

# **Balcony Flood Testing Investigation Report**

For  
25 Sigourney Street  
Hartford, CT 06106  
DPW Project Number B1-2B-033L

Prepared For  
STATE OF CONNECTICUT  
Department of Public Works

April 13, 2009



Prepared by:

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## **EXECUTIVE SUMMARY**

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At the request of Connecticut Department of Public Works, Silver Petrucelli & Associates, Architects and Engineers was retained to conduct flood testing at 25 Sigourney Street Hartford, Connecticut. Flood testing of the 19<sup>th</sup> floor south west corner balcony was conducted by Silver Petrucelli & Associates, Architects and Engineers as well as members of Servus Management Corporation, on April 10<sup>th</sup>, 2009, to evaluate and determine the cause of repeated leaks in the 18<sup>th</sup> floor office below the balcony on the 19<sup>th</sup> floor. Observations were made by a team from Silver Petrucelli & Associates, Architects and Engineers during the flood testing. The team was able to recreate storm like scenarios that produced water infiltration into the office on the 18<sup>th</sup> floor. During the testing the team was able to pinpoint 2 problem areas and deficiencies in the parapet wall construction that were found to be the cause of the persistent water infiltration into the offices below. The team found deficiencies in both the exterior wall construction as well as the interior wall of the parapet construction. The following report will explain in detail the steps the team took to reproduce each leak, as well as corrective actions that needs to be taken in order to remedy the problems.

Silver Petrucelli & Associates, Architects and Engineers recommend three solutions to remedy the water infiltration:

- An immediate and temporary step is to install a tarp on the interior parapet wall leak, at the bend in the wall, from the crest of the coping stone down to the reglet above the deck roof. This should temporarily stop the interior parapet wall leak.
- The first permanent step is to remove several courses of brick above the window head at the corner where water is leaking and replace or repair the faulty fabric flashing behind the brick.
- The second step would be to remove several courses of brick above the reglet on the interior wall of the parapet above the corner that is leaking and replace or repair the thru-wall fabric flashing that is causing this singular leak.
- After all steps are completed, flood testing should be performed by the masonry contractor to prove that these specific leaks have been resolved.

## OBSERVATIONS DURING FLOOD TESTING

On April 10<sup>th</sup>, 2009 a team from Silver Petrucelli & Associates, Architects and Engineers as well as members of Servus Management Corporation, conducted flood testing of the balcony on the 19<sup>th</sup> floor south west corner of the office building located at 25 Sigourney Street, Hartford, Connecticut. Persistent leaks in the office located below this balcony on the 18<sup>th</sup> floor led the team to believe that there were deficiencies in the installation of the roofing membrane located below stone pavers on the 19<sup>th</sup> floor balcony, or perhaps flashing flaws in the parapet wall. In order to prove this theory, the balcony floor needed to be flood tested in a controlled manner in hopes of recreating the leaks usually observed during heavy rain storms. The stone pavers were removed by members of Servus Management Corporation, exposing the rubber roofing membrane below. The roof drain on the balcony was then plugged and the roof was flooded. Water was slowly added to the roof, flooding the membrane moving slowly outward from the centralized drain. Members of the team were observing the water on the roof in order to notice any air bubbles or deficiencies in the membrane. Other members observed from the office below to see if water was penetrating into the office in the manner commonly seen during or immediately after heavy rainstorms. Water was added to the roof for about one hour until the entire surface of the membrane was covered with water. There was approximately four inches of water at the roof drain and a half inch of water at the areas of the roof farthest from the drain, proving that the balcony had sufficient amount of pitch to mitigate ponding water during large storms. No water was observed leaking into the office below after the whole roof was flooded. All aspects of the roof membrane: flashings, counter flashings, roof drain and internal piping performed well and as they should. At this time we concluded that our original theory of there being punctures or deficiencies in the roofing system was disproved.



