

**FUNDAMENTALS OF SPF FOR  
THE INDEPENDENT  
BUILDING ENVELOPE INSPECTOR**

**CHAPTER 3**

**JOB SITE QUALITY  
CONTROL FOR THE BUILDING  
ENVELOPE**



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**Spray Polyurethane Foam Alliance**  
**4400 Fair Lakes Court, Suite 105**  
**Fairfax, VA 22033**  
**800-523-6154**  
**www.sprayfoam.org**

## INTRODUCTION

The key to installing quality SPF in the building envelope is quality control (QC), before, during, and after the application process. That means quality control must be exercised before the job is bid and during the application or installation of the system.

We will review the quality control issues discussed in the previous chapters. Quality control is just that controlling quality! Therefore, we feel each item discussed again in the previous Chapters deserve to be repeated.

This CHAPTER is designed to help improve the quality control procedures such as pre-bid analysis, job site record keeping and sample testing. Keeping the equipment and spray gun in top spraying condition will enhance the quality of the SPF when you apply it. It is important that consistent quality control methods be followed on each project. This will be especially helpful on projects that are to be inspected by third party independent inspectors.

## BEFORE THE BID

Quality control starts with the estimation and bidding processes. The more careful a contractor is during these initial stages, the more comfortable he will be with the job as it proceeds towards completion. Nothing is more disturbing than to see the profit on the job slipping away, knowing there are still many expenses to meet.

Good quality control benefits the contractor, the end user, and ultimately, the whole industry.

Here are some steps to take in setting up that tight quality control:

1. There are 11 SPFA recommended design considerations and guide specifications in this section.
  - a. Spray Polyurethane Foam Systems for Cold Storage Facilities Operating Between  $-40^{\circ}\text{F}$  and  $+50^{\circ}\text{F}$ . AY-111
  - b. Spray Polyurethane Foam for Building Envelope Insulation and Air Seal AY-112
  - c. Contractor Applicator Handbook. AY-113
  - d. Moisture Vapor Transmission Paper. AY-118
  - e. Thermal Barrier for Spray Polyurethane Foam Industry. AY-126
  - f. Glossary of Terms Common to the Spray Polyurethane Foam Industry. AY119
  - g. Spray Polyurethane Foam Estimating Reference Guide. AY121
  - h. Guide for Insulating Metal Buildings with Spray Polyurethane Foam. AY134
  - i. Spray Polyurethane Foam Equipment Guidelines. AY137
  - j. Spray Polyurethane Foam (SPF) and Cathedral Roofs & Attics. AY141
  - k. Spray Polyurethane Foam for Exterior Subgrade Thermal and Moisture Protection. AY140

Consistent use of these SPFA AY guidelines and quality installation practices from SPF manufacturers is strongly recommended.

2. Allow some slack in material and labor budgets when bidding. Don't start off on the wrong foot by under estimating the amount of material needed for the job.
3. Include the cost of installation accessories (i.e. attic chutes, caulking, sealant foam), masking materials (i.e. adhesive tape, kraft paper, etc.) and other such details in your bid. If these details are not included in the specifications, include them as an addendum along with your bid.
4. Do not "assume" anything. Verify all questionable specifications.
5. Verify that specification conforms to codes and regulations.

## **ON THE JOB SITE**

### SETTING UP

Upon arriving at the job site, contact the owner or his representative (site superintendent) and introduce yourself. Meet with site superintendents and other trades to review the application and fire and respiratory safety requirements. A good first impression is very important to good customer relations, so act accordingly. Advance approval from the building owner or representative should be obtained before using home or plant power.

Then:

1. Pick a staging area that is agreeable and convenient to the contractor and building owner. Be concerned with wind direction and generator exhaust.
2. Use traffic control markers such as cones or barricades to define work areas for safety purposes.
3. Locate dumpsters or appropriate disposal sites for waste materials.
4. Make sure all employees know the location and proper usage of emergency equipment such as fire extinguishers, fire alarms, etc.
5. Verify that your foreman or superintendent knows emergency numbers in case of fire, accidental spills, explosions etc and a phone is readily accessible.
6. Keep the work area safe and clean at all times.
7. The contractor shall carry and should provide the owner with Material Safety

Data Sheets (MSDS) for products brought to the job site. In addition, the contractor should receive MSDS for all materials stored or handled on site by the owner. These MSDS sheets **must be** stored in an area for anyone associated with the project to obtain.

Details like these will enable your employees to work with confidence under a wide variety of job conditions, and will enhance the company's credibility with the owner.

In addition, inspections by local, state or federal authorities for job safety will go much smoother if you have demonstrated your intent to comply with accepted industry safety standards.

### JOB SITE RECORDS

Keeping accurate job site records is a very important quality control procedure.

