INSPECTING SPF BUILDING ENVELOPE APPLICATIONS PER SPFA INSPECTION CRITERIA
BE PROJECTS CAN WIDELY VARY IN SIZE AND SCOPE

- Residential Insulation
  - Interior, stud/joist cavities, full-fill (or nearly so)
  - Size: Thousands of sq ft

- Rim Joist Air Seal
  - Interior, sealing rim joists
  - Size: Hundreds of lineal ft
BE PROJECTS

- Hybrid Systems
  - Interior, stud/joist cavities, thin SPF application
  - Size: Thousands of sq ft

- Masonry cavity wall
  - Exterior, open wall
  - Size: Tens of thousands of sq ft
TYPICAL PROJECTS

Residential Insulation
Interior application

Masonry Cavity Wall
Exterior application

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Project inspection scope will be influenced by Project size and scope

The following inspection elements will vary depending on Project size and scope:

- Number of thickness probes
- Number of core samples
- Photographic documentation
- Sketches
- Commentary
INTRODUCTION

Three Inspection Steps:
- Visual Inspection
- Thickness testing
- Physical Sampling

Document each Step through:
- Observation
- Photography
- Commentary
BUILDING ENVELOPE INSPECTION PROCEDURES

SPFA Certification focuses on INDIVIDUAL’S ability

BE inspections focus on abilities of INDIVIDUALS to apply SPF as required by the Project specs & requirements

BE Inspector will

- Examine the Project specifications
- Examine the manufacturer’s installation requirements
- Inspect the Project
- Answer this question:

  Has (have) the individual applicator(s) met the Project specifications and the manufacturer’s installation requirements?
BE INSPECTION PROTOCOL

• Initiation
• Arrange inspection with Accredited Inspector
• Be available while inspection is conducted
• Receive Complete Inspection Record from Inspector
• Submit all appropriate materials to Contracting Entity
INSPECTION INITIATION

Contractor initiates Inspection

- Send to Inspector—completed Form 1 (Request for BE Inspection) and blank Form 2 (SPF Insulation Inspection Report)
- Attach to above:
  - Specific Project specifications
  - Manufacturer’s installation requirements: guide specs, installation instructions, etc.

Contractor and Inspector arrange/schedule Inspection

- Time, place, etc.
- Agree on payment of inspection fees, expenses, etc.
- Inspector is working for and being paid by Contractor
COMPLETE INSPECTION RECORD

Each inspection will result in the compilation of a Complete Inspection Record consisting of:

Form 1: Request for BE Inspection
Project Specifications
Manufacturer’s Installation Requirements
Form 2: SPF Insulation Inspection Report
Core Samples
Photographs
Other commentary (as appropriate)
INSPECTION INITIATION (CONTINUED)

Form 1 Provides:

- Contractor information
  - Names of individual applicators who applied SPF on Project
- Project location, scope, type
- SPF applied: Type(s), identification, basic properties
  - Where applied
  - Thickness and R-values
- Other materials applied by Contractor
  - Primers, ignition barriers, thermal barriers
- Other information (as appropriate)
INSPECTION INITIATION (CONTINUED)

Project specifications
- Determined by Project size and scope, could include:
  - Contractor proposal
  - Architectural specs

Manufacturer’s installation requirements
- Guide specifications
- Installation instructions
- Project specific recommendations or specifications

SPFA guideline documents
- To be referenced where above information is lacking
THE INSPECTION

The Inspector’s job:

- Review the Project specifications and the manufacturer’s installation requirements
- Inspect the project based on the specifications and requirements
- Fill out Form 2: SPF Insulation Inspection Report with your certification
- Assemble the Complete Inspection Record
- Submit the Complete Inspection Record to Contractor
- Retain copy of Form 2 for five years

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PHOTOS

- Photo of outside of building from different positions
- Overview of application demonstrating scope of work
- Close ups showing typical foam characteristics and surface profile (uniformity)
- Details demonstrating conformance to specifications and requirements
- Defects
TOOLS & EQUIPMENT

- Camera
- Notebook
- Thickness probe(s)
- Tape measure
- Sample bags
- Coring tool(s)
- Knife
- Magnifying glass and/or optical comparator (optional)
FORM 2: STEP-BY-STEP

Section 1: Inspection Date (self evident)

Section 2: Inspector Information (self evident)

Section 3: Contractor Information

- Obtain information from Form 1
- Include names of Contractor’s representative(s) accompanying the inspection. They are there to:
  - Repair core sample holes, thickness probes, etc.
  - Answer your questions
  - Provide access to Project
SECTION 4: PROJECT INFORMATION
- Use information provided on Form 1
- Add a brief description of Project scope

