degrees and turned down, with ends welded closed.

C. Table shall be constructed to conform to A.D.A. requirements. Unit shall be fitted with a two (2) compartment sink with one (1) compartment measuring 24" x 24" x 14" deep and one (1) compartment measuring 24” x 24” x 5” deep. Mounted to backsplash behind one (1) sink, where shown on plans, there shall be furnished one (1) pre-rinse assembly. Pre-rinse assembly shall be Model No. B-0133-BC complete with low flow spray valve (#B-0107-C), wall bracket, backflow preventer, nipples and elbows for attaching to backsplash of sink compartment, 4” wrist action handles Model No. B-WH4 all as manufactured by “T & S Brass and Bronze Works” or approved equal. Second sink to be furnished with Model No. B-0231-CC faucet, complete 12” swing spout, low flow aerator, stainless steel seats, nipples and elbows for attaching to backsplash of sink compartment, 4” wrist action handles Model No. B-WH4 all as manufactured by “T & S Brass and Bronze Works” or approved equal. Sinks to be furnished

with appropriate waste outlets. Under left drain-board provide stainless steel under-shelf. Balance of unit to be furnished with open base, cross-rails at ends and rear only (not at approach). Provide fully welded stainless steel diagonal cross-rails at rear for stability. Base shall have a minimum clearance of 27" high x 19" deep x 30" wide. In addition, refer to Sections "A" and "B" and Elevation "E-1" on Contract Drawing No. FS1.04.

D. Table shall be furnished with reinforcements, gussets, legs and flanged bullet feet bolted to floor, all as herein set forth.

E. Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.32 ITEM NO. 30– SIX (6) STOREROOM SHELVING SECTIONS (MOBILE)

A. Units to measure 48" long x 24" wide x 69" high overall.

B. Units shall be fitted with four (4) polymer shelves. Unit to have minimum weight load of 800 pounds.

C. Each unit to be provided with four (4) 63" high posts and steel shelf frame having electroplated abrasion resistant epoxy finish. Units to be furnished with four (4) casters all with brakes.

D. Units to be open style mat made of injection molded polypropylene and to include Quick adjust Corner Lock Release. Also, shelf mats to include "microban" antimicrobial product protection.

E. Each unit to consist of four (4) shelves Model No. MQ2448G, four (4) posts Model No. MQ63UPE, and four (4) casters with brakes Model No. 5MPBX, all as manufactured by "Intermetro Industries Corporation" or approved equal as manufactured by "Cambro" or "Eagle" and in accordance with all details set forth herein including all modifications.

2.33 ITEM NO. 31 – ONE (1) HAND SINK (A.D.A. ACCESSIBLE)

A. Unit to measure approximately 22" wide x 24" deep x 28" high to working surface and shall be wall mounted in location as shown on plans.

B. Unit shall be furnished with an "ITD" integral easy access, built in towel dispenser secured to right side of apron and to accommodate 9-1/2" x 9-1/2" paper towels. Front enclosure to have removable stainless-steel cover to conceal piping and allow wheelchair accessibility under unit. In addition, unit to be provided with a gooseneck hot and cold-water faucet fitted with A.D.A. wrist action handles.

C. Top to be constructed of #16-gauge stainless steel with 10" backsplash and non-drip marine edge. Integral coved corner sink bowl creased toward 1-1/2" waste outlet and an apron with enclosure.

D. Hand sink to be Model No. ADA-WS as manufactured by "IMC Teddy" or approved equal as manufactured by “Eagle Group” and in accordance with all details set forth herein including all modifications.

2.34 ITEM NO. 32 – ONE (1) UNDERCOUNTER REFRIGERATOR

A. Unit to be measure approximately 60-3/8" wide x 30-1/8” deep x 33-11/16" high. Unit shall be mounted on heavy duty 3" diameter, swivel casters all with brakes. Unit shall be positioned under Cook’s Table, Item No. 33, where shown on plans.

B. Top of unit to be furnished in standard finish. Exterior bottom of unit to furnished in standard finish. Exterior front and ends and rear to be heavy gauge stainless steel. Entire body of unit to be vapor proofed under pressure for positive seal against leaks. Unit to be insulated with rigid urethane foam.

C. Interior of unit to be all stainless steel with sanitary coved corners. Unit to have stainless steel shelves set on removable and adjustable pilaster strips.

D. Unit to be provided with four (4) drawers. Each drawer to be provided with one (1) full size 12” long x 20” deep x 6” high food pan. Drawers to be fitted with 12” long recessed foamed-in-place handles.

E. Unit to have a self-contained hermetically sealed condensing unit, cord and plug set, condensate evaporator and thermometer.

F. Unit to be Model No. TUC-60D-4-ADA-HC as manufactured by "True Food Service Equipment, Inc." or approved equal as manufactured by “Victory” or “Beverage Air” and in accordance with all details set forth herein including all modifications.

2.35 ITEM NO. 33 – ONE (1) COOK’S TABLE WITH DRAWER

A. Unit to be of length as shown on plans x 32" wide x 36" high to working surface.

B. Top to be constructed of #14 gauge stainless steel having exposed sides turned down 2" and returned 1/2" in channel shape with corners welded.

C. Where shown on plans, provide open base for clearance and access to Under-counter Refrigerator, Item No. 32, and electrical receptacle. Balance of table shall be fitted with tool drawer with carving board and bottom shelf.

D. Unit to be fitted with reinforcements, gussets, and stainless steel legs with adjustable stainless steel bullet feet. Unit to be constructed as herein set forth.

E. Unit to be manufactured by “EMI Industries, RI” or approved equal as manufactured by “Eagle Group” or “Carbone Metal Fabricator, Inc., MA” and in accordance with all details set forth herein including all modifications.

2.36 ITEM NO. 34 – ONE (1) HOT FOOD COUNTER WITH PROTECTOR CASE (MOBILE)

A. MEASUREMENTS: Unit shall be a self-contained hot well counter measuring approximately 80" long x 32" wide x 34" high to working surface.

B. TOP CONSTRUCTION: Top to be constructed of #14 gauge stainless steel with 2” channel edge, polished to a #4 finish with all corners welded, ground and polished and stainless steel bracing.

C. HOT WELLS: Five (5) hot food wells shall be "wet or dry type", sized for 12" x 20" x 6" food pans. Hot food well assembly to be Model No. MOD-500TDM as manufactured by “Wells Mfg.” or approved equal. Each hot well shall be heated by means of a 900-watt heating system and shall be furnished with an adjustable thermostatic control with "off" position and neon pilot light. There shall be a valve at the end of the manifold. Unit to be drained to end of unit to floor sink, where shown on plans. All wells shall be wired to a permanently mounted cord and plug.

D. BODY & INTERIOR: Exterior and interior body of unit to be constructed of #14 gauge stainless steel frame/supports with #20 gauge stainless steel enclosure channels, front body panels and interior shelves.

With the exception of exposed front panel, unit shall be provided with 10” ± high stainless-steel aprons at ends and Operator’s side. All control switches for lights and heat lamps to be mounted on Operator’s side apron.

E. BASE CABINET: Provide unit with semi-enclosed base cabinet with under-shelf. Under-shelf to be provided with appropriate finished cut-out for passage of hot well’s indirect waste pipe.

F. WORKSHELF: Provide unit with one (1) 8” wide x full length stainless steel work shelf mounted on NSF approved stainless steel fold-down brackets at 34” A.F.F.

G. TRAYSLIDE: Unit to be provided with a full length x 12”, #16 gauge solid stainless steel trayslide, with two (2) die formed rubbing tracks mounted 30” high A.F.F on #10 gauge stainless steel fold-down brackets.

H. CASTERS: Unit shall be mounted on 5” diameter heavy duty double ball bearing swivel casters, all with brakes.

I. ELECTRICAL: Counter to be furnished with one (1) 6’-0” cord and plug for hot wells as well as mounted food protector herein specified as a part of this unit.

J. FOOD PROTECTOR: As a part of unit, the Kitchen Equipment Contractor shall furnish a food protector, which shall be mounted on and interconnected/prewired to counter by Serving Counter Manufacturer. Kitchen Equipment Contractor shall be responsible for coordinating this effort and shipping casework to Serving Counter Manufacturer for mounting and wiring. Casework to be specified as follows;

1. Measurements: Food protector shall be fully adjustable with top shelf and rear supports. Unit to measure the full length of serving counter x 18-3/4” wide shelf. The top serving shelf shall measure approximately 21" above counter top.
2. Construction: Frame of unit shall consist of 1" o.d. heavy wall, threaded, extruded aluminum/stainless steel tubing, precision die cast adjustable, non-marking slip fittings

and hardware. Components to be constructed so that unit may be assembled without the use of tools, fully adjustable and disassembled for cleaning. All center posts to be cantilevered type. Serving shelf shall be constructed of 3/8" thick tempered safety glass with 1" radius corners, polished edges and holes drilled to align with bracket arms. At front and each end of unit, provide 1/4" thick adjustable tempered safety glass with 1" radius corners, polished edges and holes drilled to align with brackets. Front glass to be adjustable offering full-service and self-service positions. Food protectors to be constructed to meet all NSF requirements.

3. Lights & Heat Lamps: Unit to be provided with full length ultra slim shielded fluorescent lights and infra-red heat lamps with infinite controls in complimentary colored housing mounted below serving shelf. Lights and heat lamps shall be controlled by their own switches, mounted on the Counter's apron. All wiring to be chased through the vertical support legs and shall be completely concealed from view.
4. Finish: All components to be of brushed stainless-steel finish.
5. Mounting & Wiring: Unit to be below-counter mounting method. Kitchen Equipment Contractor to coordinate requirements with Serving Counter Manufacturer during the shop drawing phase. Casework shall be mounted on and interconnected/prewired to counters by Serving Counter Manufacturer. All wiring to be concealed from view. Kitchen Equipment Contractor shall be responsible for coordinating this effort and shipping casework to Serving Counter Manufacturer for mounting and wiring.
6. Entire assembly to be Model No. TM2N-A-MOD as manufactured by "Premier Food Shields" or approved equal as manufactured by "Brass Smith, Inc." and in accordance with all details set forth herein including all modifications.

K. SHOP DRAWINGS: Shop drawings must include a 1/4" scale layout of the serving line as shown on contract drawings. Shop drawings must be coordinated and submitted through and along with casework for approval prior to fabrication. Standard manufacturers catalog cuts will not be acceptable.

L. MANUFACTURER: Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.37 ITEM NO. 35 – ONE (1) PASS-OVER COUNTER (A.D.A. ACCESSIBLE)

A. MEASUREMENTS: Unit shall measure approximately 40" long x 32" deep x 30" high to working surface.

B. TOP CONSTRUCTION: Top to be constructed of 14-gauge stainless steel with 2" channel edge, polished to a #4 finish with all corners welded, ground and polished and stainless-steel bracing. Top to be provided with one (1) 2" diameter, rubber grommeted hole for line cord of counter top accessories. Location of hole shall be determined in the shop drawing phase.

BODY & INTERIOR: Exterior and interior body of unit to be constructed of #14 gauge stainless steel frame/supports with #20 gauge stainless steel enclosure channels and front body panel. Unit shall be provided with 10" $\pm$ high stainless-steel aprons at ends.

