WJE

PRIMER

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Frost Patterns—Survey Aid

Nobody likes to get up early on a cold, frosty winter day to start a building survey. Nobody except a roof consultant, that is! Frost patterns on a low-slope roof can be a no-cost boon to our investigations and understanding of existing conditions.[1]

Environmental conditions can help illustrate roof problems during investigations.

Test openings the previous afternoon at a roof located in upstate New York had revealed warped insulation panels, condensation on the underside of the insulation panels, corroded insulation fasteners, and air movement at the concrete roof deck/insulated metal wall panel interface.

As you might imagine, it is hard to photograph the movement of air. Frost brought these and other conditions to life in a dramatic way and helped illustrate the magnitude of the problem.

Overall view of the roof on a typical afternoon

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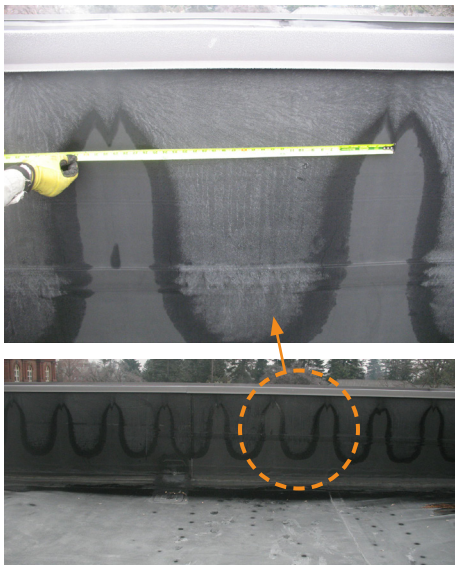
Frost Patterns (CONTINUED)

Corroded fastener plate

Single layer of polyisocyanurate insulation. The insulation warped as a result of condensation on its underside and fastener corrosion. The source of the moisture was interior air.



Frost patterns on the EPDM clad parapet walls formed a perfect sine wave. The distance between the peaks of the nonfrosted areas matched the width of the insulated metal wall panels exactly, confirming our earlier observation of air movement from the interior into the roof system, but also vividly showing the degree of heat loss through the joints between panels.

The dark round circles in this photo indicated the insulation's fastener pattern. The fastener plates are frost-free due to thermal bridging. It is estimated that thermal bridging of fasteners reduces the R-value of insulation by eight to ten percent.

To help prevent the problems illustrated from recurring, several remedies were specified in the bid documents for roof replacement, including drying out of the concrete roof decks; installation of a continuous air/vapor retarder membrane at roof/wall interfaces and parapet walls; and installation of two layers of polyiso insulation plus a cover board, with the first layer of insulation mechanically fastened and the second layer of insulation and cover board adhered using spray foam adhesive. In addition, joints between the layers of insulation and cover board were staggered to further mitigate air movement and heat loss.

[1] Other good times to survey a roof are in the middle of a downpour and immediately after a rain event as roof surfaces begin to dry, but we'll leave these for another primer.

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