



**RECOMMENDATIONS FOR REPAIR OF  
SPRAY POLYURETHANE FOAM (SPF) ROOF  
SYSTEMS DUE TO  
HAIL AND WIND DRIVEN DAMAGE**

**RECOMMENDED  
DESIGN CONSIDERATIONS  
AND GUIDE SPECIFICATIONS**

**Spray Polyurethane Foam Alliance  
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# RECOMMENDATIONS FOR REPAIR OF SPRAY POLYURETHANE FOAM (SPF) ROOF SYSTEMS DUE TO HAIL AND WIND DRIVEN DAMAGE

## OBJECTIVE

Research has indicated the damage caused by wind driven missiles typically does not cause a spray polyurethane foam (SPF) roof to leak. This damage can usually be repaired economically and does not require the roof to be replaced. This document provides a means to evaluate information collected from the investigation of an SPF roof system after damage has occurred and to make recommendations for the rehabilitation and/or repair of the damaged areas.

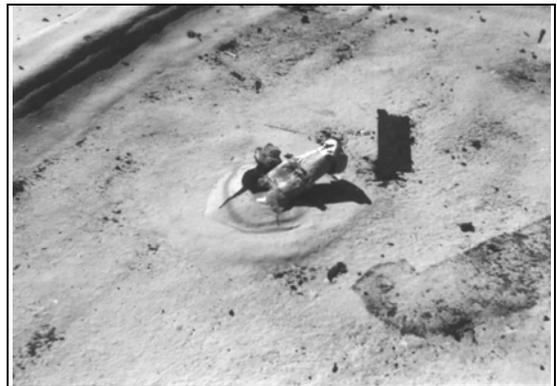
Ascertain the degree of the damage through a detailed on-site inspection (visual, physical analysis, drawings, reports) and determine which category of damage has occurred.

## CAUSE OF DAMAGE

Typical causes of damage and detailed descriptions of types of damage are described below.

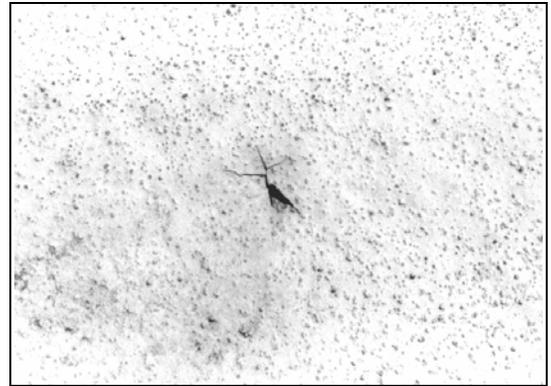
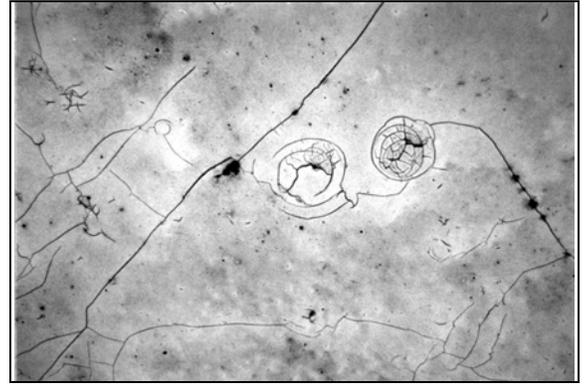
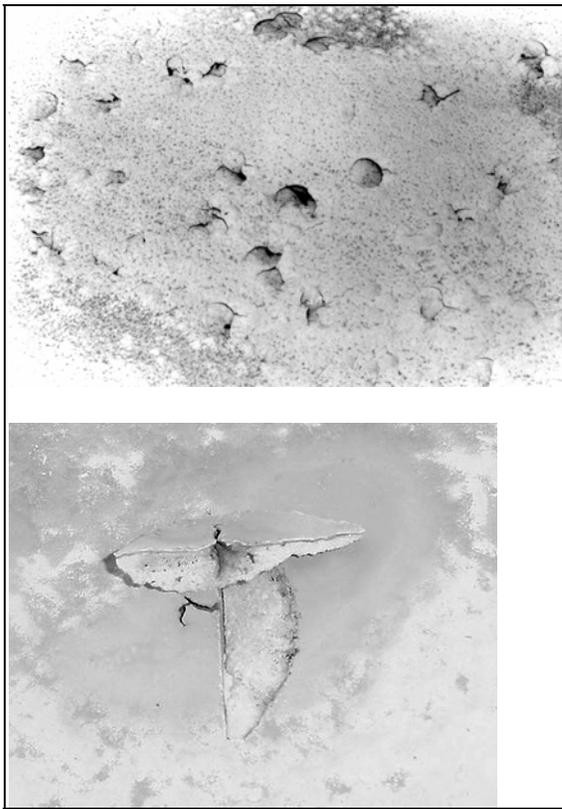
### 1) Mechanical damage due to wind driven missiles

During high wind events a wide variety of objects can potentially impact a roof and produce damage to the protective coating and SPF. This damage may be isolated to small areas of the roof or cover large areas. Substrate and structural damage may or may not have occurred and should be thoroughly investigated. The type of repairs required will depend on the size and severity of the damage and should be consistent with SPFA's Guideline AY-122, "The Renewal of Spray Polyurethane Foam and Coating Roof Systems."



