



## MULTIDISCIPLINARY APPROACH TO AN INVESTIGATION OF HAIL DAMAGED METAL ROOFS WITH A COSMETIC DAMAGE ENDORSEMENT

Hail claims involving metal roofs with cosmetic damage exclusions oftentimes require a multi-disciplinary approach to determine if a roof has indeed been functionally damaged. This matter provided a valuable investigative template for ESi and its clients, as these types of claims are increasing in frequency and value.

### SITUATION

This matter involved a dispute over an insurance claim for hail damage to several low sloped commercial metal roofs. The insured's policy included a cosmetic damage endorsement for the roofs.

Cosmetic damage affects the appearance but not the function of the roof and includes marring, denting, scratching, pitting, and discoloration--anything that doesn't directly result in increased water infiltration into the building.

Functional damage involves a reduction in water-shedding capability or the expected long-term service life of the material. Metal roofing is considered functionally damaged when:

- The metal is fractured.
- A lap element or fastener is disengaged.
- The protective surfacing is disrupted.

Hail dents in metal are not typically considered functional damage. Even the deep dents or abrasions to protective coatings don't necessarily constitute functional damage. Research published by others, and ESi's own experience have shown it's extremely rare for factory coatings to be compromised by hailstones.

After the claim in this case was denied based on the cosmetic damage endorsement, the insured sued the carrier. The insured hired a public adjuster who engaged a building consultant and a metallurgist. Both plaintiff experts provided reports concluding that the dents in the metal constituted functional damage because allegedly the dents reduced the water shedding capabilities of the roof, allowing water and dirt to accumulate in the dents and compromised the factory Galvalume® coating.

The carrier's defense attorney engaged ESi to perform an inspection of the property, obtain samples, and perform a metallurgical analysis of the hail dented metal panels.

#### Technical Disciplines:

- Mechanical
- Materials

#### ESi Consultants

Brad A. Lauritsen, M.S., P.E.  
Senior Consultant  
balauritsen@engsys.com  
(636) 240-6095

Ellen E. Wright, Ph.D., P.E.  
Senior Consultant  
eewright@engsys.com  
(816) 643-6082

#### Services Utilized

- Laboratory Inspection
- SEM/EDS Analysis
- Metallurgical Analysis

#### About ESi

For over 35 years, ESi has leveraged its multidisciplinary team of engineers, scientists, and professional technical staff to investigate many major accidents and disasters. Our technical expertise, hands-on experience and state-of-the-art facilities, combined with diagnostic, analytical and physical testing capabilities create an ideal environment for quickly identifying and interpreting the facts of a particular case.

#### Contact ESi

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## SOLUTION

ESi performed a site inspection, documented the conditions, and harvested both hail dented and control (non-dented) samples from the roofs. This inspection uncovered errors in the building consultant's analysis of the roof construction and showed the roof panels should not have been used in this low-slope roof application. Also, the opposing expert's claim that ponded water in hail divots causes accelerated corrosion was challenged by recent research, including a study by Ron Dutton and Robert Haddock presented at the 2023 IIBEC International Convention and Trade Show.<sup>1</sup> The study revealed that water in hail divots evaporates faster than it does in normal mechanical deformations, such as the panel flutes typically used to strengthen the roof panels. It also evaporates faster than water on the panel eave.

The roof samples were analyzed in the laboratory by ESi. Microscopic examination of the exterior surfaces did not reveal any visible evidence of corrosion (i.e. iron oxide/rust) of the underlying steel substrate.

SEM-EDS (Scanning Electron Microscopy/Energy Dispersive Spectroscopy) analyses indicated that although the spray applied coating had deteriorated, the underlying Galvalume coating had not yet been exposed to the environment. No appreciable iron was observed in the EDS analyses of the surfaces, which shows that the underlying steel substrate beneath the Galvalume coating was not exposed to the environment and was not corroding.

The roof samples were cross-sectioned, which allowed for measurements of the Galvalume coating thicknesses on the exterior surfaces of each sample. The analyses revealed that the steel substrate was protected by the coating on both sides of the samples. Specifically, the Galvalume coating on the exterior and interior surfaces of the samples was intact, and the thickness was similar between the hail dent samples and the respective control samples.

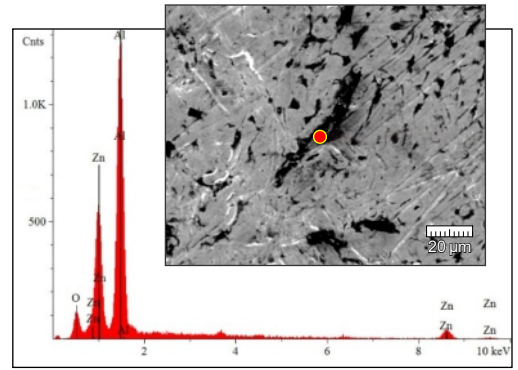
ESi prepared a report rebutting the plaintiff's expert's claims.

<sup>1</sup> Dutton, Ron, and Robert Haddock. 2023. "Oh Hail! Metal Roofs, Hail Impact, and Long-Term Performance." Published in the Proceedings of 2023 IIBEC International Convention and Trade Show, March 3-6, 2023, in Orlando, FL: International Institute of Building Enclosure Consultants.

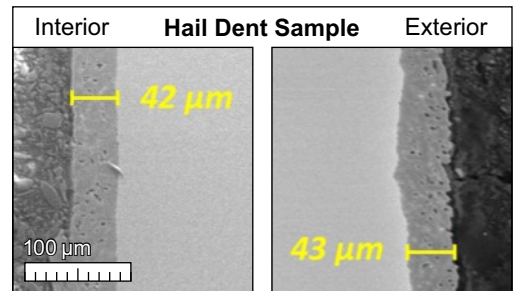
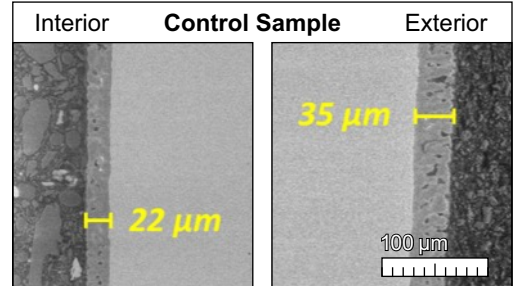
## RESULTS

Based on ESi's analyses in this case, the factory Galvalume coating was not compromised by the hail dents, and the service life of the metal panels was not reduced. Indentations from hail, without a breach of the Galvalume coating and corrosion of the underlying steel substrate, should have either no impact or a negligible impact on the overall roof performance. This is especially true given the fact that the lifetime expectancy of metal roof panels varied widely based on the exposure environment and weather. There was no scientific evidence to support the premise that the cosmetic indentations caused by the hail would impact the overall performance of the roof. In fact, the Galvalume coating was still properly adhered to both sides of the substrate, indicating that the underlying steel was protected from typical atmospheric corrosion.

The client acknowledged that ESi's report played a critical role in the mediation proceedings.



Use of SEM with EDS to verify Galvalume<sup>®</sup> coating is intact and undamaged within hail dented area (No iron detected by EDS)



Measurements of the Galvalume coating thickness for the cross-sections prepared from a control and hail dent sample



Metallographic mount containing cross-sections of the control and hail dent samples



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### WHY ESi.

ESi provides clients with critical expertise in a wide range of engineering disciplines. With ESi, clients know they have ready access to the technical and industry know-how needed to tackle complex, multi-disciplinary problems, all housed within a single organization. In this case, ESi's mechanical and materials experts collaborated on a range of technical issues to support the insurance carrier.