SECTION 5: PROJECT SKETCH
- Intended to show overall layout of Project
- Location of core samples and photographs (as appropriate)
- Nature of sketch is dependent on the Project scope
  - Use your own discretion
  - Intent is to be “schematic” rather than “detailed”
- Indicate North where appropriate
- Use additional pages where appropriate
SECTION 6: VISUAL INSPECTION

OBSERVATIONS

Indentify and/or confirm:

- Specific assemblies are insulated in accordance with Project specs and scope
- SPF installed in accordance with air barrier requirements
- SPF fully adhered to substrates and cavity framing members
- Satisfactory overall surface profile
- SPF color uniform and consistent
- Cracks, blisters, delaminations
- Presence/absence of thermal & ignition barriers

Take photographs
SECTION 6: VISUAL (CONTINUED)

Fill out the tables on individual building assemblies.

- **Example:**
  - “Yes” = Acceptable   “No” = Deficiency   “NA” = Not applicable

<table>
<thead>
<tr>
<th>No</th>
<th>NA</th>
<th>Wall Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td>All stud wall cavity insulation installed to uniformly fit the cavity side-to-side and end-to-end.</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>Insulation adhered to substrates and building components to provide an air seal where required.</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>Rim joists insulated as required.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Corner channels, wall intersections and behind tubs/showers insulated and air sealed as required.</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>Insulation surface profile satisfactory.</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>Insulation of uniform color and consistency.</td>
</tr>
</tbody>
</table>

Comments:
DELAMINATION FROM SUBSTRATE
CRACKS - SHRINKAGE

© SPFA
CHECK HIGH SPOTS FOR POTENTIAL BLISTERING
Thermal Barriers & Ignition Barriers

- Are they **In Place**?
- Can the SPF be left **Exposed**?
  - If multiple SPF types were installed, some may require barriers and others not.
  - Some SPF installations may be exceptions to the thermal barrier rules.
- Has Contractor provided **assurances** that they will be installed as required?
- Comment as appropriate
SECTION 7: THICKNESS MEASUREMENTS AND INSULATION PROFILES

- R-value closely related to thickness
- SPF thickness is usually THE fundamental requirement for BE insulation projects
  - Exception: Where SPF is used solely as an air barrier thickness could vary depending on product type, location in assembly, etc.
- Thickness will vary somewhat depending on:
  - Specific assembly
  - Location within assembly cavity
  - Surface profile
Minimum vs Average

- Specifications and manufacturer’s requirements vary
- Know the differences and evaluate accordingly

Minimuns for specific assemblies

- SPF thickness should not be less than the minimum
- Less than minimum thickness should be noted as a deficiency

Averages for specific assemblies

- SPF thickness may have isolated spots less than the average value
- Large areas less than average thickness should be noted as a deficiency
SECTION 7: THICKNESS & PROFILES (CONTINUED)

Thickness Probes

- Probe & ruler
  - Cheap, easily improvised

- Calibrated
  - Easy, single device
  - Limited in thickness
Variations in Thickness

- Building Assemblies
  - Form 1 in the SPF materials section lists the assemblies, thicknesses and R-values applied.
  - Verify and record
Assembly Cavity

Picture framing technique
- Applicators often spray the cavity perimeter first to form a cant between sheathing & framing members. Then they fill in with an up/down or side-to-side motion.
- Often leaves sides of cavity thicker than middle.

Probe for thickness in relatively open areas unaffected by framing, protrusions, etc.
SECTION 7: THICKNESS & PROFILES (CONTINUED)

- Profile
  - Profile variations should not be so great as to deviate from the required minimums or averages as provided for in the Project Specifications and the Manufacturer’s Installation Requirements
  - Note any concerns and deficiencies in the Comment section

- Profile will vary with the SPF type
  - Open-cell SPF typically exhibits greater surface profile variation than closed-cell SPF
### SECTION 7: THICKNESS & PROFILES (CONTINUED)

<table>
<thead>
<tr>
<th>Closed-Cell SPF (at appx. 2-3 inch thickness, open area)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>¼-inch variation</td>
<td>E = excellent</td>
</tr>
<tr>
<td>½</td>
<td>G = good</td>
</tr>
<tr>
<td>¾</td>
<td>F = fair</td>
</tr>
<tr>
<td>1 +</td>
<td>P = poor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Open-Cell SPF (at appx. 2-3 inch thickness, open area)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-inch variation</td>
<td>E = excellent</td>
</tr>
<tr>
<td>3/4</td>
<td>G = good</td>
</tr>
<tr>
<td>1</td>
<td>F = fair</td>
</tr>
<tr>
<td>1.5 +</td>
<td>P = poor</td>
</tr>
</tbody>
</table>
SECTION 7; THICKNESS 7 PROFILES (CONTINUED)

