

Overview

The Newington Town Hall roofs consist of three types of roofing systems. Asphalt architectural shingles are on the steep slopes. A multi-ply asphalt built-up membrane with a gravel coating is on the flat roof decks of the original construction as well as the earlier additions. There is also an EPDM rubber roof with a ¼ inch per foot slope on the newest addition. The asphalt shingles and the multi-ply asphalt roofs appear to be a minimum of 15 years old.



Multi-ply asphalt built-up membranes with gravel coating on flat roof deck

Asphalt architectural shingle roof on steep sloped decks



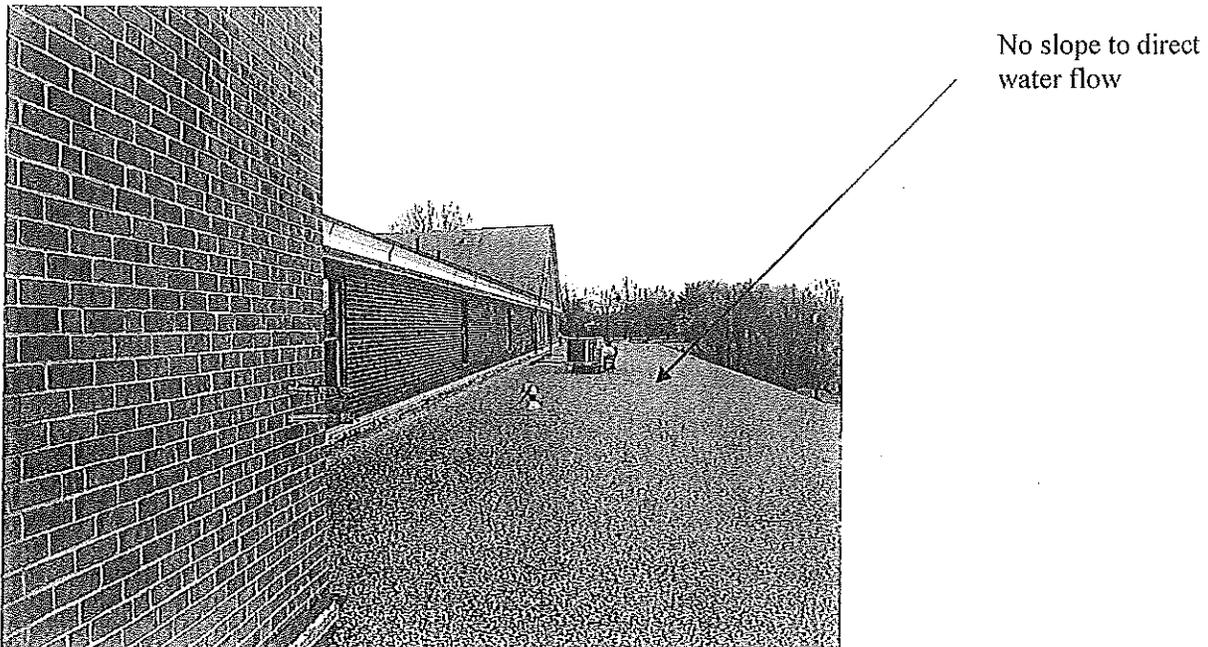
EPDM rubber roof membrane on 1/4 inch per foot slope on New Addition

Asphalt architectural shingles on steep slopes

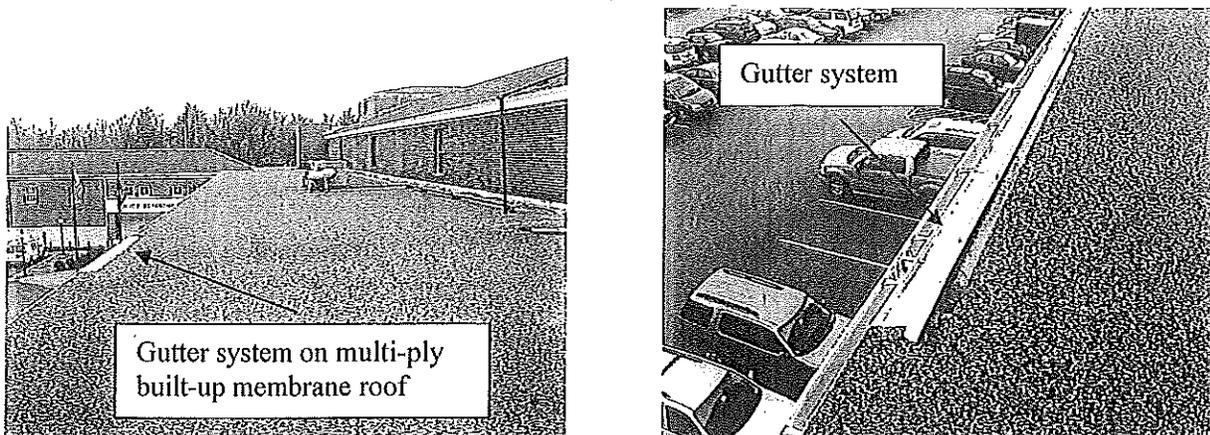
**The multi-ply asphalt built-up membrane with gravel roof**

The multi-ply asphalt built-up membrane roofs have reached the end of their life expectancy; many areas were observed where water has infiltrated into the roofing assembly, indicated by the soft and spongy reaction to foot traffic when walking across the roof surfaces. Although the leaks may not be evident in the interior spaces these water saturated areas nullify the R-value of the insulation beneath the roof membrane and create breeding grounds for mold and mildew.

