Roofing Foam Lifts

Thin and Thick Foam lifts: The problems and the solutions
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Thin and Thick Foam lifts: The problems and the Solutions

Bruce Schenke
Premium Spray Products
Roofing Foam Lifts

- Agenda
- Definitions
- Application Guidelines and Specifications
- Application techniques
- How does pass and lift thickness affect system performance
- Study of the multiple lift interface
- Interlaminar Adhesion
- Sources and References
Foam Roofing Lifts – Thin/Thick or just Right
LIFT: The sprayed polyurethane foam resulting from passes of foam in a specific area. A lift is defined by its thickness and the area. For example, a one inch lift of foam was installed to a 20 x 20 ft area, and then a second lift of foam 1.5 inch thick was installed to the same area. (See also: PASS).

PASS: The amount of coating or polyurethane foam applied by moving the gun from side to side and moving away from fresh material. A pass is delineated by its width, length and thickness. Foam passes sprayed and tied together in one area are called a lift of foam.
Definitions

- **PASS LINES**: Pass lines are created when the end of a pass of foam or coating ties into an adjacent pass. The overlapping of the polyurethane foam or coating can be seen typically as a darker color than the middle of the pass. Foam at the pass lines typically contain thinner lifts than the middle of the foam pass as the applicator tapers the foam to uniformly tie the foam passes together.

- **TIE-IN LINES**: The starting or stopping point at which new foam is applied to foam which had been sprayed earlier.
Definitions

- **FLASH COAT**: A thin initial pass of a spray-applied material.

- **SKIN**: The denser layer formed at the top surface of a layer or lift of spray polyurethane foam.

- **EXOTHERMIC REACTION**: A chemical reaction that produces heat. SPF and certain coatings are the product of exothermic reactions.
Application Guidelines

- Minimum pass thickness of \( \frac{1}{2}'' \).
- Total thickness of SPF should be a minimum of 1” (or more if specified)
- Apply uniformly plus \( \frac{1}{4}'' \) per inch, minus 0”
- Maximum pass of 1.5”
- Ay-104 SPF Roof Guideline Specifications
SPF Lifts/Passes

- (Typical Specification) Polyurethane foam shall be applied in a minimum of ½-inch thick passes and not more than 1 ½ inches. The total thickness of the polyurethane foam shall be a minimum of 1.5 inches (or more for drainage or detail considerations), except where tapering is required to facilitate drainage.
Application Guidelines

- The SPF must be applied in a minimum pass thickness of \( \frac{1}{2} \)".
Thin lifts – less than ½” thick

- The SPF must be applied in a minimum pass thickness of ½”.

- Why?
  - Lower mass = lower exotherm
  - Physical properties reduced
  - Thermal Cycling and foot traffic cause stress on the interlaminar bond if the thin lift is at the outside surface of the SPF system. Causes delaminations as the system ages and the stresses occur.
  - Reduces yield and increases costs
Thin lifts – less than ½” thick

- The SPF must be applied in a minimum pass thickness of ½”.
- Where do we see these thin lifts?
  - A thin lift applied to “dress up” rough foam (final or top lift).
  - A thin lift applied to add a bit more thickness to meet specs. (final or top lift).
  - A thin lift to fill in ponds for better drainage. (final or top lift).
  - At tie ins – day to day or pass to pass and at details.
  - To cover up a misapplication.
Thin lifts – less than ½” thick

- The SPF must be applied in a minimum pass thickness of ½”.
- Where are these thin lifts usually not a problem?
- At or near the bottom of the total SPF thickness
- Thin, low exotherm lift over board stock or scarified SPF.
- Proper tie in applications and tapers at details and terminations.
Thin Lift Delaminations
Thin lifts in the Field
Thick Lifts – over 1.5 inches

- Maximum pass of 1.5”
  - Better yield
  - Lower Density
  - Reduced Compressive Strength
  - More open cells
  - Higher exotherm
  - More of a challenge to create a consistent thickness
Thick Lifts – over 1.5 inches

- Maximum pass of 1.5”
- Cants and Details are generally OK if applied in multiple layers
Thick Lifts – over 1.5 inches

- Maximum pass of 1.5”
- Robotic Application
Thick Lifts – over 1.5 inches

- Discussion
  - Polyurethane foam formulation is a factor
  - Less risk of delamination
  - Reduced cost
  - Traffic and impact resistance
  - Scorching
  - Meeting specifications
Thick Lifts – over 1.5 inches
Effect of Lift thickness on Physical properties

- Density, compressive strength, tensile strength, and water absorption properties can vary in a spray polyurethane foam roofing application due to several factors.
  - Pass thickness and number of passes
  - Ambient and substrate temperatures
  - Application techniques
  - Altitude
Effect of Lift thickness on Physical properties

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<th>Density (Nominal 3.0)</th>
<th>Compressive Strength</th>
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<td>(2) 1.25 inch passes</td>
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Effect of Lift thickness on Physical properties

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<td>(2) 2.0 inch passes</td>
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</table>
Effect of Lift thickness on Physical properties

2" Pass

Two 1.25 inch passes

Knit line
Application Guidelines

- The FULL specified thickness of SPF should be applied in any area the same day.
- SPF should be cured sufficiently before subsequent applications.
Application Guidelines

- If the full specified thickness of polyurethane foam is applied in an area in the same day this minimizes adhesion problems or delaminations between lifts.

- If this is not possible then a primer can be used to get good adhesion.
3/8” thick

Rusted SPF surface

Moisture at the interface
Scarified Foam to Foam Interface
Sources and References

- SPFA AY 104 - Spray Polyurethane Foam Systems for New and Remedial Roofing
- SPFA AY 119 - Glossary of Terms Common to the SPF Industry
- SPFA AY 107 - Spray Polyurethane Foam Blisters
Questions?