C. BASE CABINET: As noted on plans, counter shall be constructed to conform to A.D.A. requirements with open base. Base shall have a minimum approach clearance of 27" high x 19" deep x 30" wide.

D. WORKSHELF: No work-shelf is required for this unit.

E. TRAYSLIDE: Unit to be provided with a full length x 12", #16 gauge solid stainless steel trayslide, with two (2) die formed rubbing tracks mounted 30" high A.F.F on #10 gauge stainless steel fold-down brackets.

F. CASTERS: Unit shall be mounted on 5" diameter heavy duty double ball bearing swivel casters, all with brakes.

G. SHOP DRAWINGS: Shop drawings must include a 1/4" scale layout of the serving lines as shown on contract drawings. Standard manufacturers catalog cuts will not be acceptable.

H. MANUFACTURER: Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.38 ITEM NO. 36 – ONE (1) COLD FOOD COUNTER WITH DISPLAY CASE (MOBILE)

A. MEASUREMENTS: Unit shall be a self-contained hot well counter measuring approximately 68" long x 32" wide x 34" high to working surface.

B. TOP CONSTRUCTION: Top to be constructed of #14 gauge stainless steel with 2" channel edge, polished to a #4 finish with all corners welded, ground and polished and stainless steel bracing.

C. COLD PAN: Cold pan to be constructed in accordance with N.S.F. Standard No. 7 and shall be Model No. RCP-7400-D with self-contained refrigeration assembly as manufactured by "Wells Mfg." or approved equal. Cold pan shall be provided with pan rail and divider bars. All pans to be furnished by Owner.

D. DRAIN: Unit to be provided with 1" indirect waste to floor drain where shown on plans.

E. BODY & INTERIOR: Exterior and interior body of unit to be constructed of #14 gauge stainless steel frame/supports with #20 gauge stainless steel enclosure channels, front body panels and interior shelves.

With the exception of exposed front panel, unit shall be provided with 10" ± high stainless-steel aprons at ends and Operator's side. All control switches for display case lights to be mounted on Operator's side apron.

F. BASE CABINET: Provide unit with semi-enclosed base cabinet with under-shelf. Under-shelf to be provided with appropriate finished cut-out for passage of indirect waste pipe.

G. WORKSHELF: Provide unit with two (2) 8" wide x full length stainless steel work shelves mounted on NSF approved stainless steel fold-down brackets at 34" A.F.F.

H. TRAYSLIDE: Unit to be provided with a full length x 12", #16 gauge solid stainless steel trayslide, with two (2) die formed rubbing tracks mounted 30" high A.F.F on #10 gauge stainless steel fold-down brackets.

I. CASTERS: Unit shall be mounted on 5" diameter heavy duty double ball bearing swivel casters, all with brakes.

J. ELECTRICAL: Counter to be furnished with one (1) 6'-0" cord and plug for cold pan as well as mounted lights from display case herein specified as a part of this unit.

K. DISPLAY CASE: As a part of unit, the Kitchen Equipment Contractor shall furnish a food protector, which shall be mounted on and interconnected/prewired to counter by Serving Counter Manufacturer. Kitchen Equipment Contractor shall be responsible for coordinating this effort and shipping casework to Serving Counter Manufacturer for mounting and wiring. Casework to be specified as follows;

1. Measurements: Food protector shall be fully adjustable with top shelf and rear supports. Unit to measure the full length of serving counter x 18-3/4" wide shelf. The top serving shelf shall measure approximately 21" above counter top.
2. Construction: Frame of unit shall consist of 1" o.d. heavy wall, threaded, extruded aluminum/stainless steel tubing, precision die cast adjustable, non-marking slip fittings and hardware. Components to be constructed so that unit may be assembled without the use of tools, fully adjustable and disassembled for cleaning. All center posts to be cantilevered type. Serving shelf shall be constructed of 3/8" thick tempered safety glass with 1" radius corners, polished edges and holes drilled to align with bracket arms. At front and each end of unit, provide 1/4" thick adjustable tempered safety glass with 1" radius corners, polished edges and holes drilled to align with brackets. Front glass to be adjustable offering full-service and self-service positions. Food protectors to be constructed to meet all NSF requirements.
3. Lights: Unit to be provided with full length ultra slim shielded fluorescent lights in complimentary colored housing mounted below serving shelf. Lights shall be controlled by its own switch, mounted on the Counter's apron. All wiring to be chased through the vertical support legs and shall be completely concealed from view.
4. Finish: All components to be of brushed stainless-steel finish.
5. Mounting & Wiring: Unit to be below-counter mounting method. Kitchen Equipment Contractor to coordinate requirements with Serving Counter Manufacturer during the shop drawing phase. Casework shall be mounted on and interconnected/prewired to counters by Serving Counter Manufacturer. All wiring to be concealed from view. Kitchen Equipment Contractor shall be responsible for coordinating this effort and shipping casework to Serving Counter Manufacturer for mounting and wiring.
6. Entire assembly to be Model No. TM2N-A-MOD as manufactured by "Premier Food Shields" or approved equal as manufactured by "Brass Smith, Inc." and in accordance with all details set forth herein including all modifications.

L. SHOP DRAWINGS: Shop drawings must include a 1/4" scale layout of the serving line as shown on contract drawings. Shop drawings must be coordinated and submitted through and along with casework for approval prior to fabrication. Standard manufacturers catalog cuts will not be acceptable.

M. MANUFACTURER: Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.39 ITEM NO. 37 – ONE (1) CASHIER COUNTER

A. MEASUREMENTS: Unit to measure approximately 40" long x 32" wide x 34" high to working surface.

B. TOP CONSTRUCTION: Top to be constructed of 14-gauge stainless steel with 2" channel edge, polished to a #4 finish with all corners welded, ground and polished and stainless-steel bracing. Top to be provided with one (1) 2" diameter, rubber grommeted hole with removable cover. Location of this hole shall be determined in the shop drawing phase.

C. BODY & INTERIOR: Exterior and interior body of unit to be constructed of #14 gauge stainless steel frame/supports with #20 gauge stainless steel enclosure channels and front body panel.

End of unit adjacent to Item No. 36 shall be provided with 10" ± high stainless-steel apron and Operator's side.

D. SEATING AREA: Seating position shall be provided with a lockable cash drawer with dividers. Stainless steel interior panels in seating areas.

E. In addition, a 120V convenience outlet with cord and plug shall be mounted inside of base cabinet. No tubular foot rest required. No bottom shelf required.

F. TRAYSLIDE: Unit to be provided with a full-length x 12", 16-gauge solid stainless-steel tray-slide, with three (3) "inverted vee" full length integral runners mounted 30" high A.F.F on 12-gauge stainless steel fold-down brackets.

G. CASTERS: Unit to be mounted on 5" diameter heavy duty ball bearing swivel casters, all with brakes.

H. SHOP DRAWINGS: Shop drawings must include a 1/4" scale layout of the Servery as shown on contract drawings. Standard manufacturer catalog cuts will not be acceptable.

I. MANUFACTURER: Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.40 ITEM NO. 38 – ONE (1) MICROWAVE WALL SHELF

A. Microwave shelf to measure approximately 24" long x 24" deep and shall be constructed of high polished 16-gauge, 300 series stainless-steel.

B. Front to be turned down 1-1/2" at 90 degrees and back 1/2" at 45 degrees. Sides to be formed up approximate 10". Bottom rear to be turned up and sides rears to be turned inward 1" and pre-

punched with mounting holes for securing to wall. At rear of bottom, unit to be provided with a 2" diameter rubber grommeted hole.

C. Unit shall be secured to wall with die-formed stainless-steel mounting brackets with tab lock feature. Unit to be mounted at 54" high A.F.F.

D. MANUFACTURER: Unit to be manufactured by "EMI Industries, RI" or approved equal as manufactured by "Eagle Group" or "Carbone Metal Fabricator, Inc., MA" and in accordance with all details set forth herein including all modifications.

2.41 ITEM NO. 39 – ONE (1) MICROWAVE OVEN

A. Unit to measure approximately 17" long x 20" deep x 14" high overall.

B. Unit to have door to be left hinged with "Grab & Go" handle. Door to have a safety door seal and see-through window and interior of cavity to be lighted.

C. Controls to be located across top of oven. Unit to have sixty (60) programmable memory with three (3) power levels and three (3) stage cooking options. In addition, controls to have a one touch start feature and digital display.

D. Unit to be operable at 1200 watts, 17.7 AMPS, 120 Volt – 1 Phase, and shall be provided with cord and plug.

E. Unit to be Model No. NE-12521 as manufactured by "Panasonic" or approved equal as manufactured by "Sharp" or "Amana" and in accordance with all details set forth herein including all modifications.

2.42 ITEM NO. 40 – ONE (1) DESK (N.I.K.E.C.)

A. Unit is not in the Kitchen Equipment Contract and shall be furnished under a separate section of the specifications.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Rough-In Work: The Installer of food service equipment must examine the rough-in mechanical and electrical services by others, and the installation of floors, walls, columns and ceilings by others, and the conditions under which the work is to be done: and must verify the dimensions of the services before fabricating the work. Notification is required in writing of unsatisfactory locations and dimensions of other work, and of unsatisfactory conditions for the proper installation of food service equipment. Do not proceed with the fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner acceptable to the Architect.

## 3.2 INSTALLATION

A. Standards:
   1. Water Connections: Install water connections and outlets at each item of equipment, with air gaps, vacuum breakers and similar provisions to comply with governing regulations, but not less than compliance with ANSI Standards A.40.4 and A.40.6.
   2. Electrical Work: Assemble electrical components of equipment in accordance with applicable "Standards of Installation" by the National Electrical Contractors Association.
   3. Service Lines and Equipment Connections: Refer to other sections for piping connections and piping systems. Refer to other sections for electrical work including equipment connections.

B. Jointing and Anchoring: Set each item of non-mobile and non-portable equipment securely in place, leveled and adjusted to correct height. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorages wherever possible. Adjust counter tops of other work surfaces to a level tolerance of 1/16" (maximum offset and plus-or-minus on dimension and maximum variation of 2'-0" run from level or indicated slope).
   1. Complete field assembly joints in the field (joints which cannot be completed in the shop) by welding.
   2. Treat enclosed spaces (inaccessible after equipment installation) by covering horizontal surfaces with powdered borax at a rate of 4 oz. per square foot.
   3. Install closure plates and strips where required with joints coordinated with units of equipment.
   4. Install sealants and gaskets around all penetrations to make joints air-tight, water-proof, vermin-proof and sanitary for cleaning purposes. In general, make sealed joints not less than 1/8" wide and stuff with backer rods to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave with edges flush with faces of materials at joint. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" joint width; metal closure strips for wider joints, with sealant application on each side of strip. Anchor gaskets mechanically or with adhesives to prevent displacement.

## 3.3 CLEANING, RESTORING FINISHES

A. After completion of installation and completion of other major work in food service areas, remove protective coverings, if any, and clean food service equipment internally and externally. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed metal surfaces, and touch up painted surfaces. Replace work, which cannot be successfully restored.

## 3.4 TESTING, START-UP AND INSTRUCTIONS

A. General: Delay the start-up of food service equipment until service lines have been tested, balanced and adjusted for pressure, voltage and similar considerations and until water and steam lines have been cleaned and treated for sanitation.