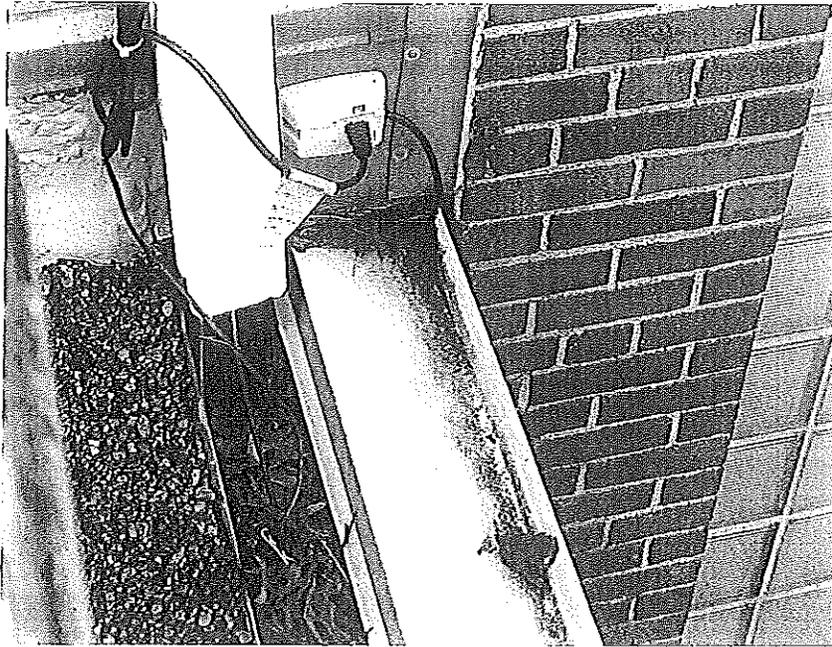
The multi-ply asphalt built-up membrane roofs on the original construction were installed on roof decks that are totally flat with no slopes to direct water flow.



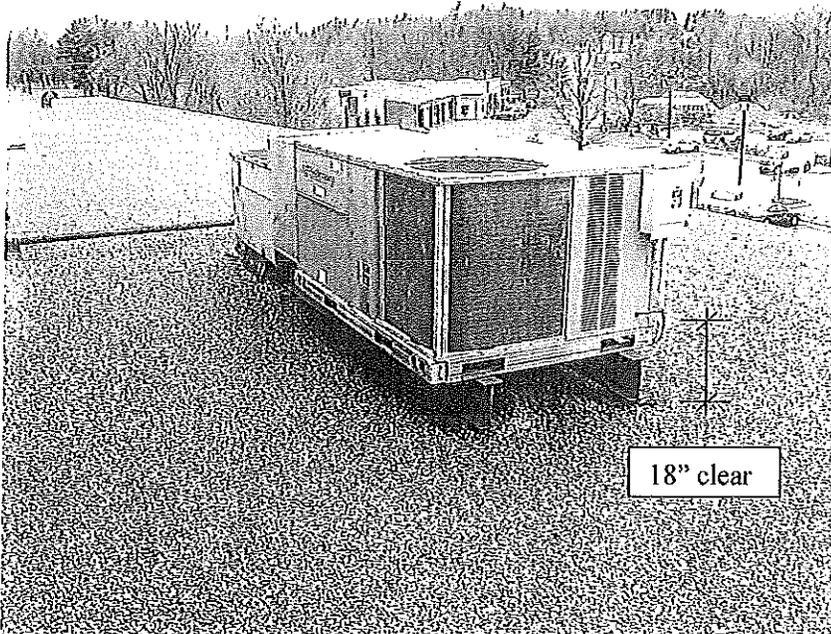
The roofs on the original building have no drains. They rely exclusively on a system of perimeter gutters and downspouts which appear undersized and incorrectly proportioned to handle the volume of water coming off the roof surface.



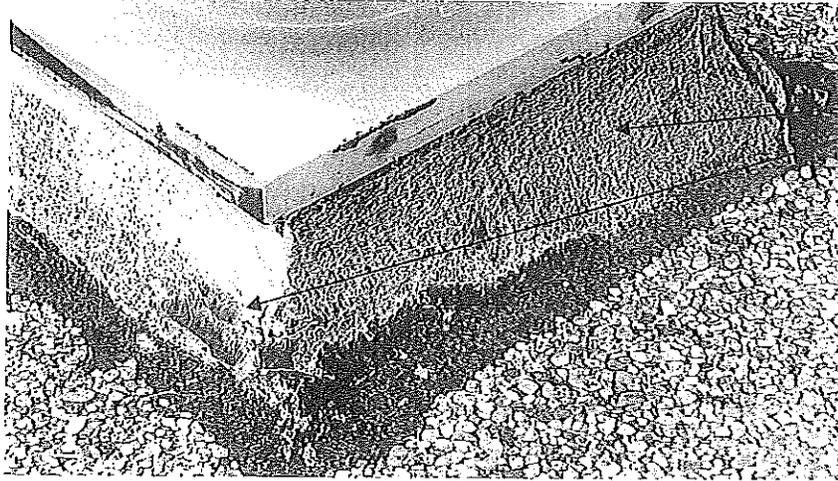
The gutters typically fill with leaves and gravel which is washed from the roofing surface blocking the gutters and reducing their capacity.