Condition of Roof Membrane



Flooding the Roof Membrane



Flooding the Roof Membrane

Determined to find the cause for the water infiltration we once again looked towards the next level of construction above the deck membrane, i.e. the masonry parapet walls surrounding the balcony. In the past we had found problems with the exterior masonry at the window head flashing but we had not tested the interior masonry wall. Methodically this was the best place to start. The team began by soaking the lower three courses of brick in the corner of the parapet wall located directly above the office area where water had been observed in the past. Water was sprayed directly onto the corner about two feet on each side of the corner for about 20 minutes. No leaks were observed, so we increased our spray to five feet on each side of the corner, again soaking only the lower three courses of brick. Again no leaks were observed so we increased our spray area to the whole back side of the parapet wall, remaining below the cheney flashing of the concrete parapet wall cap (Servus staff had 'tarped' the copings during preceding months proving that the copings and cheney flashing were not the source of the infiltration. Water was applied for another 30 minutes with still no leaks observed. At this time the wall had been soaked long enough that no more water was applied and our results at this time were inconclusive.

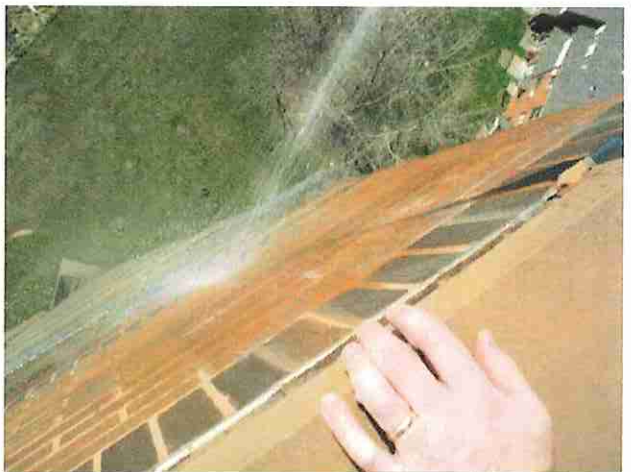


Searching for Leaks above Reglet



Soaking the Interior Parapet Wall

Our next step was to retest the exterior masonry to determine if we could find leaks that had been overlooked during our last round of testing and treating of the wall. We began soaking the wall at the same troubled corner, but this time on the exterior side of the wall. We started applying water about a foot on each side of the corner starting at the metal flashing (only) above the window and then slowly progressing up the brick faces. After only about ten minutes of soaking the wall we observed water beginning to soak the back of the sealant backer rod above the window flashing on the interior of the building. The water was soaking through the brick dripping down the back of the brick and then instead of flowing back out through the weep holes it was flowing back into the building and leaking into



Soaking the Exterior Wall above Window

the office at its traditional drip. We believe that the water leaks at the corner because the steel and flashing at the corner is cut and not connected to each other. There is also no metal 'turn up' at the back of the flashing, which is the last line of defense for this type of water infiltration. However water should never make it this far into the cavity unless there are penetrations through the fabric flashing membrane located above the metal flashing and steel.

While observing this leak water began to drip off the back side of the concrete beam in the ceiling cavity. This concrete beam is not connected to the exterior face of the masonry because there is a one inch cavity between the two masonry wythes. There is no possible way for water that we were applying to the exterior to ever 'jump the gap' and drip in this manner. Therefore we determined that we had a second leak which was occurring due to the earlier soaking of the interior wall. It is logical that it took about an hour after flooding for the water to penetrate the entire wall and begin leaking on the interior as masonry is intended to absorb limited amounts of water and to pass excess water thru to the interior fabric flashing before draining to weeps at the reglets. This proved to be a second leak and the explanation why some of the staff had witnessed leaks continuing long after heavy rainstorms had stopped. Nathan Cyr of Servus Management Corporation observed this leak with us and said that when he examines leaks in these rooms that this was the drip location and manner in which he most commonly observed water infiltration. We now had located two different types of leaks.