B. Test each item of operational equipment to demonstrate that it is operating properly and that controls and safety devices are functioning. Repair or replace equipment, which is found to be defective in its operation including units, which are below capacity or operating with excessive noise or vibration.

C. Perform tests of all equipment in the presence of the authorized representative of the Architect and/or Owner. All defects disclosed by the tests shall be eliminated to the approval of the Architect for approval showing the schedule of testing, date and results.

D. Provide necessary technicians, materials and equipment required to conduct these tests. A statement shall be furnished to the Architect for approval showing the schedule of testing, date and results.

E. Provision shall be made for properly trained personnel to demonstrate to the Owner's operators the operation of all equipment including refrigeration systems. All demonstrations shall be completed within three (3) consecutive working days. Refer to Demonstration and Training under Section 017900.

F. Final Cleaning: After testing and start-up, clean and sanitize the food service equipment and leave in a condition ready for use in food service.

G. Equipment described herein shall be provided with service for a period of one year after final acceptance of the building. This service shall include adjustment of all equipment. It shall also include repair or replacement of electrical and mechanical parts of the equipment whenever this is required during maintenance periods, and only genuine standard parts produced by the manufacturer of the equipment shall be used. This warranty shall include all parts and labor for this one (1) year period. Renewals and repairs, as necessary, due to ordinary wear and tear shall be performed by competent personnel under the manufacturer's supervision. Emergency service shall be available at all times.

H. Kitchen Equipment Contractor to verify with the Owner, the delivery and condition of all accessories for each item to which they apply.

I. Kitchen Equipment Contractor to verify the delivery of all Owner's operating manuals and warranties.

J. Kitchen Equipment Contractor to provide a listing of names, addresses, and telephone numbers of factory authorized service agents for all items of equipment. In addition, a clear and concise statement must accompany this list as to proper procedure in requesting warranty work to be performed.

END OF SECTION 11 40 00

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**SECTION 11 52 13 – PROJECTION SCREENS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Electrically operated, front-projection screens and controls.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood backing for screen installation.
3. Division 26 Sections for electrical service and connections including device boxes for switches and conduit, where required, for low-voltage control wiring.

1.3 DEFINITIONS

A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.

B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:

1. For electrically operated projection screens and controls:

a. Location of screen centerline relative to ends of screen case.
b. Location of wiring connections for electrically operated units.

c. Location of seams in viewing surfaces.
d. Drop lengths.
e. Anchorage details, including connection to supporting structure for suspended units.
f. Details of juncture of exposed surfaces with adjacent finishes.
g. Accessories.
h. Wiring diagrams.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For projection screens to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.

2.2 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Controls: Remote, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.

    a. Provide power supply for low-voltage systems if required.

3. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
4. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- diameter metal rod with ends of rod protected by plastic caps.

    a. Roller for motor in roller supported by vibration- and noise-absorbing supports.

5. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.

B. Suspended, Electrically Operated Screens with Automatic Ceiling Closure, with Motor-in Roller, and with Tab Tensioning: Units designed and fabricated for suspended mounting; with bottom of case composed of two panels, fully enclosing screen, motor, and wiring; one panel hinged and designed to open and close automatically when screen is lowered and fully raised, the other removable or openable for access to interior of case.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

    **a. Draper Inc; Premier.**

2. Screen Case: Made from metal.
3. Finish on Exposed Surfaces: Baked enamel, black.

## 2.3 FRONT-PROJECTION SCREEN MATERIAL

A. Matte-White Viewing Surface: Peak gain not less than 1.0, and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

    **a. Draper Inc.; Matt White XT1000V.**

B. Material: Vinyl-coated, glass-fiber fabric.

C. Mildew-Resistance Rating: 0 or 1 when tested according to ASTM G 21.

D. Flame Resistance: Passes NFPA 701.

E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

F. Seams: Where length of screen indicated exceeds maximum length produced without seams in material specified, provide screen with horizontal seam placed as follows:

1. At top of screen at juncture between extra drop length and viewing surface.

G. Seamless Construction: Provide screens, in sizes indicated, without seams.

H. Edge Treatment: Black masking borders.

I. Provide black extra drop length of dimensions and at locations indicated.

## PART 3 - EXECUTION

### 3.1 FRONT-PROJECTION SCREEN INSTALLATION

A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.

a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

3.2 PROJECTION SCREEN SCHEDULE

A. Electrically Operated, Front-Projection Screen Type: Suspended.

1. Screen Surface: Matt white.
2. Viewing Surface Size: 16:10 format; 100” x 160” minimum.
3. Extra Drop Length: As needed at top of screen for bottom of screen to be 36 inches above floor, and for top of image area to be at least two inches below main valance.
4. Location: Cafetorium.

END OF SECTION 115213

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# SECTION 11 61 43 - STAGE CURTAINS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

### 1.2 SUMMARY

A. Section includes the following:

1. Main traveler.
2. Blackout curtain (rear traveler).
3. Borders (wing tab draperies).
4. Leg panels.
5. Cyclorama panel.
6. Curtain tracks.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 05 Section "Metal Fabrications."
3. Division 26 Sections for stage lighting including all rigging supports.

### 1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design rigging, including comprehensive engineering analysis by a qualified professional structural engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Rigging shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Design Loads: Weight of curtains and 20 lbs. per linear foot of support.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:

1. Operating clearances.
2. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.
3. Locations of equipment components and controls.

D. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing the full range of colors available, together with a 12-inch- square Sample (any color) of each type of fabric.

E. Delegated-Design Submittal: For rigging indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional structural engineer licensed in the State of Connecticut responsible for their preparation.

F. Qualification Data: For qualified Installer and professional structural engineer.

G. Product Certificates: For the following, from manufacturer:

1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
2. Rigging: Compliance of suspended battens and tracks with requirements.

H. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

I. Warranty: Sample of special warranty.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of stage curtains.

B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame-Resistance Ratings: Passes NFPA 701.

    a. Permanently attach label to each fabric of curtain assembly indicating fabric is inherently and permanently flame resistant and whether it requires retreatment after designated time period or cleaning.

C. Preinstallation Conference: Conduct conference at Project site.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of rigging equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, faulty operation of rigging equipment.
2. Warranty Period: Two years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 CURTAIN FABRICS

A. General: Provide fabrics inherently and permanently flame resistant to comply with requirements indicated. Provide fabrics of each type and color from same dye lot.

B. Polyester Velour (Main and Rear Curtains): Napped fabric of 100 percent polyester weighing not less than 26 oz./linear yd., with pile height approximately 75 mils; inherently and permanently flame resistant; 54-inch minimum width.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dazian LLC; Angelo.
    b. JB Martin Company; Dante.
    c. KM Fabrics, Inc.; Prestige.

2. Colors: As selected by Architect from manufacturer’s full range.

C. Polyester Lining (Main Curtains): 100 percent polyester fabric; inherently and permanently flame resistant; 54-inch minimum width; black.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dazian LLC; PD Cloth.
b. Rose Brand; RB Cloth.
c. Valley Forge Fabrics; Wiz Key.

D. Polyester (Cyclorama Curtain): 100 percent polyester yarn woven fabric weighing not less than 13 oz./linear yd.; inherently and permanently or durably flame resistant; 20'-0" minimum width.

1. Products: Subject to compliance with requirements, provide the following:

a. Rose Brand; IFR Trevira Muslin, Extra Wide.

2. Color: White.

## 2.2 CURTAIN FABRICATION

A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.

1. Vertical Hems: Provide vertical hems not less than 2 inches wide, with not less than a 1-inch tuck, and machine sew with no selvage material visible from front of curtain. Sew open ends of hems closed.
2. Leading Edge Turnbacks: Provide turnbacks formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and secure by sewing turnbacks vertically.
3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch-wide, heavy jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched box pleats sewn flat and spaced at 12 inches o.c. along top hem reinforcement.
5. Grommets: Brass, No. 3 or No. 4.

a. Black Curtains: Provide brass or aluminum grommets with black finish.
b. Pleated Curtains: Centered on each box pleat and 1 inch from corner of curtain; for snap hooks or S-hooks.

6. Bottom Hems: For curtains with fullness.

a. For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape. Sew open ends of hems closed.

b. For floor-length curtains, provide hems not less than 6 inches deep with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain. Stitch chain pockets so chain rides 2 inches above finished bottom edge of curtain. Sew open ends of hems closed.

1) Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413/A 413M.

7. Velour Curtains: Fabricate with the fabric nap down.
8. Lining: Provide lining for each curtain in same fullness as face fabric and finished 2 inches shorter than face fabric. Sew or otherwise securely attach lining to top hem of face fabric. Attach lining to face fabric along bottom and side seams with 4-inch- long strips of heavy woven cotton tape.

B. S-Hooks: Track Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

C. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtain; not less than 1/8 inch wide by 36 inches long, threaded through grommets.

## 2.3 STEEL-CURTAIN TRACK

A. Steel Track: Fabricate of roll-formed, galvanized, commercial-quality, zinc-coated steel sheet; complying with ASTM A 653/A 653M; G60 coating designation with continuous bottom slot and with each half of track in one continuous piece; black paint finish.

1. Products: Subject to compliance with requirements, provide one of the following, or equal:

a. Automatic Devices Company; Besteel 170 series.
b. H & H Specialties Inc.; 400 series.

2. Thickness: 14 gauge.

B. Suspended Track: NPS 1-1/2 steel pipe stiffener for supporting both sections of suspended tracks.

C. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

D. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.

E. Fold Guide: Equip carriers with rear-fold or backpack guide and rubber spacers to permit offstage curtain folding; sized for use with operating line if any.

F. Heavy-Duty Track System: Equip track with heavy-duty components. Provide end stops for track.

1. Curtain Carriers: Standard carriers of molded nylon with a pair of neoprene-tired ball-bearing wheels riveted parallel to body. Equip carriers with rubber or neoprene bumpers to reduce noise, and heavy-duty, plated-steel swivel eye and manufacturer's standard trim chain for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

    a. Master Curtain Carriers: One master carrier, for each leading curtain edge, of plated steel with two pairs of neoprene-tired ball-bearing wheels and with two line guides per carrier.

2. End Pulleys and Floor Block: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable, floor block; each with not less than 5-inch molded-nylon- ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off-stage curtain end. Provide an adjustable floor block to maintain proper tension on operating line with steel housing painted black.

G. Manual Operation: Provide with cord operating line consisting of manufacturer's standard 3/8-inch- diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

## 2.4 ALUMINUM-CURTAIN TRACK – SCENERY TRACK

A. Aluminum Track: Fabricate of extruded aluminum; complying with ASTM B 221; alloy and temper recommended by manufacturer for strength and corrosion resistance, 0.125 inch thick; mill finish.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Automatic Devices Company; Rig-I-Flex 140 series (#142).
    b. H & H Specialties Inc.; 500 series.
    c. Tru-Roll, Inc.; Tru-Roll Model No. 2300.

B. Curtain Rails: Double curtain capacity. Provide end stops for track rails.

C. Curtain Carriers: Standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

1. Master Curtain Carriers: One master carrier, for each leading curtain edge, with two pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body.
2. Provide a total of 120 single carriers and 4 master carriers for two track assemblies. Include 5 link trim chain for each carrier (ADC #TC-2).