The steel dunnage which supports the roof top mechanical equipment were installed too low to the roof surfaces to allow sufficient height for roof repairs that might be required beneath the unit. The roofing industry recommends a minimum of 18 inches clear between the bottom of steel and the roof surface.

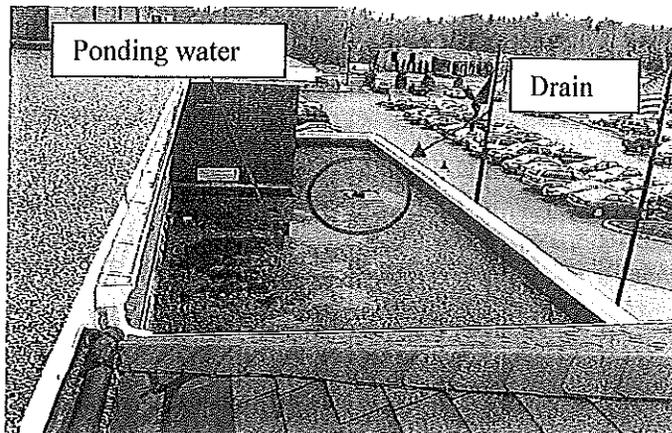
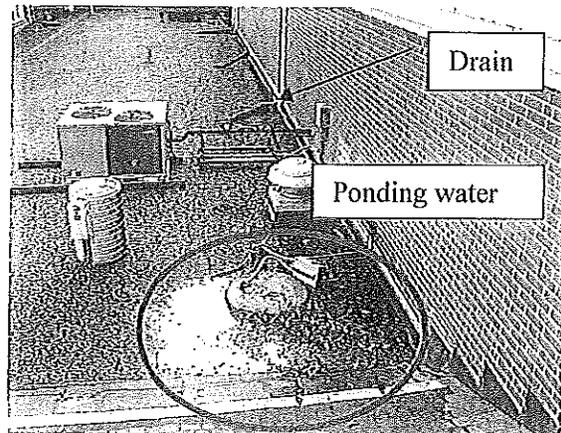
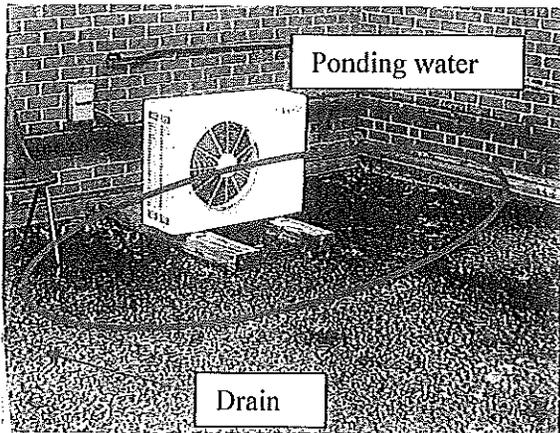


The membrane flashings around the mechanical equipment curbs are deteriorated and have lost their protective asphalt coating exposing the fiber reinforcement scrim which wicks water into the system.



Exposed reinforcing scrim on the membrane flashing

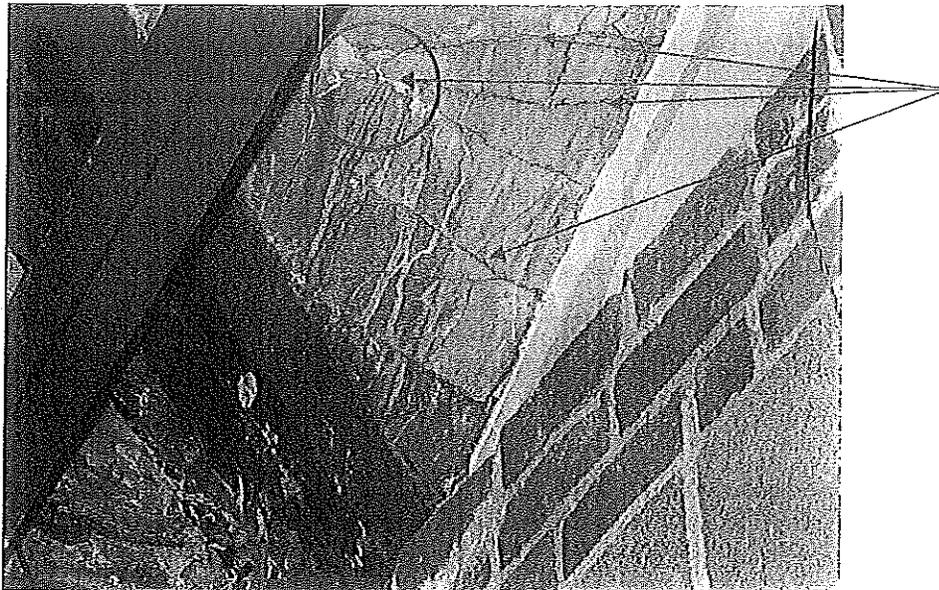
The multi-ply asphalt built-up membranes on the 1970's addition have drains, however, the roofs are not sloped to the drains and consequently many areas have ponding water which deteriorates the seams and allows water to enter the roofing system.