With the second leak coming from the interior side of the parapet wall, we needed to pinpoint which part of the wall construction was causing the leak. We began to reapply water to the interior side of the parapet wall. Because the wall was already saturated from our earlier flooding, the flow of the leak was observed quicker than before. We noticed that the drip on the inside was at a steady pace of one drip every



Water Soaking through Backer Rod and Pooling above Window

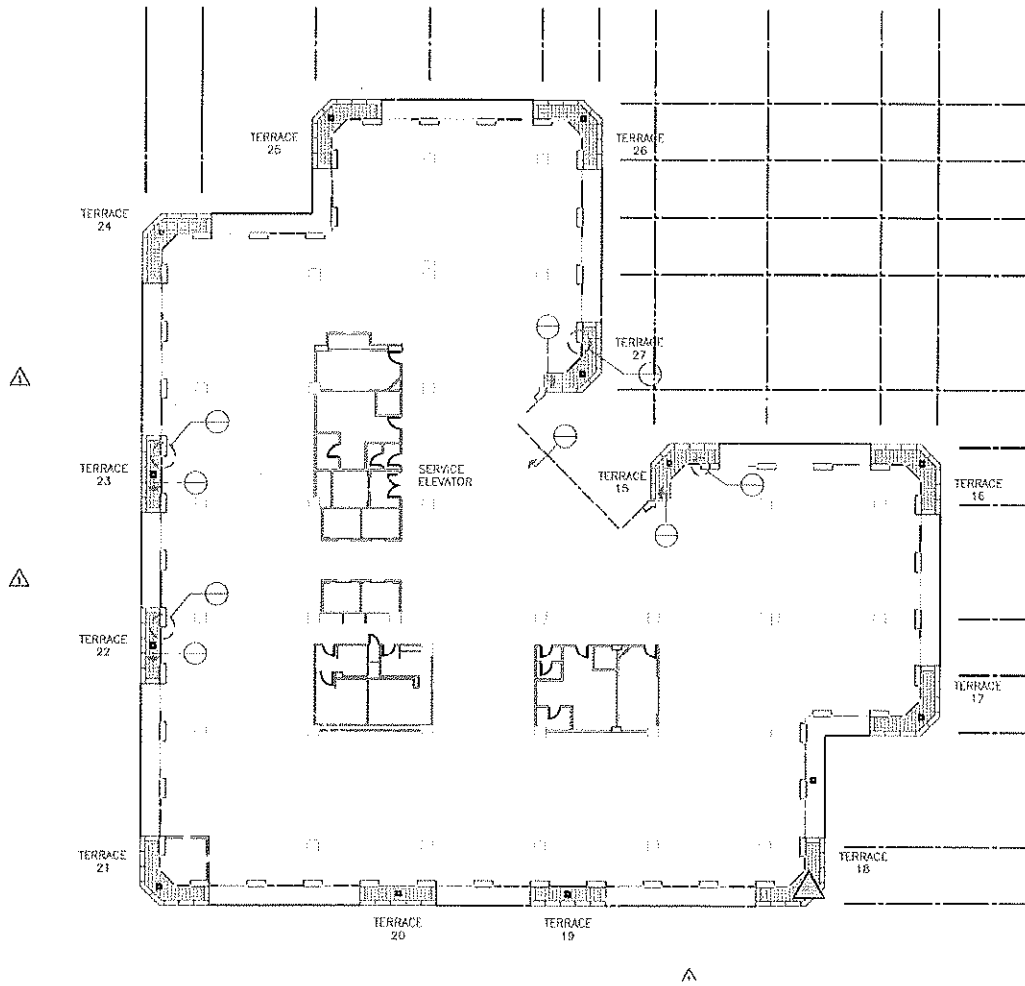


Discontinuous Steel Angle @ Corner  
(Area where the exterior water infiltrates)



27 seconds. We then began soaking just the reglet which is the small continuous piece of metal that secures the roofing membrane to the parapet wall. While concentrating all the water at the reglet, the dripping slowed to 41 seconds between drops. This proved that the reglet was not the problem. We next concentrated our water directly on the masonry mortar in one specific brick/mortar joint location right at the corner of the parapet located directly above the leak. Within minutes the dripping increased to 10 seconds between drips. We concluded from this that water is soaking through the brick like it is designed to do, but then when it reaches the interior fabric flashing, (which is designed to direct water from the cavity out to the weep wholes on the exterior side of the wall), it is penetrating through the fabric and leaking down the back of the concrete beam and into the office below. There was now enough evidence of how the water was entering the building and there are several ways to remedy the problems.