D. Suspended Track: NPS 1-1/2 steel pipe stiffener for supporting both sections of suspended tracks.

E. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

F. Walk-Along Manual Operation: Fabricate curtain track without cord, cable, pulleys, or floor block.

## 2.5 CURTAIN RIGGING

A. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with a drive-fit pipe sleeve not less than 18 inches long, and secure with four Grade 5 bolts, plug welds, or another equally secure method. Shop-paint completed pipe battens with black paint and with a 1-inch- wide yellow stripe at the center of each.

1. Steel Pipe: ASTM A 53/A 53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 nominal diameter unless otherwise indicated.

B. Supports, Clamps, and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.

C. Trim and Support Cable: 1/4-inch- diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.

D. Trim and Support Chain: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M.

E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. Install stage-curtain system according to track manufacturer's and curtain fabricator's written instructions.

## 3.3 BATTEN INSTALLATION

A. Install battens by suspending at heights indicated with trim and support spaced to support load, but do not exceed 10 feet o.c.

1. Cable Trim and Support: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that are not subject to deterioration or failure with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, moused or fixed with nuts after adjustment, to prevent loosening.
2. Chain Trim and Support: Secure chain with load-rated terminations.

## 3.4 TRACK INSTALLATION

A. Batten-Hung Tracks: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at spacing, according to manufacturer's written instructions.

B. Spacing: Do not exceed the following dimensions between supports:

1. Heavy-Duty Track: 72 inches.
2. Medium Duty Track: 48 inches.

C. Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps.

## 3.5 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with S-hooks.

B. Batten Hung: Secure curtains to pipe battens with ties.

C. Hang all curtains 1-inch above finished floor surface.

## 3.6 DEMONSTRATION

**A.** Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage curtains, and tracks.

3.7 CURTAIN SCHEDULE

| DESCRIPTION | QTY | FABRIC | SIZE (HxW) | HARDWARE |
|---|---|---|---|---|
| Main Traveler | 2 | Synthetic velour with lining | *VIF* | Steel Track |
| Rear Traveler, Blackout Curtain | 2 | Synthetic velour | *VIF* | Steel Track |
| Leg Panels | 2 | Synthetic velour | *VIF* | Batten |
| Cyclorama | 1 | Seamless white synthetic muslin | *VIP* | Scenery Track |

END OF SECTION 11 61 43

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**SECTION 11 66 23 - GYMNASIUM EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section includes:

1. Basketball equipment.
2. Wall safety pads.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 09 Section “Fluid-Applied Athletic Flooring” for coordination of game lines.

1.3 DEFINITIONS

A. NFHS: The National Federation of State High School Associations.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide basketball backboards capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" and the Connecticut State Building Code.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For gymnasium equipment. Include plans, elevations, sections, details, attachments to other work, and the following:

1. Method of field assembly for removable equipment, connections, installation details, mountings, floor inserts, attachments to other work, and operational clearances.
2. Transport and storage accessories for removable equipment.

D. Structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium equipment to structure.

E. Coordination Drawings: Court layout plans, drawn to scale, and coordinating floor inserts, game lines, and markers applied to finished flooring.

F. Samples for Initial Selection: For each type of gymnasium equipment indicated.

G. Samples for Verification: For the following products:

1. Pad Fabric: Not less than 3 inches square, with specified treatments applied. Mark face of material.

H. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.

I. Qualification Data: For Installer and professional engineer.

J. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

K. Warranty: Special warranty specified in this Section.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.8 COORDINATION

A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Basketball backboard failures.

2. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with the following:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
3. Steel Sheet: ASTM A 1011/A 1011M.

B. Support Cable: Manufacturer's standard 1/4-inch galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.

C. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, grade required for structural loading.

D. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed[; tamperproof, vandal- and theft-resistant design].

E. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

## 2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated by **Porter Athletic Equipment Company (Porter)**, or a comparable product by one of the following:

1. Draper Inc.
2. Jaypro Sports.

B. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rule Book."

## 2.3 BASKETBALL EQUIPMENT

A. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

B. Wall-Mounted Backboard (Side Fold): Complete assembly extending from wall, including support framing to building structure, bracing, cables, chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Porter; Model 90220000 Side-Fold Backstop.**

2. Folding Type: Provide manufacturer's standard assembly for side-folding backboard, with hardware and fittings to permit folding.
3. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.

a. Finish: Manufacturer's standard black powder-coat finish.

4. Extension: 4 to 10 feet.
5. Goal Height Adjuster: Adjustable from 8 to 10 feet with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.

a. Operation: Electric operation with integral gear-drive motor, with limit switches preset to goal heights and the following:
1) Key switch control.

C. Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backboard.

1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backboard is in playing position; one per folding backboard.

D. Basketball Backboard:

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Porter; Model 00204000.**

2. Shape and Size:

a. Rectangular, 72 by 42 inches width by height.

3. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:

a. Glass: Not less than 1/2-inch- thick, transparent tempered glass. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, and bracing, including center-strut frame reinforcement, and with mounting slots for mounting backboard frame to backboard support framing.

1) Direct Mount: Designed for mounting backboard frame to center mast of backboard framing to maximize relief of stresses on backboard frame and glass.
2) Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.

4. Target Area and Border Markings: Marked in pattern, stripe width, and color according to referenced rules.

E. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with universal hole pattern that is manufacturer's standard for goal attachment.

1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
2. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and stability of goal are maximized.

F. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

**a. Porter; Model 236154 Powr-Flex II Goal.**

2. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
3. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism including positive-lock, preset pressure release, set to release at 230-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
4. Mount: Front.
5. Net Attachment: No-tie loops for attaching net to rim without tying.
6. Finish: Powder-coat finish.

G. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:

1. Cord: Made from white nylon.

H. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as per manufacturer's standard design.

1. Attachment: Bolt-on.
2. Color: As selected by Architect from manufacturer's full range.

## 2.4 SAFETY PADS

A. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Pad Coverings: Provide safety pad fabric covering fabricated from puncture- and tear-resistant, not less than 14-oz./sq. yd PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner.

C. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.

1. Basis of Design Product: Subject to compliance with requirements, provide **Porter Athletic Equipment Company; Super Safe Wall Pad 00570-01** or comparable product by one of the following:

    a. Draper Inc.; EcoVision Class A.
    b. Jaypro Sports; Fire Rated Wall Pads.

2. Backer Board: Not less than 7/16-inch oriented strand board backing, without nailing margins.
3. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 2-inch- thick fire-resistive neoprene, 6.0-lb/cu. ft. density.
4. Size: Each panel section, 24 inches wide by not less than 70 inches long.
5. Number of Panel Sections: As indicated.
6. Installation Method: Concealed Z-clips.
7. Fabric Covering Color: As indicated on Finish Legend.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Verify critical dimensions.
2. Examine supporting structure and subfloors below finished floor.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.

B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.

C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.

1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

D. Wall Safety Pads: Mount with bottom edge at dimension indicated on Drawings.

E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.

## 3.3 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

## 3.4 CLEANING

A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

## 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 11 66 23

# SECTION 11 66 53 - GYMNASIUM DIVIDERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Walk-draw divider systems.
2. Divider curtains.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium dividers to structure.

E. Samples for Initial Selection: For each type of gymnasium divider curtain fabric indicated.

F. Samples for Verification: For divider curtain fabric, not less than 12 inches square of open mesh and of opaque fabric.

G. Product Certificates: For each type of gymnasium divider, signed by product manufacturer.

H. Qualification Data: For Installer and professional engineer.

I. Operation and Maintenance Data: For gymnasium dividers to include in emergency, operation, and maintenance manuals.

J. Warranty: Special warranty specified in this Section.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products or an employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of gymnasium divider from a single manufacturer.

## 1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position for gymnasium dividers.

## 1.6 COORDINATION

A. Coordinate installation of overhead-supported gymnasium dividers and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of gymnasium dividers.
b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WALK-DRAW DIVIDER SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Draper, Inc.; Walk-Draw Gym Divider** or a comparable product by one of the following:

1. Jaypro Sports, LLC.
2. Porter Athletic Equipment Company.

B. Source Limitations: Obtain from single source from single manufacturer.

C. Divider-Curtain System: Manually operated, horizontal pull type gymnasium divider including clamps for attachment to building structure system, and as follows:

1. Stacking: Bi-parting with 36-inch overlap at opening as indicated on Drawings.

a. Stack space for curtain not to exceed 1-1/8 inches per carrier.
b. Minimum required clearance for curtain on each side of track is 6 inches.

2. Top Hem: Solid fabric in double thickness and double welded to mesh to form 3 inch wide top hem with grommets spaced at 12 inches on center.
3. Outer Edge Hems: Double turned and double welded.
4. Bottom Pocket: Double thickness with No. 2/0 proof coil chain in pocket.
5. Channel Track: 16 gauge galvanized steel channel-type track, 1-1/2 by 1-1/4 inches, attached to structural support at 8 feet on center maximum.
6. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2-inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs. each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor.
7. Carriers: 1-1/8-inch diameter ball bearing wheels with trim chain for attachment to grommets in curtain top. Space carriers at 12 inches on center.
8. Grommets: Manufacturer's standard material, size, and spacing; for snaps or S-hooks.

2.2 DIVIDER CURTAINS

A. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 9 oz./sq. yd.

1. Mesh Color: As selected by Architect from full range of colors.

B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 18 oz./sq. yd., 8-foot height above floor.

1. Fabric Color: As selected by Architect from full range of colors.

C. Hems: Folded and electronically welded.

D. Seams: Electronically welded.

E. Overall Curtain Height: As indicated on Drawings, within installation clearances required.

F. Bottom of Curtain: Approximately 2 inches above finished floor.

G. Divider-Curtain Flame-Resistance Rating: Passes NFPA 701 Test 2.

## 2.3 SUPPORT MATERIALS AND FASTENERS

A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal-resistant design.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Verify critical dimensions.
2. Examine supporting structure.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions. Complete field assembly, where required.

B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, have been completed.

C. Gymnasium Dividers and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.

1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.

D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing gymnasium dividers to structural support and for properly transferring load to in-place construction.

## 3.3 ADJUSTING

A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

## 3.4 CLEANING

A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

## 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 11 66 53

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**SECTION 11 90 00 – MISCELLANEOUS EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. This Section includes the following:

1. Flameproof Safety Storage Cabinets.
2. Narcotics cabinet.
3. Kiln.
4. Transaction window components.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements."
2. Division 06 Section “Miscellaneous Rough Carpentry" for wood blocking.
3. Division 10 Section “Fire Protection Specialties” for fire extinguisher cabinets.
4. Division 11 Section “Residential Appliances."
5. Division 23 Sections for connection to kiln.
6. Division 26 Sections for wiring, disconnect switches, and other electrical materials required to complete miscellaneous equipment installation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

C. Operation and Maintenance Data: For each product indicated.

D. Warranty: Special warranties included in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Product Options: Information on Drawings and in Specifications establishes requirements for performance characteristics. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.5 DELIVERY, STORAGE AND HANDLING

A. Store equipment on site protected from weather, direct sunlight, and temperature extremes.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install miscellaneous equipment until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

# PART 2 - PRODUCTS

## 2.1 FLAMEPROOF SAFETY STORAGE CABINETS

A. Flameproof Safety Storage Cabinets: Provide full height safety cabinets as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Eagle Mfg. Co.; Model 4510**, or comparable product by the following:

    a. Justrite Mfg. Co. LLC.
    b. Lyon Workspace Products.