**Architectural asphalt shingle**

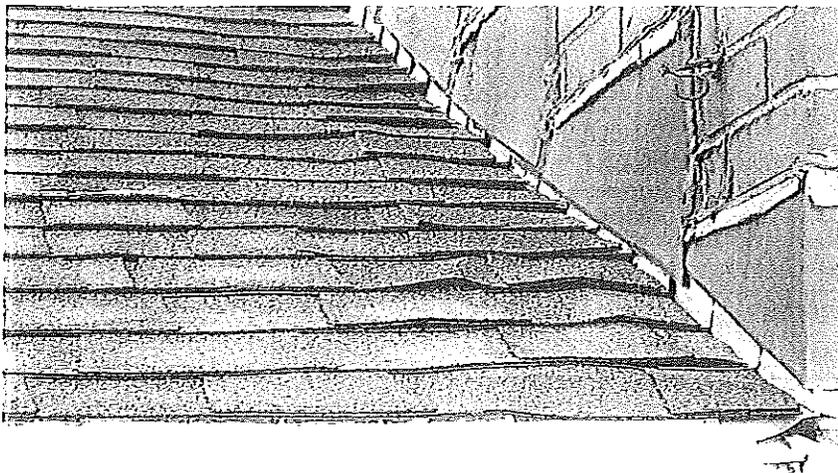
Architectural asphalt shingles typically provide good weather tight protection for a minimum of 25 years, however, due to the history of leaks at this facility it appears that this installation is failing before the end of its expected life span.

An investigation in the attic space indicated that the shingles were nailed directly to a masonry board which is not an acceptable nailable substrate. The masonry boards do not provide sufficient pull out resistance in the case of a high wind event, in addition, the masonry boards are fragile and the roofing nails have produced cracks that radiate out from the point of penetration. Prior to installing the shingles, plywood sheathing should have been installed in order to properly secure the shingles to an acceptable substrate.



Roofing nails are popping through masonry board and causing it to crack

The shingles are not secured tightly to the deck due to the poor pull out resistance of the substrate causing leaks to occur because the shingles are lifting and curling.

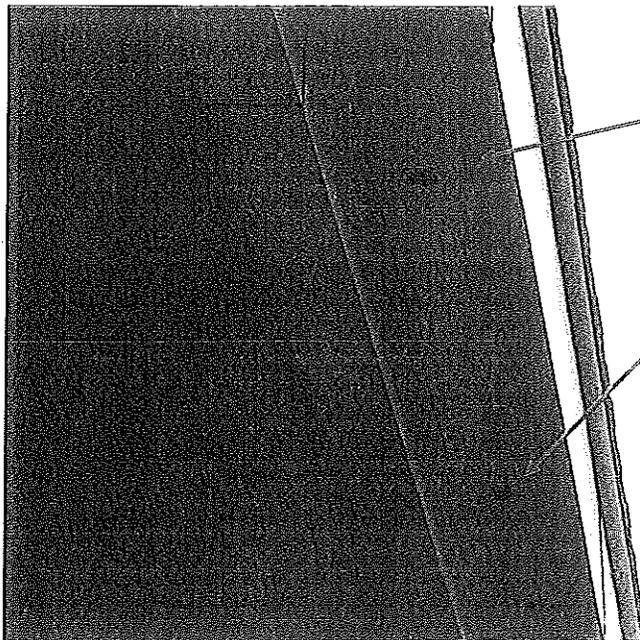


No factory recommended ridge vents were observed. Ridge vents are typically specified to help to prolong the life span of a shingle roof installation by preventing excessive heat in the attic space that causes the shingles to dry out and deteriorate. In addition, soffit vents which help create a fresh air flow into the attic space are inadequate or nonexistent contributing to the accelerated aged condition of the shingles.