1. Probe thickness at random, representative spots approximating the following frequency schedule:

<table>
<thead>
<tr>
<th>Project Size</th>
<th>Area Assemblies (walls, floors, ceilings, roof decks, etc.)</th>
<th>Lineal Assemblies (rim joints, etc.)</th>
<th>Maximum No. per Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (&lt;10,000 ft²)</td>
<td>1 per 100 ft²</td>
<td>1 per 10 lin ft</td>
<td>25</td>
</tr>
<tr>
<td>Large (&gt;10,000 ft²)</td>
<td>1 per 500 ft²</td>
<td>NA</td>
<td>25</td>
</tr>
</tbody>
</table>

2. Record thickness, assembly type and the profile in the vicinity of the probe

3. Contractor repairs holes as appropriate
Example record:

<table>
<thead>
<tr>
<th>Location / ID</th>
<th>Assembly Type (W,C,F, etc)</th>
<th>Thickness (inches)</th>
<th>Profile (E, G, F, P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W</td>
<td>3</td>
<td>G</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>5</td>
<td>E</td>
</tr>
<tr>
<td>3</td>
<td>RD</td>
<td>5.5</td>
<td>F</td>
</tr>
<tr>
<td>4</td>
<td>W</td>
<td>2.75</td>
<td>G</td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>3</td>
<td>G</td>
</tr>
<tr>
<td>6</td>
<td>GW</td>
<td>2.5</td>
<td>E</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments: GW = Wall between garage and family room
MEASURE FOAM THICKNESS
ROUGH SURFACE PROFILE
OVERSPRAY, SLOPPY APPLICATION
SECTION 8: SAMPLES

Removal of the full thickness of SPF from the assembly
- Coring tool (cylindrical sample)
- Knife or saw (rectangular, triangular sample)

Inspect

Photograph (as appropriate)

Store in plastic bag

Record observations

Contractor repairs hole
TYPICAL CORING TOOL

Typical cores

Handle/Pusher

Coring tube

Coring tools may be purchased or fabricated at a local machine shop.

Other cutting tools may also be used to cut core samples (for example: knife for open-cell SPF or saw for closed-cell SPF).
SECTION 8: SAMPLES (CONTINUED)

Inspect for:

- Number & thickness of lifts or passes
- Color uniformity and consistency
- Cell structure uniformity and consistency
- Unusual softness, brittleness, stickiness or odor
- Presence of moisture
- UV degraded surfaces
  - Darker skin on the foam or pass surface
- Blistering or delamination between lifts or substrate & SPF
ELONGATED, NON-UNIFORM CELL STRUCTURE
NON-UNIFORM CELL STRUCTURE
HIGH EXOTHERMIC HEAT

Scorching (discoloration) is due primarily to spraying lifts or passes thicker than manufacturer’s maximums.
SECTION 8: SAMPLES (CONTINUED)

Frequency

- Take one core sample from each representative building assembly.
- For large assemblies (greater than 1000 square feet), take one random representative core sample approximately every 1000 square feet,
- not to exceed ten (10) core samples per project.
## Record observations

<table>
<thead>
<tr>
<th>Core ID</th>
<th>Assembly Type (W, C, F, etc.)</th>
<th>Total Thickness (inches)</th>
<th>Number of Passes</th>
<th>Thickness of Individual Passes (from surface down)</th>
<th>Overall Quality and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>W</td>
<td>2</td>
<td>3</td>
<td>0.5/1.0/0.5</td>
<td>Good, cells very uniform</td>
</tr>
<tr>
<td>B</td>
<td>CS</td>
<td>3</td>
<td>3</td>
<td>1.5/0.5/1.0</td>
<td>Good overall, a few elongated cells</td>
</tr>
<tr>
<td>C</td>
<td>Roof Deck</td>
<td>5</td>
<td>4</td>
<td>1.0/1.5/1.0/1.5</td>
<td>See comment below</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Comment: Contractor used a different foam system on roof deck. Color was blue-green. Otherwise OK. This was noted in Form 1.
SECTION 9: REPORTING

Inspector’s Findings

- Did the individual applicators meet the Project specifications and the manufacturer’s installation requirements?
- The inspector should review the findings with the contractor prior to leaving the site