2. Cabinets: NFPA Code 30, OSHA and Factory Mutual tested and approved, fabricated from 18 gauge steel, double wall, all welded, leak proof construction with 1-1/2" air space, two coat, baked enamel finish. Equipped with steel legs, double doors, two 2" vents in cabinet sides, each with flash arresters. Static ground connections inside and out.
3. Doors: Steel double wall construction, matching construction of cabinets, with continuous piano hinges, 3-point spark proof lock/latch assembly, key locks.
4. Shelves: Two (2) galvanized 18 gauge steel shelves on adjustable shelf supports, surface mounted.
5. Capacity: 45 gallons.
6. Size: 65”H x 43”W x 18”D.

2.2 NARCOTICS CABINETS

A. Narcotics Cabinet: Surface mounted, double-door steel cabinet with high security pick-resistant tubular locks and individual key for each door, with two adjustable steel shelves, and full length piano hinges.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

**a. Harloff; Large Narcotics Cabinet.**

2. Size: 23-1/2"W x 10-1/2"D x 29-1/2"H.
3. Finish: Beige.

2.3 KILN

A. Kiln: Digital automatic ceramics kiln with Cone 8 capacity, digital controls, and steel stand.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

**a. Skutt Ceramic Products; Model KM-1227-3.**

2. Opening: 46” x 30.75”.
3. Chamber Depth: 27 inches.
4. Chamber Volume: 9.9 cu. ft.
5. Maximum Temperature: 2300 deg F.
6. Electrical Requirements: 208V, 60 amp, three phase.
7. Wattage: 11,000 watts.
8. Downdraft Ventilation System: Skutt “EnviroVent 2” negative pressure downdraft ventilation system; capable of removing hazardous fumes only, not heat. System to consist of the following components:

a. Blower motor with six (6) ft. power cord and in-line switch.
b. 8 x 12 inch mounting plate.
c. Eight (8) ft. x three (3) inch flexible aluminum duct.
d. Spring-loaded plenum cup assembly.
e. Blower inlet tube.
f. Blower discharge tube.
g. Plenum spring.
h. Three (3) to four (4) inch connector.
i. Floor mounting plate.
j. Mounting hardware

9. Provide a dual intake kit to vent a single kiln over 12 cu. ft. Maximum chamber volume that can be vented with one (1) motor is 24 cu. ft.
10. Electrical Switching Device: Skutt “EnviroLink” electrical switching device utilizing a programmable power output in the controller to turn the downdraft ventilation system on and off.

11. Accessories:

    a. Furniture Kit: Model 1227-3 kit including (8) 5/8-inch half shelves and one large post assortment.
    b. Kiln stand.

12. Warranty: Two years from date of Substantial Completion.

## 2.4 TRANSACTION WINDOW COMPONENTS

A. Glass Speak-Thru Device:

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

    **a. C.R. Laurence; Model SST5.**

2. Size: 5 inch diameter.
3. Finish: Stainless steel.

B. Deal Tray: All welded stainless steel construction.

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

    **a. Shuresafe; Countertop Stationary Deal Tray.**

2. Size: 12”W x 10”D x 1-5/8”H.
3. Finish: Stainless steel.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install miscellaneous equipment in accordance with approved shop drawings and manufacturer’s written installation instructions.

B. Provide startup training for Owner as required for each product as required.

## 3.2 PROTECTING AND CLEANING

A. Provide temporary covering of miscellaneous equipment until time of Substantial Completion. Use type of covering approved by manufacturer that will effectively protect equipment from abrasion, breakage, or other damage.

B. Clean miscellaneous equipment immediately before date scheduled for inspection intended to establish date of Substantial Completion. Use methods and cleaning materials recommended by manufacturer, taking care not to scratch or damage coatings.

END OF SECTION 11 90 00

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# SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes horizontal louver blinds with aluminum slats for interior hollow metal glazed frames and transaction window.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

C. Samples for Initial Selection: For each type and color of horizontal louver blind indicated.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type and color of horizontal louver blind indicated.

1. Slat: Not less than 12 inches long.
2. Blind: One full functional unit, 16-inches wide by 24-inches long.

E. Window Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Architectural Window Treatment Schedule.

F. Product Certificates: For each type of horizontal louver blind, signed by product manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of horizontal louver blind.

H. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

## 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Flame-Resistance Ratings: Passes NFPA 701.

C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## 1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed, but no fewer than one unit for each size installed.

## PART 2 - PRODUCTS

### 2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Hunter Douglas; Lightlines.
2. Levolor, a Newell Rubbermaid Company; Riviera Classic.
3. Springs Window Fashions Division, Inc.; Bali Classics.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile.

1. Width: 1 inch (0.991- inch actual).

a. Spacing: Not less than 0.85 inch (21.5 mm).

2. Thickness: Not less than 0.008 inch.
3. Finish: One color.

a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.

C. Headrail: Formed steel channel, "U"-shaped; long edges returned or rolled; fully enclosing operating mechanisms on three sides and the following:

1. Capacity: One blind per headrail.
2. Size: 1-inch high by 1-1/2- inch deep, 0.025 inch thick.
3. Provide steel end stiffeners at each end of headrail with a lateral adjustment tab to eliminate lateral movement and the center the blind in the window.
4. Hardware: Acetal low friction thermoplastic, mechanically locked into head channel by means of snap-in fittings with no mechanical cleats visible from underside of headrail.
5. Finish: Prime coat of vinyl primer with finish coat of polyester baked enamel, to match bottom rail and end support brackets.

D. Bottom Rail: Formed-steel tube 0.025 inch thick, with plastic or metal capped ends, top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill; and locking groove to receive dust cover.

1. Finish: Prime coat of vinyl primer with finish coat of polyester baked enamel.

E. Ladders: Braided string; 100% high tenacity polyester yarn, not less than 0.045- inch diameter or greater than 0.066- inch diameter.

1. Spacing: Distance between end ladder and end of slats not to exceed 6-1/2 inches; distance between ladders not to exceed 24 inches.
2. Ladder drum: Injection molded thermoplastic with smooth hole edges to position ladder. Secure ladder with a snap down top, eliminating the need for braided ladder clips.

F. Lift Cords: Manufacturer's standard; braided with polyester jacket and center core, 1.4 mm, securely anchored to bottom rail with provision to detach cords.

1. Equip lift cords with plastic tassels.

G. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing overrotation, and linkage rod, and the following:

1. Tilt Operation: Manual.
2. Wand: Detachable, clear polycarbonate hollow rod with a hexagonal shape measuring approximately 1/4- inch across.
3. Length of Tilt Control: Length required to make operation convenient from floor level.
4. Tilt: Full.
5. Tilt Rod: Electro-zinc coated solid steel, hexagonal in shape, 1/4-inch at its widest point. Tilt rod to limit torsional deflection to 6 degrees in a 30-inch test length with a torque application of one-foot pound.
6. Tilt Rod Support: Acetal low friction thermoplastic, to provide smooth bearing and center the ladder drum over ladder hole. Incorporate a grommet guide to guide lift cord and braided ladder through bottom of headrail. Provide acetal grommet with beveled edges to prevent cord and braided ladder wear and discoloration.

H. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

1. Cord Lock: Snap-in design which incorporates a stainless steel wear guard over which cords pass, and a floating shaft-type locking pin. Locking pin shall be free of abrasive teeth and offer minimum wear to cord. Incorporate a crash-proof safety feature which will lock blind automatically upon release of cord.
2. Cord Guide: Nickel steel plated.

I. Tilt-Control and Cord-Lock Position: Right and left side of headrail, respectively.

J. Mounting: Wall or ceiling mounting as required, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind, but not more than 48-inches.

K. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard; provide at locations indicated.

L. Colors: As selected by Architect from manufacturer's full range.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
2. Blind Units Installed outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, and operating hardware, and for hardware position and blind mounting method indicated.

1. Fabricate from steel, marked left and right to facilitate installation, with 1-1/4- inch extra wide top to accommodate power screwdriver.
2. Finish: Prime coat of vinyl primer with finish coat of polyester baked enamel, to match headrail.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

E. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal, and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

B. Flush Mounted: Install horizontal louver blinds with slat edges flush with finish face of opening if slats are tilted open.

C. Jamb Mounted: Install headrail flush with face of opening jamb and head.

D. Head Mounted: Install headrail on face of opening head.

## 3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

## 3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

## 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 01 Section "Demonstration and Training."

## 3.6 SCHEDULE

A. Provide horizontal louver blinds at interior borrowed lights as indicated.

END OF SECTION 12 21 13

# SECTION 12 24 13 - ROLLER WINDOW SHADES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.
2. Manually operated roller shades with double rollers.
3. Manually operated spring roller shades for interior doors.
4. Motor-operated roller shades with double rollers.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
3. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

1. Motorized Shade Operators: Include operating instructions.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
2. Wiring Diagrams: Power, system, and control wiring.

D. Samples for Initial Selection: For each colored component of each type of shade indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification:

1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
2. For the following products:

a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.

F. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

G. Product Certificates: For each type of roller shade, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Product Test Reports: For each type of roller shade.

J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of roller shade.

K. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.

L. Warranty: Special warranty included in this Section.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years' experience in installing products comparable to those specified in this section.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

D. Product Standard: Provide roller shades complying with WCMA A 100.1.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manual roller shades that fail in performance, materials, or workmanship within specified warranty period.

1. Warranty Period for Chain and Shadecloth: 25 years from date of Substantial Completion.
2. Warranty Period for Motors and Motor Control System: 5 years from date of Substantial Completion.

3. Warranty Period for Installation: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **MechoShade Systems, Inc.; MechoShade Mecho/5** or comparable product by one of the following:

1. Draper Inc.; FlexShade.
2. Hunter Douglas Contract; RB 500.

B. Rollers: Extruded-aluminum roller tubes of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.

1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
c. Provide optional wall mount angle for wall mounted and window mounted shades.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

E. Shade Operation: Manual; with 90 lb. stainless steel continuous-loop bead-chain, clutch, and chain retainer.

1. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor. Delrin and stainless steel; commercial grade. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
2. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades as required for size of shade.

3. Loop Length: Full length of roller shade.
4. Bead Chain: Stainless steel. 90 lb. test.
5. Cord Tensioner Mounting: Sill.
6. Operating Function: Static; stop and hold shade at any position in ascending or descending travel.
7. Fascia: Continuous extruded aluminum SnapLoc type. Bent steel will not be accepted.
8. Shadeband: Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
9. Mounting spline: shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
10. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

F. Manual Operated Chain Drive Hardware and Brackets: Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

1. Drive Bracket and Brake Assembly: Drive sprocket and brake assembly shall rotate and be supported on a welded 3/8-inch steel pin.
2. Brake: Provide an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
3. Braking mechanism: Applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
4. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

G. Shadebands:

1. Shadeband Material: Light-blocking fabric.

## 2.2 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **MechoShade Systems, Inc.; MechoShade Mecho/5 DoubleShades** or comparable product by one of the following:

1. Draper Inc.; FlexShade.
2. Hunter Douglas Contract; RB 500.

B. Rollers: Extruded-aluminum roller tubes of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.

1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
2. Inside Roller:

    a. Drive-End Location: Right side of inside face of shade.
    b. Direction of Shadeband Roll: Regular, from back of roller.