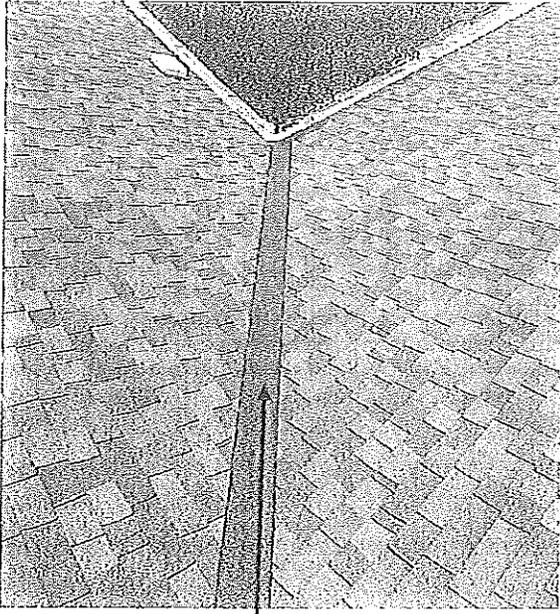
No Ridge Vent

Shingles are loose and curling

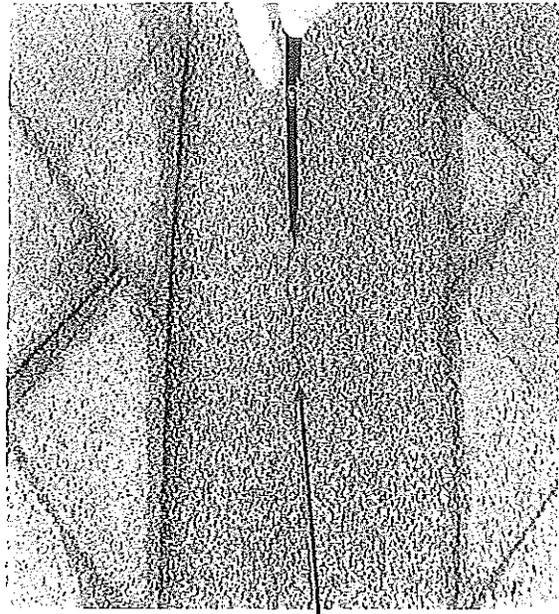


Insufficient soffit vents

The valleys of the converging roof planes were not flashed with copper, but with a granulated membrane which is not an acceptable material for valley flashing. The protective granules that reflect the damaging UV rays have been washed away by the volume of water that runs down the valleys causing the membrane to become dried and cracked allowing water to enter the facility.



Granulated membrane is not acceptable material for valley flashing.



Valley flashing is split open

The asphalt shingles over the old entrance to the police department are dried cracked and extremely deteriorated.



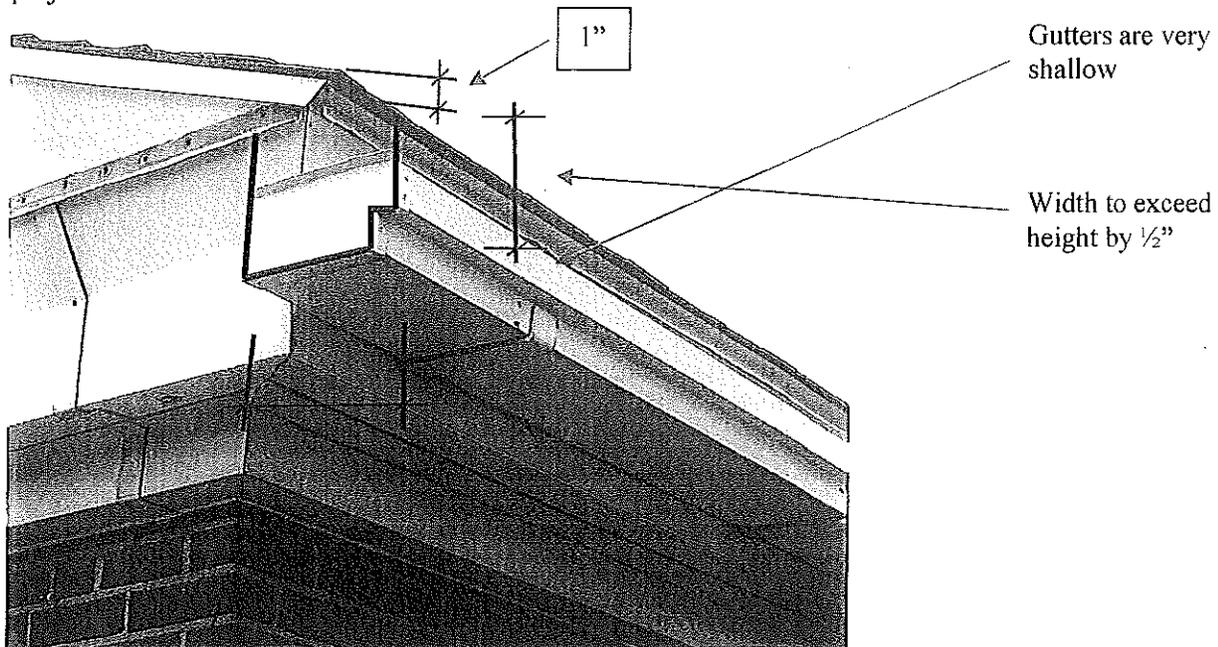
**The EPDM roof on the new addition**

The EPDM roof on the new addition contains a ¼ inch slope to the drains, consequently no ponding water was observed and the membrane appears to be in excellent condition although the furniture should be removed in order to avoid as much foot traffic on the roof as possible.