# LOCATION OF FLOOD TESTING



NINETEENTH FLOOR PLAN

△ - Flood Tested April 10th 2009

## **RECOMMENDATIONS**

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It is our recommendation that problems in the fabric flashing located at the corner of the window just above the window head in the office on the 18<sup>th</sup> floor be examined by the installing contractor and a professional. In order to do this the soldier course and a minimum of two brick courses above that should be removed around the corner where water is penetrating the building. Once the bricks have been removed the fabric flashing underneath can be examined thoroughly for tears or penetrations. The fabric flashing needs to either be patched and repaired or completely replaced. Once the fabric is replaced the bricks can be set back into place and after a few days the walls should be flood tested to see if the problem has been solved. The exterior wall leak should be solved with this solution but the separate leak on the interior will still persist.

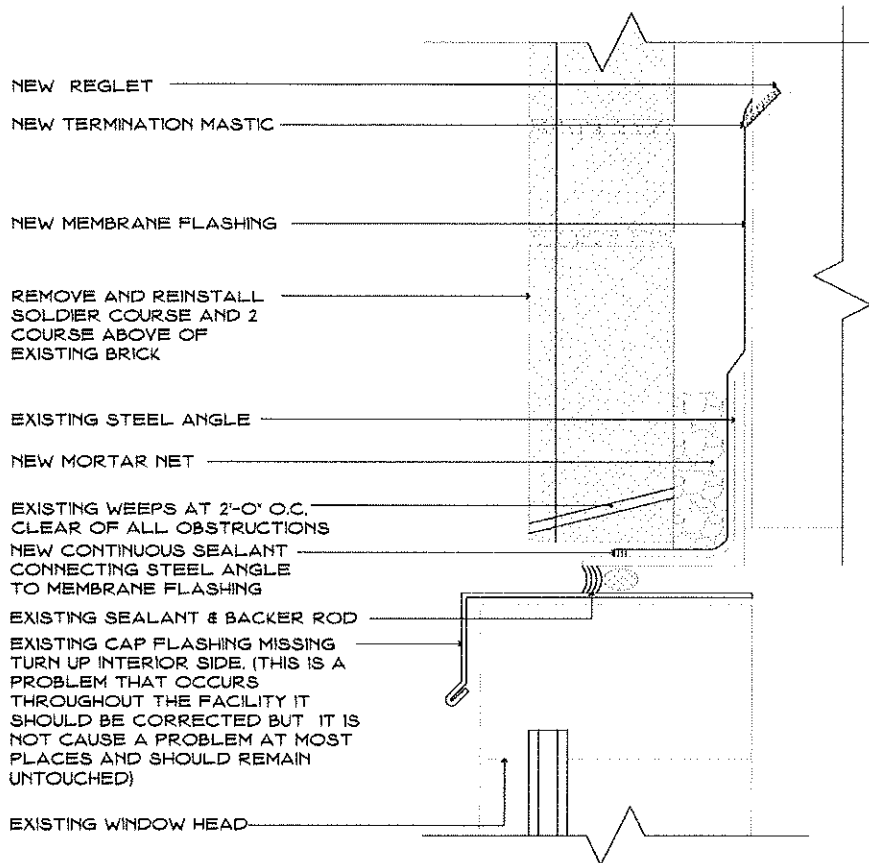
In this is the case the three courses of brick above the reglet on the interior side of the parapet wall about a foot on each side of the leaking corner should be removed and the fabric flashing in this location should also be observed, repaired or replaced. The brick should than be set back into place with new weep holes and again the walls be flood tested. This should correct the leaks at this particular window.

It is our opinion that the other leak locations around the building are likely occurring in the same manner. Once this solution has been determined to be successful it should be repeated at the one other location currently reported as an active leak.

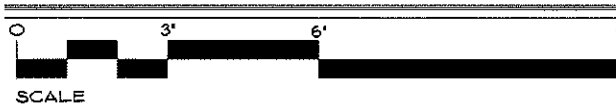
Until these proper steps can be taken to permanently fix the leaks there is a rather simple temporary solution that can be performed by the Servus Management to slow the amount of water infiltrating the building. A simple tarp can be taped to the interior wall of the parapet at least one foot on each side of the corner that is reported leaking spanning from the high point of the coping stones to the top of the roofing reglet. This should temporarily impede water from soaking through the wall.