3. Outside Roller:

    a. Drive-End Location: Right side of inside face of shade.
    b. Direction of Shadeband Roll: Regular, from back of roller.

4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 8 inches.
    c. Depth: 5-5/8 inches from face of aluminum window framing to face of fascia.

2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

E. Shade Operation: Manual; with 90 lb. stainless steel continuous-loop bead-chain, clutch, and chain retainer.

1. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor. Delrin and stainless steel; commercial grade. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
2. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades as required for size of shade.
3. Loop Length: Full length of roller shade.
4. Bead Chain: Stainless steel. 90 lb. test.
5. Cord Tensioner Mounting: Sill.

6. Operating Function: Static; stop and hold shade at any position in ascending or descending travel.
7. Fascia: Continuous extruded aluminum SnapLoc type. Bent steel will not be accepted.
8. Shadeband: Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
9. Mounting spline: shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
10. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

F. Manual Operated Chain Drive Hardware and Brackets: Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

1. Drive Bracket and Brake Assembly: Drive sprocket and brake assembly shall rotate and be supported on a welded 3/8-inch steel pin.
2. Brake: Provide an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
3. Braking mechanism: Applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
4. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

G. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.

H. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.

## 2.3 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide **MechoShade Systems, Inc.; ElectroShade Electro/3 DoubleShade** or comparable product by one of the following:

1. Draper Inc.; Motorized FlexShade.
2. Hunter Douglas Contract; RB 500 Motorized Roller Shades.

B. Rollers: Extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Direction of Shadeband Roll: Regular, from back of roller.
2. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

1. Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or thicker, as required to support 150 percent of the full weight of each shade.
2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside or outside mount).
3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer’s design criteria).
4. Bracket Type: No. 17.

D. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Enclosed in sealed pocket of shadeband material.
    b. Color: As selected by Architect from manufacturer's full range.

E. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Exposed with endcaps and integral light seal.
    b. Color: As selected by Architect from manufacturer's full range.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, 3-25/32 inches.
    c. Bracket: #20 Bracket.

2. Endcap Covers: To cover exposed endcaps.
3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

    a. Provide ShadeLoc system at Training Room.

4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

## 2.4 SHADEBAND MATERIALS

A. Light-Filtering Fabric: 85% PVC coating, 15% polyester core.

1. Basis of Design Product: Subject to compliance with requirements, provide **MechoShade Systems, Inc.; EuroVeil 5300 Series** or comparable product by one of the following:

    a. Draper Inc.
    b. Hunter Douglas Contract.

2. Colors: As indicated on Finish Legend.
3. Material Openness Factor: 5 percent.
4. Bottom Hem: Straight.

B. Light-Blocking Fabric: Opaque fabric, 75% PVC coating, 25% polyester core.

1. Basis of Design Product: Subject to compliance with requirements, provide **MechoShade Systems, Inc.; Classic Blackout 0700 Series** or comparable product by one of the following:

    a. Draper Inc.
    b. Hunter Douglas Contract.

2. Color: As selected by Architect from manufacturer's full range.
3. Bottom Hem: Straight.

## 2.5 MANUALLY OPERATED SHADES WITH SINGLE SPRING ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or equal:

**1. Draper Inc.; Spring Roller FlexShade.**

B. Spring Operating Mechanisms: Roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.

1. Roller Tube: 1-1/4-inch diameter, one piece, heavy gauge steel, roll formed with rust resistant finish. Roller tube includes groove for spline attachment of fabric with continuous wire or clips.
2. Mechanism: Inertia/gravity driven, ball bearing catch style, 2-stop design. Lock bearings housed in nylon type 6 cylinder and bushing, completely enclosed. Roller bushing is self-lubricating for life. Spring spindle made of round aluminum tubing, removable for replacement on site.
3. Idler Pin: Case hardened steel, fixed in nylon plug, securely held in roller tube by friction.
4. Brackets: Universal brackets for face mounting.
5. Pulley and Cord: Provide locking pulley with cord in length required to operate shade from open position on door at 48” above finish floor maximum.

C. Shadeband Material: Light-blocking fabric.

## 2.6 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room. Sewn seams or hem pockets with open ends will not be accepted.
2. Shade band and Shade Roller Attachment:

    a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
    b. Provide for positive mechanical engagement with drive / brake mechanism.
    c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
    d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
    e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.

1. Fabricate hem as follows: Concealed hemtube.

E. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

1. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

F. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

G. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

H. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

I. Colors of Metal and Plastic Components Exposed to View: Matching or coordinating with shade band color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 01 Section “Demonstration and Training."

END OF SECTION 12 24 13

# SECTION 12 35 51 – MUSIC EDUCATION STORAGE SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. The Section includes the following:

1. Musical instrument storage casework.

B. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements.”
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking for anchoring cabinet systems.
3. Division 09 Section "Resilient Base and Accessories" for resilient base applied to cabinet systems.

### 1.3 DEFINITIONS

A. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.

B. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.

C. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

2. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show fabrication and installation details for cabinet and storage systems. Include plans, elevations, sections, details, and attachments to other Work.

D. Samples for Initial Selection: For cabinet finishes and for each type of material indicated.

E. Samples for Verification: For modular metal storage shelving components as follows:

1. Shelf Brackets: Cantilevered shelf brackets with attachment hardware.
2. Vertical Supports: 12-inch section of vertical supports.

F. Warranty: Special warranties specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of music instrument and library storage systems manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain storage system cabinets through one source from a single manufacturer.

C. Catalog Standards: Manufacturer’s catalog numbers may be shown on drawings for convenience in identifying certain work. Unless modified by notation on drawings or otherwise specified, catalog description for indicated number constitutes requirements for each item.

1. The use of catalog numbers and specific requirements set forth in drawings and specifications are not intended to preclude the use of any other listed manufacturers’ product of procedures which may be equivalent, but are given for purpose of establishing standard of design and quality for materials, construction, and workmanship.
2. The approval of other listed manufacturers’ products does not relieve the Contractor from compliance with the detailed requirements of this Section.

D. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years’ experience in manufacture of similar products in use in similar environments. Obtain music education storage casework through one source from a single approved manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver storage systems only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install institutional casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where institutional casework is indicated to fit to other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate layout and installation of metal framing and reinforcements in gypsum board assemblies for support of storage systems.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of music education storage systems that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.
2. Delamination or other failures of glue bond of components.
3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
4. Failure of operating hardware.
5. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide **Wenger Corporation; UltraStor** or comparable products by one of the following:

1. Fleetwood Group.
2. Ironwood Manufacturing.

2.2 SYSTEM DESCRIPTIONS

A. Music Instrument Storage System: Provide one-piece high molecular polyethylene instrument shelving with integral ventilation grooves, designed and engineered to withstand continuous use without surface or front edge breakdown.

1. Provide molded plastic instrument storage shelf with a static load capacity of a minimum of 1000 lbs.
2. Provide full height solid hinged door for instrument storage units to support a minimum dynamic live load of 315 lbs, applied at outer edge.

B. Robe and Uniform Storage Casework: Provide with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.

C. Sheet Music Storage: Casework in wheeled retractable units, providing high-density storage, adjustable to fit most sizes of published sheet music, enabling Owner reconfiguration of unit layout.

2.3 PERFORMANCE REQUIREMENTS

A. Acoustically Enhanced Music Instrument Storage Casework Acoustic Properties:

1. Sound Absorption Average: Minimum SAA of 0.80, based upon sound absorption coefficient for twelve one-third octave bands from 200 to 2500 Hz, inclusive, with a minimum Noise Reduction Coefficient (NRC) of 0.75, per ASTM C 423 and ASTM E 795.

2. Acoustical Performance, One-third Octave Band Center Frequency, Hz, for four: 27 by 84 by 29 inch deep units:

| | 125 | 250 | 500 | 1000 | 2000 | 4000 |
|---|---|---|---|---|---|---|
| Sound Absorption Coefficient | | | | | | |
| Mounting Type F65 | 1.08 | 0.71 | 0.86 | 0.77 | 0.75 | 0.68 |
| Sound Absorption, sabins/unit | | | | | | |
| Mounting Type F65 | 68.72 | 45.25 | 55.00 | 48.83 | 47.85 | 43.45 |
| Scattering Coefficient | | | | | | |
| | 0.10 | 0.13 | 0.40 | 0.62 | 0.80 | 1.44 |

B. Storage Casework Wire-Grille Door Hinge: Each weld capable of resisting 400 lbf pull test without visible damage or permanent deformation.

C. Storage Casework Full Grille Door Hinge: Full length door capable of supporting 315 lbs. Through open and close cycle without permanent damage.

D. Seismic Performance: Comply with ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" based upon seismic design criteria indicated, and the Connecticut State Building Code.

2.4 MATERIALS

A. General:

1. Adhesives: Adhesives shall not contain urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
3. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

    a. Color: As selected by Architect from manufacturer's full range.

4. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts.

    a. Color: As selected by Architect from manufacturer's full range.

B. Polyethylene Shelves: High-density, one-piece, blow-molded or polyethylene, with radiused front edge, for abuse-resistant shelves.

1. Color: As selected by Architect from manufacturer's full range.

2.5 INSTRUMENT STORAGE

A. Cabinet Wall Panels: Fabricated from 3/4-inch thick industrial cabinet grade particleboard, 43 lb. density with thermoset polyester laminate on both sides for totally finished construction. Melamine, backer sheets or unfinished surfaces are not permitted on unexposed sides.

B. Cabinet Back Panel: Standard back panel to be ¼-inch thick prefinished hardboard.

C. Cabinet Shelving:

1. Cabinets up to 27 inches wide: One-piece high molecular blow-molded polyethylene with 1-3/8 inch radius front edge. Mount to cabinet walls with one-piece molded rigid ST nylon clip. Shelf is replaceable without damage to adjacent surfaces. Doweled shelves are not permitted.
2. Cabinets over 27 inches wide: One-piece high molecular formed polyethylene with radius front edge and 3/16" wall thickness, ribbed for structural integrity, and supported by four structural tubular members 1-1/2" x 1" x 16 gauge wall thickness with 14 gauge welded end plates.

D. Grille Doors: Bright basic steel wire, 5/16 and 3/16 inch diameter, with full 360 degree welds at T-joints.

E. Vertical Closure Kit: Provide visual closure between wall and cabinet, constructed of ¾-inch thick thermoset polyester composite wood to match cabinet side panels, sized to fit 3/4" to 30" wide opening.

F. Top Back Filler Kit: Provide visual closure between back wall and top panel of cabinet, constructed of ¾-inch thick thermoset polyester composite wood to match cabinet top panels, sized to fit 10" and 20" deep openings.

G. Finished Back Panel: Provide panel to attach to cabinet back that is exposed, constructed of ½-inch thick thermoset polyester composite wood to match cabinet.

H. Steel Sheet, Steel Wire, and Exposed Fastener Finish: Urethane-based electrostatic powder coating, color as indicated.

2.6 HARDWARE

A. Hinges: Provide 5-knuckle heavy duty institutional type hinge, with 2-3/4" pin, prefinished to match cabinet color, through-bolted to side panels, and welded to grille door frames. Provide two hinges on compartment doors; four on full height doors.