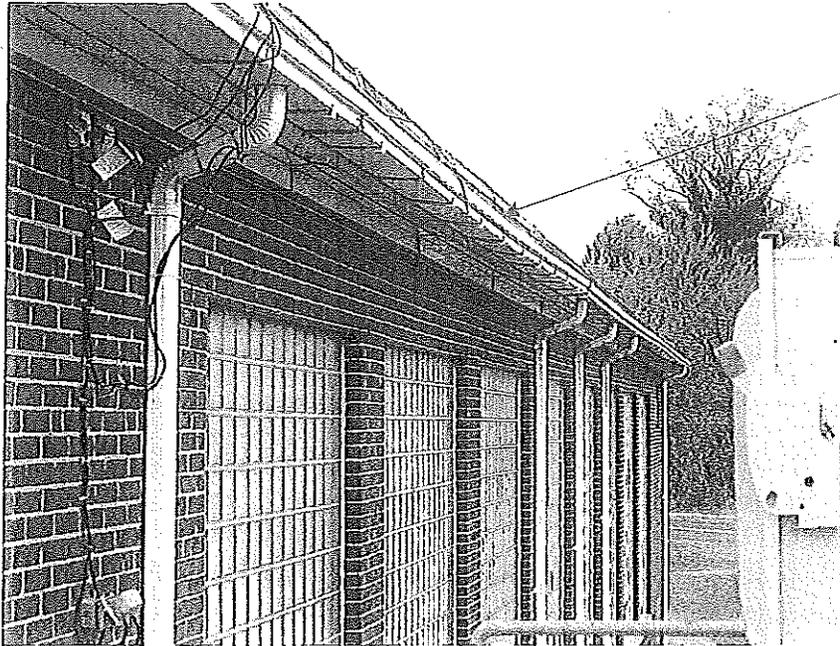


**Gutters and downspouts**

As previously mentioned the proportions of the gutters are not to industry standards. The national sheet metal association (SMACNA) recommends that the width of the gutter exceed the height by only ½", in addition, it also recommends that the top outside edge of the gutter should be installed 1 inch below the projection of the roof line

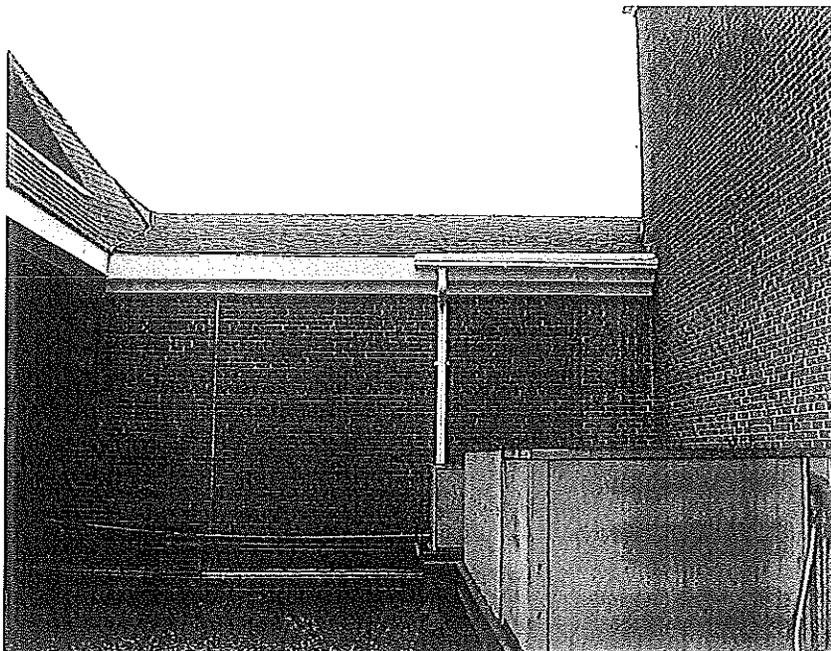


The gutters should slope toward the downspouts which should be the low points. It was observed that in some locations the gutter installation does not slope towards the downspouts, and in reality the gutter slope away from the downspouts locations.



Low point occurs in the middle of the section between downspouts

At one location only a partial gutter was installed where the gutters should extend along the entire roof edge. At other locations no gutters were installed, at the bottom of one valley the water shoots out about 4 feet onto the built-up roof below, where 6 concrete pavers were placed to protect the membrane.

