TITLE: Importance of Removal and Replacement of Roof Substrate Materials Damaged by Entrapped Moisture or Moisture Intrusion During New Roof Installation

DESIGNATION: RCI-TA-013-2017

OBJECTIVE: To provide an industry statement regarding the removal and replacement of roof substrate materials damaged by moisture and discovered at the time of new roof installation.

A. BACKGROUND

Roof insulation or substrate materials damaged by moisture have been the source of many roof system problems that include, but are not limited to:

- Corrosion of metal-based structural roof decks, fasteners, and similar components,
- Decay of wood decking or nailers,
- Loss of thermal value,
- Variation in dimensional uniformity of substrate products,
- Premature deterioration of the roof membrane, and
- Degradation of adhesives.

Roof insulation products (including facers) that retain moisture have been identified as the primary target of this moisture damage. Sources of the moisture include leakage through the membrane, water vapor exposure caused by interior air or vapor migration, and moisture release from other interior assembly materials. Migrating water vapor that cannot return to the environment or be controlled by mechanical methods may cause excessive moisture exposure to the roof assembly similar to water leakage. Air infiltration may transport moisture into the roof assembly. Certain roof substrate materials exposed to this moisture may release chemicals that accelerate corrosion of metal decks, fasteners, fastener plates, and other similar attachment components. Additionally, the moisture can maintain a wet surface at interfaces between insulation facers and adhesives.

Numerous roofs under construction experience leaks and moisture damage prior to completion of construction or within the first few years of service. Foregoing corrective action addressing removal of damaged substrate materials often results in deteriorated materials, delamination of components at adhesive layers, and subsequent corroded metal components or decayed wood components.

A literature search performed by the RCI Technical Advisory Committee (RCI-TAC) found few published statements pertaining to removal of damaged substrate materials during new roof installation. Statements pertaining to roof repair and removal of damaged substrate materials rarely addressed their removal at the time of new construction. Mitigating the initial and long-term adverse effects caused by leaks and other mechanisms of moisture intrusion requires replacement of the damaged substrate materials.

Issues concerning the safety of persons accessing roofs where excessive corrosion/deterioration has likely occurred and compromised the structural capacity of the roof system are integral to this advisory.

B. RESULTANT HAZARDS

Corrosion of metal attachment components, if extreme, can lead to premature failure of the components and potentially compromise the wind uplift resistance of the roof assembly.

Corrosion of metal decks or decay of wood decks, if extreme, can create a lack of support for the roof assembly, compromise the wind uplift resistance of the roof and deck, reduce the load-carrying capacity of the deck, and pose a potential hazard to the safety of those who access the roof and to the building's occupants.

Damaged substrate materials may develop cupped and curled edges that create a tripping hazard. Moisture-soaked insulation reduces the R-value, leading to poor energy efficiency. Loss of adhesion between layers within the system creates a risk for wind damage, most notably, the membrane layer when fully adhered to the substrate.

C. ORIGIN AND DISCUSSION OF THE PROBLEM

As indicated, roof insulation products (including facers) that tend to retain moisture are the most likely components to be associated with the issues noted herein. However, in certain environments, even insulation or other substrate products that may sustain water leakage and/or allow water vapor to pass through them with little retention can have a negative effect on metal or adhesive products. The industry has made improvements with coatings that protect metal fasteners from corrosive environments. Steel roof decks are generally covered by paint or galvanized coatings to provide corrosion protection. However, the metal deck material is typically more vulnerable to corrosion than stainless steel or corrosion-resistant coated fasteners.

Many low-volatile organic compound (VOC) water-based roof adhesive products will re-emulsify if they become wet, reducing their adhesive properties. As environmental requirements change, leading to

additional modifications to adhesive and attachment options for roofing, the interaction of these adhesives with insulation facer products appears not to be fully understood. The loss or reduction of adhesion between roofing components has caused numerous post-construction issues that have required investigation and correction.

D. RECOMMENDATIONS

If a newly installed roof requires repair due to exposure to water from leakage or water vapor accumulation, insist that the repair include the investigation of all underlying roof insulation and substrate materials, as well as replacement of all moisture-damaged components, including insulation, substrate materials, adhesives, and/or any damaged structural elements (decks and fasteners).

E. INDUSTRY STANDARDS AND REFERENCES

ARMA, NRCA, and SPRI, *Repair and Maintenance for Low Slope Roof Systems*, NRCA 1997.

Heshmat O. Laaly, "*The Science and Technology of Traditional and Modern Roofing Systems*" (Laaly Science Publishing, 1992, Vol. 2. Page 62-14).