B. Edging: Heat bonded 3mm beveled PVC edge-banding, machine applied using hot-melt adhesives, edges and corners machine profiled for safety, with integral color.

C. Finish Hardware:

1. Joinery Hardware: Provide two inch, 1/4-20 panel connectors with 15mm head diameter, and steel thread inserts to join desired cabinets side-to-side; use factory jigged and drilled joinery holes.
2. Cabinet levelers: Structural levelers for each cabinet, accessible from within the unit when desired, concealed in complete installation; glides with minimum 3/8 inch diameter threaded rod mounted in steel corner brackets. Provide minimum four glides per cabinet, six glides for cabinets with divider panels.

D. Fasteners: Manufacturer-recommended fasteners as required for casework substrate and project performance requirements, consisting of one or more of the following:

1. Sheet Metal Screws: SAE J78, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
2. Wood Screws: ASME B18.6.1.
3. Expansion Anchors in Concrete and Concrete Masonry Units: Carbon-steel, zinc plated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of music instrument and library storage systems.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 CABINET INSTALLATION

A. Install plumb, level, and true; shim as required, using concealed shims. Where storage system abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

C. Adjust cabinets and hardware so doors operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

## 3.3 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain storage specialties.

B. Turn over keys, tools, and operation and maintenance instructions to Owner.

## 3.4 CLEANING AND PROTECTING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 12 35 51

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**SECTION 12 36 61 – SIMULATED STONE COUNTERTOPS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SUMMARY

A. Section Includes:

1. Solid-surface countertops.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements.”
2. Division 06 Section “Interior Architectural Woodwork” for plastic-laminate-clad countertops and backsplashes, and counter support brackets.
3. Division 22 Section for non-integral sinks and plumbing fittings.

1.3 SUBMITTALS

A. Product Data: For countertop materials.

B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Certificates for Credit d11: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples for Verification:

1. Countertop material, 6 inches square.

E. Qualification Data: For Installer and fabricator.

F. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in Division 07 Section "Joint Sealants" and indicating that sealants will not stain or damage simulated stone.

G. Maintenance Data: For countertops to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

H. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate simulated stone countertops similar to that indicated for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products, or installer approved by fabricator, and a certified participant in AWI's Quality Certification Program.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification labels and certificates indicating that solid surfacing countertops, including installation, comply with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical solid surfacing countertop and backsplash in location as directed by Construction Manager.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace solid-surface-material countertops that fail within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Basis of Design Product (**SS-1,2)**: Subject to compliance with requirements, provide **Wilsonart; Solid Surface** or comparable product by one of the following:

a. DuPont; Corian.
b. LG Hausys; HI-MACS Classic.

2. Physical properties:

a. Water Absorption per ASTM D 570: 0.033.
b. Abrasion Resistance: Minimum value of 223, based on testing according to ANSI Z124.
c. Fungal and Bacterial Resistance per ASTM G 21 and G 22: No growth.
d. Surface Burning Characteristics per ASTM E 84: Flame spread of 15, smoke developed 255.
e. Stain Resistance per ANSI Z124.6: Not affected.

3. Type: Provide Standard Type.
4. Colors: As indicated by manufacturer's designations on the Finish Legend.

2.2 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: As indicated.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: Solid surface material with front edge built up with same material.

1. Thickness: 1/2-inch thick.

C. Backsplashes: 1/2-inch- thick, solid surface material.

D. Fabrication: Fabricate tops in one piece with shop-applied edges, backsplashes and endsplashes. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

## 2.3 ADHESIVES, SEALANTS, AND ACCESSORIES

A. General: Use only adhesives formulated for simulated stone and recommended by their manufacturer for the application indicated.

B. Water-Cleanable Epoxy Adhesive: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bonsal, W. R. Company.
b. Laticrete International, Inc.
c. MAPEI Corp.

C. Joint Sealant: Silicone sealant to comply with Division 07 Section “Joint Sealants.”

D. Cleaner: Cleaner specifically formulated for simulated stone types, finishes, and applications indicated, as recommended by manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates indicated to receive countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of countertops.
2. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work acknowledges acceptance of substrates.

## 3.2 PREPARATION

A. Clean dirty or stained surfaces by removing soil, stains, and foreign materials before setting. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

## 3.3 CONSTRUCTION TOLERANCES

A. Variation from Level: Do not exceed 1/16 inch in 120 inches.

B. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.

C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.

D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

## 3.4 INSTALLATION OF COUNTERTOPS

A. General: Install countertops by adhering to supports with water-cleanable epoxy adhesive.

B. Set countertops to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust countertops to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure stone countertops in place.

C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

D. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.

1. Apply silicone sealant to gap between wall and backsplash.

E. Apply sealant to joints; comply with Division 07 Section "Joint Sealants." Remove temporary shims before applying sealant.

## 3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive and sealant smears immediately.

B. Remove and replace simulated stone countertops of the following description:

1. Broken, chipped, stained, or otherwise damaged simulated stone. Simulated stone may be repaired if methods and results are approved by Architect.

2. Defective countertops.
3. Defective joints, including misaligned joints.
4. Interior simulated stone countertops and joints not matching approved Samples and mockups.
5. Interior simulated stone countertops not complying with other requirements indicated.

C. Replace in a manner that results in countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Clean countertops not less than six days after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage simulated stone.

END OF SECTION 12 36 61

# SECTION 13 34 23 – FABRICATED STRUCTURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

### 1.2 SUMMARY

A. Section includes fabricated, wood framed structures.

B. Related Sections:

1. Division 08 Section "Door Hardware" for door hardware and cylinders.
2. Division 32 Section "Exterior Improvements" for crushed stone pads.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fabricated buildings.

B. Shop Drawings: For fabricated buildings. Include plans, elevations, sections, details, accessories, and fastening and anchorage details, including mechanical fasteners.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Connecticut responsible for their preparation.

C. Samples for Verification: For each type of exposed finish in manufacturer's standard sizes.

D. Delegated-Design Submittal: For fabricated structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair finish or replace fabricated buildings that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Modular buildings shall withstand the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 and in accordance with the Connecticut State Building Code.

1. Loads: As indicated on Drawings.
2. Building Use Group: Storage.
3. Construction Type: VB.

B. Regulatory Requirements: Comply with applicable provisions in the 2010 ADA Standards and the ICC/ANSI A117.1.

2.2 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide products indicated by manufacturer indicated or comparable product by one of the following, or equal:

1. Hometown Structures.
2. Kloter Farms.

2.3 FABRICATED BUILDINGS

A. General: Fabricate building from an integrated set of mutually dependent components to form a completed assembly, ready for installation on Project site.

B. Roof Construction:

1. Rafters: 2x6 kiln dried Spruce at 16 inches on center.
2. Sheathing: 1/2-inch thick CDX plywood with 15 lb. felt underlayment.
3. Roofing: Manufacturer’s standard architectural asphalt shingle roofing with 30-year warranty.

C. Exterior Wall Construction: 2x4 wood studs at 16 inches on center, unless noted otherwise.

D. Doors: Manufacturer's standard as indicated.

1. Locksets: Furnished and installed by Division 08 Section "Door Hardware."

E. Windows: Provide manufacturer's standard windows in operation indicated.

F. Courtyard/Playground Storage Shed:

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

**a. The Barn Yard; Carriage House.**

2. Modular Size: 10 x 16 feet.
3. Fabrication:

a. Roof Pitch: 10:12.
b. Wall Height: 7'-4".
c. Provide 12-inch overhang on all four sides.
d. Pressure treated wood ramp, 4 by 8 feet.
e. Pressure treated wood floor joists, 12 inches on center.
f. Plywood subfloor, 3/4 inch CDX.
g. Vinyl siding and MiraTEC trim.
h. Two double hung windows, 24 by 36 inches, including two pairs of shutters.
i. Two transom windows over pair of doors.
j. One pair 6' fiberglass doors.
k. One single 3' fiberglass door.
l. 25 inch cupola.
m. Deluxe electrical package.

4. Building and Trim Color: As selected by Architect from manufacturers' full range.

G. West Playground Storage Shed:

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

**a. The Barn Yard; Traditional Cape.**

2. Modular Size: 8 x 10 feet.
3. Fabrication:

a. Roof Pitch: 10:12.
b. Wall Height: 7'.
c. Provide 6-inch overhang on all four sides.
d. Pressure treated wood ramp, 4 by 6 feet at pair of doors.
e. Pressure treated wood floor joists, 8 inches on center.
f. Plywood subfloor, 3/4 inch CDX.
g. Vinyl siding and MiraTEC trim.

h. One pair 6’ solid core fiberglass doors (5’ double door)
i. Deluxe electrical package.

4. Building and Trim Color: As selected by Architect from manufacturers’ full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical systems to verify actual locations of connections.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fabricated structure according to manufacturer's written instructions.

B. Set fabricated structure plumb and aligned on asphalt surfacing or crushed stone pads where indicated.

3.3 ADJUSTING

A. Adjust doors and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

C. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 13 34 23

# SECTION 14 24 00 - HYDRAULIC ELEVATORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

### 1.2 SUMMARY

A. This Section includes telescoping holeless, hydraulic passenger elevators.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Division 04 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
3. Division 05 Section "Structural Steel" for the following:
    a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    b. Hoist beams.
4. Division 05 Section "Metal Fabrications" for the following:
    a. Structural-steel shapes for subsills.
    b. Pit ladders.
5. Division 09 Section “Resilient Tile Flooring” for resilient flooring.
6. Division 26 Sections for electrical service for elevators to and including fused disconnect switches at machine room door and standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.
7. Division 27 Communications Sections.
8. Division 28 Section "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
9. Division 28 Section “Door Access Control” for card reader operation.
10. Division 28 Section “Video Surveillance Systems” for security camera installed at hall call buttons.

1.3 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Repeated operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:

1. Car enclosures and hoistway entrances.
2. Operation, control, and signal systems.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station and standby power operation control panel. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- square Samples of sheet materials; and 4-inch lengths of running trim members.

E. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

F. Qualification Data: For Installer.

G. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

H. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

I. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

J. Warranty: Special warranty specified in this Section.

K. Continuing Maintenance Proposal: Service agreement specified in this Section.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain elevator through one source from a single manufacturer.

1. Provide major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1, elevator design requirements for earthquake loads in ASCE 7, the Connecticut State Building Code, and Chapter 538 of the Connecticut General Statutes.

D. Accessibility Requirements: Comply with ICC/ANSI A117.1 and the 2010 ADA Standards.

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1. Provide entrances with Class B or 60 minute label.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's original protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

## 1.7 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

D. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

E. Include the cost of a licensed elevator operator for all inspections required as it relates to the elevator as well as all other operating systems within the elevator shaft, and coordination of other trades requiring access to elevator shaft and final inspections.

## 1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

## 1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service.

a. Response Time: One hour or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

C. The elevator control system must:

1. Provide in the controller the necessary devices to run the elevator on inspection operation.
2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.

D. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:

1. Remotely diagnose elevator issues with a remote team of experts
2. Remotely return an elevator to service
3. Provide real-time status updates via email
4. Remotely make changes to selected elevator functions including:

a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak / down peak mode, activate independent service
b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s)
c. Improve passenger experience**:** Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Otis Elevator Co.; Hydrofit** or comparable product by one of the following:

1. Schindler Elevator Corp.
2. ThyssenKrupp Elevator.

B. Comparable or Equal Products: Provide comparable or equal product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product; and that meet all regulatory requirements indicated in Performance Requirements Article.