### 2) Hail

Hail can damage both the surface coating and the underlying foam in an SPF roof system.



Coating damage can appear as gouges, cracks, and punctures. Hail induced coating cracks often form patterns shaped like “crow’s feet” or semi-circles.

Depending on hail stone size, shape, and hardness, the underlying foam may be dented, cracked, or gouged. Depressions in SPF dented by hail stones may be 1/8-inch to 3/4-inch deep. Hail damage can be isolated to small areas or cover the entire roof surface.

The repair technique is determined from the severity (size and depth of damage) and extent (number of hail hits per unit area) of the hail damage. For example, fifteen 3-inch diameter hail dents on a 1000 square foot roof may be easier to repair than hundreds of 3/4-inch diameter dents.

Occasionally, hail damage may not be discovered for months or years after a hail event. In these circumstances, the repairs may be more extensive because of UV degradation and/or moisture intrusion due to breached coating and damaged foam cell structure.

### 3) Foam and coating abrasion

Abrasion occurs when the wind blows sand/debris at a velocity sufficient to erode the protective coating over the SPF. Abraded coated SPF roofs are repaired by re-coating the affected areas and should be consistent with the SPFA’s Guideline AY-122.

## INSPECTION PROCEDURES

The first step in making an evaluation and repair recommendation of a damaged SPF roof is a thorough inspection. Follow the SPFA AY-122, “The Renewal of Spray Polyurethane Foam and Coating Roof Systems.” Wind driven damage may not be readily visible from all directions. Check for the specific following items:

- Damage causing roof leaks.
- Flashing and termination point damage.
- Splits and other impact damage.
- Abraded coating.
- Substrate or structural damage.
- Moisture intrusion in the SPF.

Determine severity and extent of hail damage by using a grid method (See Table 1).

## DEGREES OF HAIL OR MISSILE DAMAGE AND REPAIR RECOMMENDATIONS

After obtaining information from the roof inspection, repair recommendations can be developed specific to the damage sustained based on Table 1. The degree of damage may vary in different areas of the roof. Repair procedures shall vary accordingly. Consult the manufacturer for specific recommendations before commencing repairs.

**TABLE 1**

The following chart can help classify the mechanical damage and provide repair recommendations. Damage extent in this chart is categorized as less than 10 or more than 20 defects per 100 ft<sup>2</sup>. Recommended repairs for damage extents between 10 and 20 defects per 100 ft<sup>2</sup> will require judgement based on manufacturer's recommendations.

Degree of Damage	Size & severity	Extent per 100 ft <sup>2</sup>	Recommended repair
Light	1/2" diameter or less less than 1/8" deep	Less than 10 cracks, cuts and/or dents	Caulk and coat dents, cuts and cracks. <i>Note: Re-coat should be considered based on remaining service life of coating</i>
		More than 20 cracks, cuts or dents	Re-coat as required to fill in cracks <i>Note: Some caulking may be required to seal deeper cracks</i>
Moderate	1/2" to 3/4" diameter less than 1/4" deep	Less than 10 cracks/dents	Coat/caulk cracks
		More than 20 cracks, cuts or dents	Recoat as required to seal cracks <i>Note: Some caulking may be required to seal deeper cracks</i>
Heavy	3/4" to 1-1/2" diameter 1/4" to 1/2" deep	Less than 10 cracks/dents	Remove damaged SPF: Caulk holes and recoat as required
		More than 20 cracks/dents	Scarify 1/2" of roof surface: Re-foam and coat
Severe	1-1/2" or larger diameter 1/2" or deeper	Less than 10 crack/dents	Remove damaged SPF: Caulk holes: Recoat as required
		More than 20 cracks/dents	Scarify 3/4" of roof surface: Re-foam and coat

## DEGREES OF COATING ABRASION AND REPAIR RECOMMENDATIONS

Wind driven sand, dirt, and other small particles can abrade and scour the coating and SPF systems. The degree of damage will vary in different areas of the roof. Repair procedures will vary accordingly. Different coatings will have different resistance to abrasion and thicker coating layers will provide protection for longer periods of time.

Light and moderate abrasion will remove and roughen the coating surface exposing small areas of SPF. This type of damage can be repaired by renewing the coating system with additional compatible coating. Consult the coating manufacturer for specific recommendations.

Heavy and severe abrasion will remove much of the coating system, expose the SPF, and possibly erode the SPF as well. This will leave depressions and pits in the surface. Severe abrasion can be repaired by scarifying or removing the damaged foam and coating surface, reapplying SPF, and applying the coating system in the area affected. Repairs for this type of damage can sometimes be made by applying a mixture of fillers and coating to cover the rough SPF and coating surface followed by a finish coat. Consult the manufacturer for specific recommendations.

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