## D18 Evaluating the Impact of Reroofing on Increasing the Risks of Ponding of Water

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After attending this presentation, attendees will understand some factors that affected and contributed to a roof ponding event, as well as how the selected materials, installation procedure, and localized drainage conditions caused the collapse of a recreational facility roof.

This presentation will impact the forensic science community by using a case study to illustrate how modification work done on a building can negatively impact the structural integrity of that building. This presentation also highlights the importance of building code compliance, which often prevents building collapses as building modifications are made over time.

Ponding, the unexpected pooling of water, often occurs with catastrophic events and is a predictable condition in areas of heavy rainfall. The weight of rapidly congregating water on a rooftop can cause an existing structural roof system to deflect and progressively collapse during intense rainstorms.

In this instance, reroofing work completed on a recreational facility negatively altered the roof drainage capability of the building. The continuing adequacy of the rooftop drainage system was not properly reevaluated as part of the reroofing project, thereby leading to a significant structural roof failure incident approximately a year later during a rainstorm microburst. In this case, a localized portion of the structural steel support system of the roof collapsed due to ponding from a blockage created in the drainage system.

Prior to this ponding incident, the original roof drainage system had functioned properly for more than 20 years since the time it was constructed.

The major factor contributing to the ponding failure was the installation of two-inch-diameter drain inlets without proper debris-protection baskets during the reroofing process. The thickness of the drain inlets and the installation of an Ethylene Propylene Diene Terpolymer (EPDM) membrane within the inlets reduced the effective drainage diameter to approximately the size of a common bathtub or shower drain. This reduction in diameter significantly and proportionally reduced the effective drainage area of the roof drainage system by as much as 80%. In addition, no secondary or overflow roof drainage system was provided as per code. The new roofing material installed, including flute fillers and insulation, also created additional dead loads to be supported by the existing structural roof framing members.

While the roofing design of the original building would not have required emergency scuppers, the drainage system was altered, thereby making it inadequate to withstand even regular rainfall events. The significant drainage capacity reduction, in combination with the lack of protection baskets and the potential for blockage of the inlets, allowed the significant roof ponding and additional roof loading to occur. In this case, the reroofing contractor did not conduct a proper engineering review of the rooftop surface conditions as part of the completion of the reroofing job. While plumbing codes prohibit the reduction of drainage diameters on existing buildings, appropriate attention by installers to the impact of modification work on the structural integrity of a building could also help prevent such failures in the future.

**Ponding, Roof Collapse, Reroofing**