1. If the elevator shaft size or height is required to be altered from that shown for the basis of design product, there shall be no additional cost associated with reconfiguration of the shaft enclosure.

### 2.2 SYSTEMS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.

B. Car Frame and Platform: Welded steel units.

C. Car Guide Rails: Tee-section steel rails with brackets and fasteners.

D. Guide Shoes: Provide sliding guides at top and bottom of car. Provide guide-rail lubricators or polymer-coated, nonlubricated guides.

E. Buffers: Provide adequate buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor, or to continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions as required.

F. Plungers and Cylinders: Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.

G. Power Unit: Self-contained unit consisting of the following:

1. Oil reservoir with tank cover.
2. Oil hydraulic pump.
3. Electric motor.
4. Oil control unit.

H. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide the following:

1. Pump, with fan-cooled squirrel-cage induction motor, mounted under oil tank with vibration isolation mounts. Enclose pump and motor in prime-painted steel enclosure lined with 1-inch- thick, glass-fiber insulation board.
2. Provide manufacturer’s standard motor, in minimum size as required for rated speed indicated.

    a. Electrical: 208 volts, 3 phase, 60 hz.

3. Solid-state Starting: Electronic reduced voltage starter featuring adjustable starting currents.

I. Oil Control Unit: Provide the following components built into a single housing:

1. Relief Valve: Externally adjustable and capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
2. Up start and stop valve: Adjustable and designed to bypass oil flow during start and stop of the motor pump assembly. Valve designed to close slowly, gradually diverting oil to or from the jack unit for smooth up starts and up stops.
3. Check Valve: Designed to close quietly without permitting any perceptible reverse flow.
4. Lowering and Leveling Valve: Adjustable for down start speed, lowering speed, leveling speed, and stopping speed to provide smooth down starts and stops.

J. Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.

K. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide flexible connectors to minimize sound and vibration transmissions from power unit.

L. Hydraulic Fluid: Nontoxic, biodegradable, fire-resistant fluid made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives and approved by elevator manufacturer for use with elevator equipment.

M. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

N. Terminal Limit Switches: Place limit switches in the hoistway near the terminal landings. Limit switches are to cut of the electric current and stop the car if it runs beyond the terminal landing.

O. Automatic Self-Leveling: Provide elevator car with a self-leveling feature to automatically bring the car to the landings within a tolerance of 1/2-inch, and correct for overtravel or undertravel. Self-leveling to be automatic and independent of the operating device. The car is to be maintained approximately level with the landing irrespective of its load.

1. The clearance between the car platform sill and the edge of any hoistway landing shall be no greater than 1-1/4-inch.

P. Failure Protection: Provide an electrical control circuit so if a malfunction of the elevator occurs, including but not limited to motor starter failure, low oil, or the car failing to reach a landing in the up direction within a predetermined time, the elevator car will automatically descend to the lowest terminal or other designated landing.

1. Power operated doors to automatically open when the car reaches that landing. Doors will then automatically close and all control buttons, except the “door open” button in the car station, will become inoperative.

Q. Emergency Terminal Stopping Device: Provide emergency terminal stopping device to operate independently of the normal terminal stopping device if it should fail to slow the car down at the terminal landing as intended.

1. Normal and emergency terminal stopping devices are not to control the same controller switches unless two or more separate and independent switches are furnished, two of which shall be closed in either direction of travel to complete the circuit to the control valve solenoids in the down direction, and to complete the circuit to the pump motor for the up direction travel.

2.3 OPERATION SYSTEMS

A. General: Provide non-proprietary microprocessor operation system as required to provide type of operation system indicated.

1. Mount components in a NEMA 1 enclosure.
2. Logic Control System: Microprocessor based and protected from environmental extremes and excessive vibrations.
3. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

C. Auxiliary Operations:

1. Single-Car Standby-Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.
2. Emergency Power Operation: When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature is included in the elevator contract and does not utilize a building-supplied standby power source.

D. Security features shall not affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at hall push-button stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers.

    a. Security access card reader is specified in Division 28 Section "Electronic Access Control and Intrusion Detection."

2. Programming, operation and location of each Card Readers/Keypads/Door Access Controllers needs to be coordinated between the End-User, Architect, Elevator Contractor and Technology Contractor. The Technology Contractor shall arrange a meeting between these parties, to finalize the programming, operation and location for each of the Card Readers/Keypads/Door Access Controllers/Motion Sensors.
3. Elevator Contractor shall confirm/approve the agreed upon programming, operations and Card Readers/Keypads/Door Access Controllers/Motion Sensors locations to properly interface to the elevator solution being provided.

a. All Card Readers/Keypads/Door Access Controllers/Motion Sensors associated with the interior and exterior elevator cabs, shall be furnished by the Technology Contractor and installed by Elevator Contractor.
b. Travel cabling and other cabling associated with the elevator card readers/Keypads/door controllers/motion sensors, shall be provided by the elevator contractor, with conductors per the technology contractor's requirements.
c. Elevator Contract shall land cabling on the elevator controller and provide programming associated with the agreed upon elevations operations. Elevator cabling for Card Readers/Keypads/Door Access Controllers/Motion Sensors shall be routed to an accessible location for easy access by the technology contractor.
d. Both contractors shall coordinate requirements for proper landing of the cabling.
e. Technology contractor shall interface the elevator cabling to the Card Readers/Keypads/Door Access Controllers/Motion Sensors as required to provide the agreed upon operations.

4. Video Surveillance Cameras, (Refer to Drawings):

a. The final location of the elevator Camera and its associated video jack for each elevator needs to be coordinated between Technology Contractor and Elevator Contractor; the location of video jack shall be per the Elevator Contractor's requirements, but in a location easily accessible by the Technology Contractor.
b. The camera within the elevator cabs and the associated travel cabling to the finalized video jack location shall be provided by the Elevator Contractor; with conductors per the technology contractor's requirements
c. The technology Contractor shall interface this cabling to the applicable video jack location and to the camera on the interior of the elevator cab; then extend the cabling to video surveillance system network.

## 2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with a uniform array of 40 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

1. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound. When the doors are released, the doors shall begin to close at reduced kinetic energy.

## 2.5 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Aluminum Extrusions: ASTM B 221, Alloy 6063.

F. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

## 2.6 CAR ENCLOSURES

A. General: Provide enameled-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
2. Provide finished car including materials and finishes specified below.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:

1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch nominal thickness.
2. Floor Finish: Resilient tile, as specified in Division 09 Section “Resilient Tile Flooring.”
3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E84.

    a. Plastic-laminate color, texture, and pattern as selected by Architect from elevator manufacturer's full range.

4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
9. Metal Ceiling: Flush stainless steel panel with LED perimeter lighting (FC-10).
10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

C. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

D. Fan: A one-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

E. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

F. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

## 2.7 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.

B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet.
2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
3. Sight Guards: Provide sight guards on doors matching door edges.
4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

## 2.8 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

B. Car Control Stations: Provide manufacturer's standard recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.

1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.

    a. Call button for the main entry floor to be designated by a raised star at the left side of the floor designation.
    b. All raised designations for control buttons shall be placed immediately to the left of the button to which they apply.

2. All floor buttons shall be no higher than 48-inches above finish floor. Emergency control buttons to be grouped at the bottom of the panel with their centerlines no less than 35 inches above finish floor.

    a. Buttons: A minimum of 3/4-inch in the smallest dimension, raised or flush.
    b. Provide vandal resistant buttons with LED illuminated center jewel.

3. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Provide system that complies with ASME A17.1, the 2010 ADA Standards, and AAB. On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

1. Identify emergency communication system with a raised symbol and characters located adjacent to the device.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.
2. Numerals: A minimum of 1/2-inch high and illuminated on a contrasting background.
3. Audible signal: No less than 20 decibels with a frequency no higher than 1500 Hz.

E. Hall Push-Button Stations: Provide hall push-button stations at each landing.

1. Provide manufacturer's standard wall-mounted units.

    a. Mount buttons at 42 inches above finish floor to center.
    b. Buttons: A minimum of 3/4-inch in the smallest dimension, raised or flush, with button designating up direction on the top.
    c. Provide vandal resistant buttons with LED illuminated center jewel.

2. Provide units with flat faceplate for mounting with body of unit recessed in wall.
3. Equip units with buttons for calling elevator and for indicating desired direction of travel.
4. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, mounted at 72 inches minimum to centerline of unit.
2. Visible signals: At least 2-1/2-inches in the smallest dimension, visible from the vicinity of the hall call buttons.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

H. Door Jamb Markings: At each hoistway entrance, provide raised and Braille floor designation characters on each jamb. Install baseline of characters at 48 inches minimum above finish floor.

1. Characters: A minimum of 2-inches high, on a contrasting background.

2. Provide a tactile star on both jambs at the main entry level.

I. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.

## 2.9 ELEVATOR

A. Elevator Description:

1. Type: Holeless, beside-the-car, telescoping.
2. Machine Location: Inside hoistway at front.
3. Rated Load: 2,500 lb.
4. Rated Speed: 125 fpm minimum, or manufacturer's standard speed.
5. Stops: Two stops, one at front, one at rear.
6. Operation System: Selective collective automatic operation.
7. Auxiliary Operations:

    a. Standby-power operation (generator).
    b. Automatic operation of lights and ventilation fans.

8. Security Features: Card-reader operation.
9. Car Enclosures:

    a. Clear Inside Width: 6'-5-9/16" from side wall to side wall.
    b. Clear Inside Depth: 4'-3-9/16" from back wall to front wall.
    c. Inside Height: 7'-9" inches to underside of ceiling, or Manufacturer's standard.
    d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
    e. Car Fixtures: Satin stainless steel, No. 4 finish.
    f. Side and Rear Wall Panels: Plastic laminate.
    g. Reveals: Satin stainless steel, No. 4 finish.
    h. Door Faces (Interior): Stainless steel.
    i. Door Sills: Aluminum, mill finish.
    j. Ceiling: Satin stainless steel, No. 4 finish.
    k. Handrails: Flat bar (DH-155), satin stainless steel, No. 4 finish, at sides of car.
    l. Floor prepared to receive resilient tile (specified in Division 09 Section "Resilient Tile Flooring").

10. Power Supply: 408V, three phase, 60 Hz.
11. Hoistway Entrances: As follows:

    a. Width: 42 inches.
    b. Height: 84 inches.
    c. Type: Single slide side opening.
    d. Fire-Protection Rating: 1-1/2 hours.
    e. Frames: Satin stainless steel, No. 4 finish.

f. Doors: Satin stainless steel, No. 4 finish.
g. Sills: Aluminum, mill finish.

12. Hall Fixtures: Satin stainless steel, No. 4 finish.
13. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
b. Provide blanket buttons and one complete set of full-height protective blankets.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

B. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.

C. Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent-cemented fittings.

D. Lubricate operating parts of systems as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

## 3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Advise Owner, Construction Manager, Architect and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

## 3.4 PROTECTION

A. Temporary Use: The elevator may not be used for construction purposes.

## 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator. Refer to Division 01 Section "Demonstration and Training."

B. Check operation of elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION 14 24 00

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