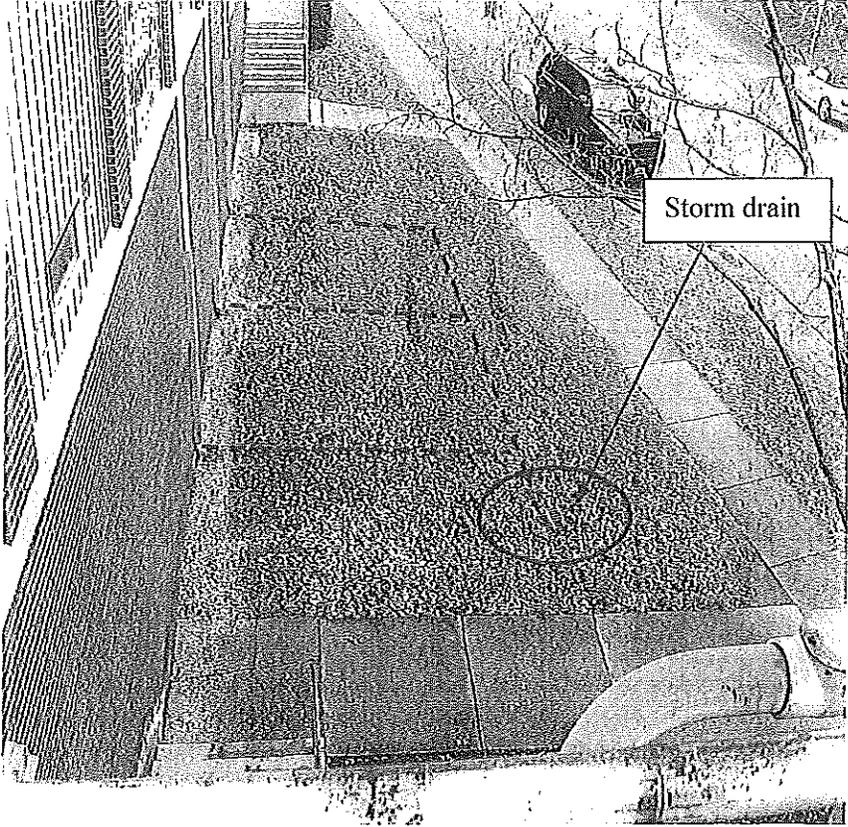




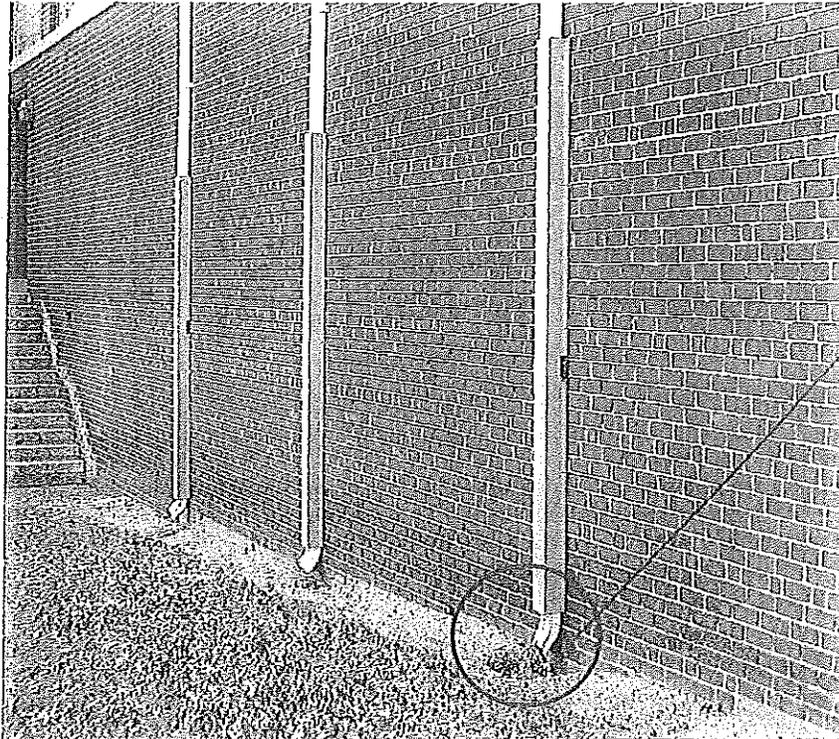
Path of water onto roof below

Pavers provide the protection for lower roof

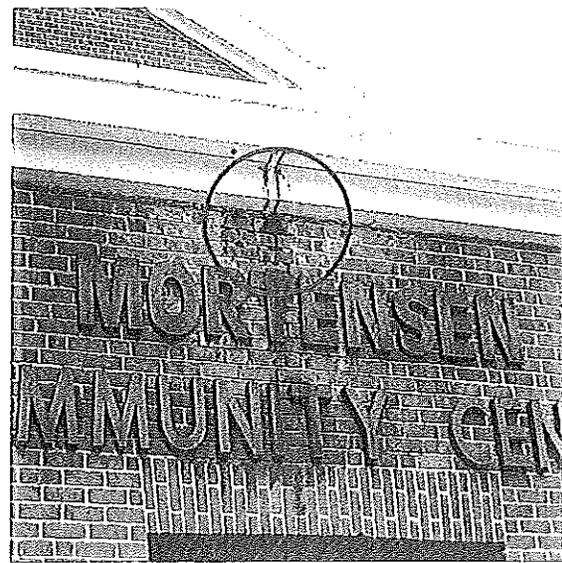
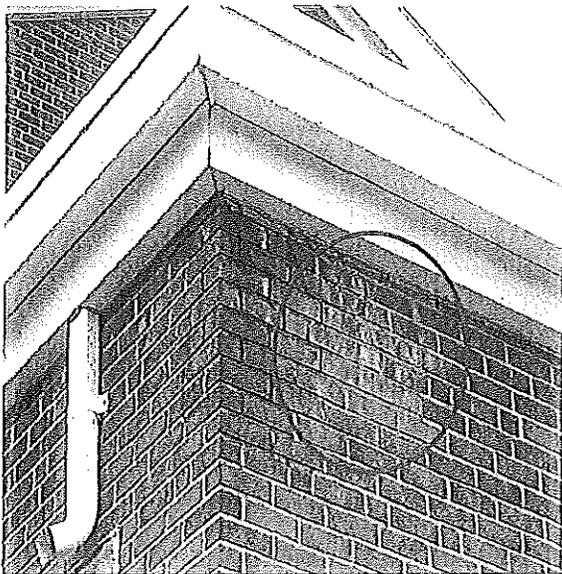
Many downspouts spill out onto the ground instead of being piped to the storm drain system, eroding the earth and creating areas of ponding water against the foundation walls.