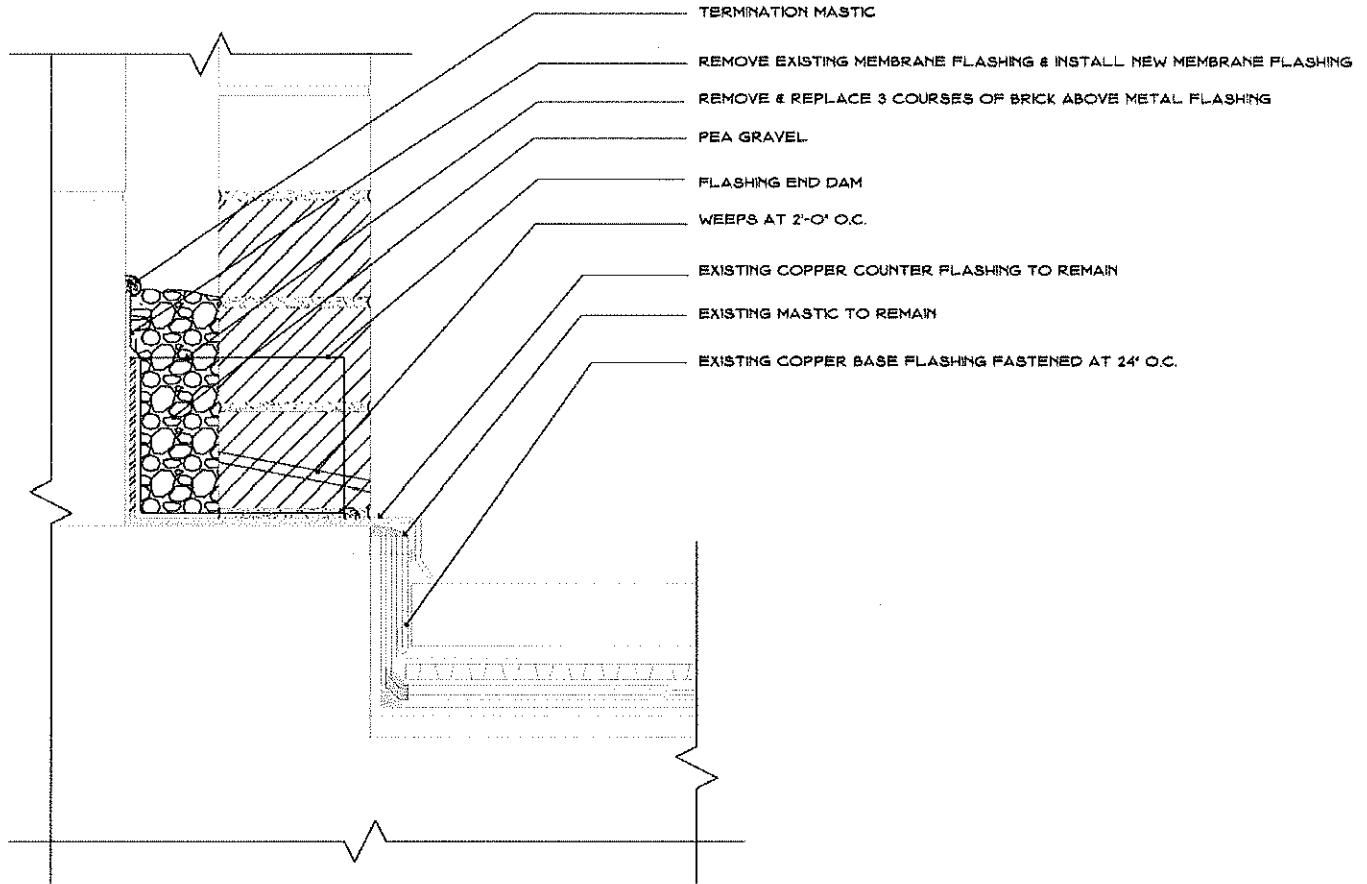
**DETAILS OF RECOMMENDATIONS**



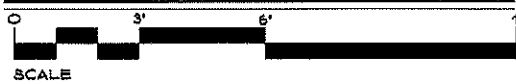
**FLASHING DETAIL**



Flashing Detail for First Step Recommendations



## FLASHING DETAIL



Flashing Detail for Second Step Recommendations