Storm drain



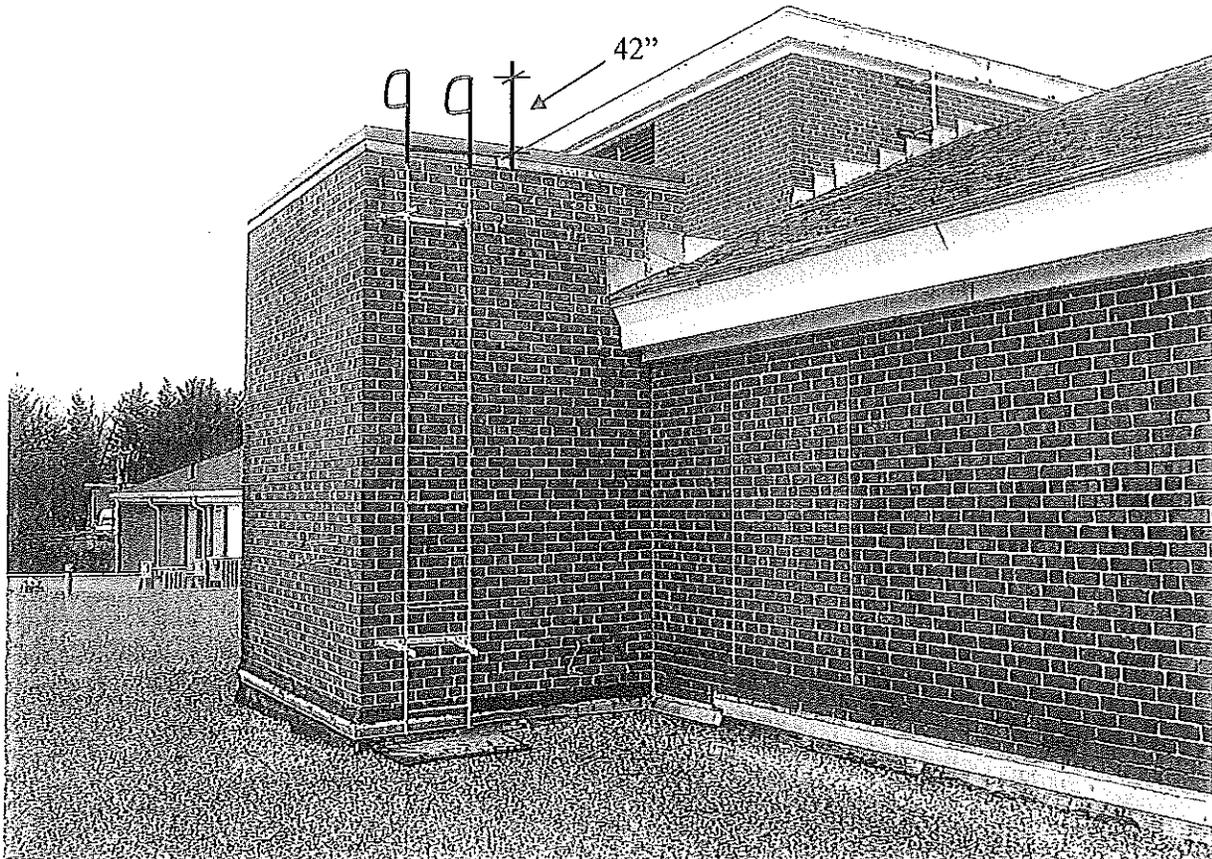
Erosion at bottom of  
downspout



The gutters are leaking at several locations

Miscellaneous

There is no easy safe access to the different roof levels and the only roof access ladder on the facility does not extend up above the top of the roofline 42 inches per OSHA guidelines. The lack of an easy access to the various roof levels discourages any regular visits for routine inspection and maintenance which in the long term would reduce the number of expensive repairs.



Recommendations:

Built up roofs

The existing multi-ply built-up asphalt roofs have reached the end of their expected life cycle. The roofs must be removed down to the decks and replaced with a new 20 year warranty single-ply membrane system with a 1/4 inch tapered insulation layout to improve water management and eliminate the ponding water. Where possible additional drains should be provided and at other locations where new drains are not possible because of existing conditions, a better designed gutter system should be installed to increase the capacity and efficiency of the roof drainage system drainage. In addition the height of the steel dunnage supporting the roof top equipment should be raised to a minimum height of 18 inches clear above the roof line to allow for inspection of seams and roof repairs.

### Asphalt Shingle Roofs

The shingle roofs were not installed on an acceptable nailable substrate nor were they vented adequately, consequently the shingles leak as they move, lift and curl on the surface of the roof. The only solution to this problem is to remove the shingles down to deck and install an acceptable prefabricated, vented, nailable substrate designed for this purpose before installing a new architectural asphalt shingle roof assembly. The new design must include zinc coated copper valley flashings and proper ventilation at the eaves and ridges to insure the longevity of the new shingle roof. The project should also include a new system of gutters and downspouts sized to meet the roof's requirements.

### Miscellaneous

Install a ships ladder and hatch to provide easy access to the roof level as well as additional ladders to provide access to each individual roof surface.

Connect where possible all the downspouts to the existing storm drain system.

### Solar Voltaic Roof Panels

The Connecticut Clean Air Fund offers a unique opportunity for reimbursement of up to 50% of the cost for the installation of photovoltaic solar roof panels. The town hall facility combines both steep slope and flat roofs. Recent developments in the solar panel industry have now made it possible for them to offer solutions for both construction types. However, these systems are expensive and without other grants or reimbursements to offset initial installation costs it will take at least 15 years of energy saving to recover the costs for the system. If the Town of Newington is interested in more information on the costs, state grants and payback for a Photovoltaic system KBA would be interested in providing the preliminary study.