Job site quality control forms are many and varied, but typically they include the following information:

1. Job name and number
2. Date
3. Weather conditions
4. Batch number of all materials.
5. Building sketch/location of respective batches
6. Comments on any unusual conditions including anomalies, areas that could not be insulated properly with reasons, any observations or construction technique that could lead to a problem and who was advised of the situation
7. Proper material thickness as specified.

### FOAM APPLICATION PRECAUTIONS

#### **QC Proper Material Storage Temperature**

Many SPF application problems begin with material supply or storage difficulties. Chemicals stored under conditions outside the manufacturers' temperature recommendations often create processing problems that result in an off-spec, finished product. Follow instructions provided by manufacturers on the material data sheets and drum labels.

#### **Proper Ambient Conditions and Substrate Surface Temperature**

Check the ambient and substrate temperatures and humidity level to determine if they are within the limits of the guidelines by the SPF manufacturer. If weather conditions are close to the temperature limits or high humidity limits established by the SPF manufacturer's installation instructions, measure the substrate temperature by means of a surface thermometer. If the temperature or humidity reading is outside the limits of the spray system in use, consult with your manufacturer.

Measuring these conditions will give you a clearer understanding of how your SPF chemicals react under varying ambient weather conditions. These observations will increase your confidence as an applicator and make the information you submit to your manufacturers much more meaningful when questions arise about particular field situations.

**NOTE:** Thermal shock – During certain seasons, some climates experience rapid temperature drops in the late afternoon or early morning. If this occurs during the curing of the spray polyurethane foam (usually 2-3 hours after application) the foam may separate from the substrate, crack or split open. The telltale sound called “rifling” (sounds like a small 22 shot) indicates to the installer that these thermal shocks results are likely occurring. These can be repaired by cutting out **loose foam or open gaps and refilling those areas.** It is a good practice to regularly check for bonding of foam over substrates throughout the day.

### **Sprayed-In-Place SPF Mix**

After SPF operations have started, you should occasionally examine the newly applied foam for firmness proper cell structure. Do this by pressing its surface with your thumb. The surface should firmly resist this pressure.

Check the pass lines for stickiness or friability. If these conditions are observed, check the proportioning equipment for proper operation, and ambient conditions for compliance with the manufacturer's recommendations for the SPF system in use. Return to the area where stickiness or friability has been noted before leaving the job site for the day and make sure that curing of these areas is complete. Spraying over sticky or friable SPF surfaces can result in blistering later on.

### **SPF Application Thickness**

Monitor the thickness of SPF lifts as they are applied. SPF lifts for medium density closed cell foams must be a minimum of one-half inch ( $\frac{1}{2}$ " ) (13 mm) to a maximum as recommended by the manufacturer.

Most HFC blown polyurethane foams today have a maximum lift thickness of 1½" to 2" (35-50 mm) as specified by the material data sheet. The physical properties of the finished product can be severely compromised including density, compressive and tensile strength, moisture permeance resistance and R-value retention if manufacturer's recommendations are not followed.

### Proper Detailing

1. Follow application guidelines.
2. Check for voids.
3. Check details in Chapter 5
4. Verify that SPF is properly installed.
5. Verify that SPF is properly adhered.
6. Verify the thickness of the SPF.

### Field Applied SPF Quality Control

1. Masking is very important and necessary. If you don't want to clean it after, cover it before.
2. Mask any tub or shower units before any spraying begins.
3. Take care not to spray too much foam into cracks, as this may bow the wall or frame. Expanding SPF can have a force or more than 24 psi (165 kPa).
4. Be careful when spraying near electrical fixtures. Expanding spray polyurethane foam can force fixtures out of place. Do not spray recessed light fixtures even if they are approved for direct insulation contact. SPF allows no air circulation and fixtures are not typically tested with this type of insulation product. Recessed light fixtures should be enclosed in sheetrock box and the box may be sprayed.
5. Do not apply spray polyurethane foam within 3" (75 mm) of chimneys or flues or other heat producing appliances.
6. When using spray polyurethane foam to insulate exterior foundation walls and dampproofing, product must be installed incorporating ultraviolet protection above grade.
7. All excess and over-sprayed materials must be removed and all masking materials removed. **Remember**, to leave the job as clean (or cleaner) than when you arrived.

### Sealant Foam Quality Control

1. In renovation, old insulation, trim, drywall or other barriers may have to be removed to effectively seal the envelope.

2. Overfill situations should be apparent before you are ready to leave the job site. Any overfilled areas have to be trimmed or excess SPF will be compressed into the cavity or deform wallboard or interface with its installation. Foam should never be left beyond the inside of the stud faces where drywall or other interior materials are to be attached.
3. When injecting SPF into hidden cavities, always ensure that there is a breather hole (minimum of 3/8") to allow escape of trapped air and excess materials.
4. Do not disturb SPF until fully cured (2-3 hours), since it may become detached from the substrate.
5. One- and two-component kits need to be near normal room temperature to operate properly. You must warm these units before using when temperatures are too low.

### **Low Density Foam Quality Control**

1. It is a good practice to take samples of each job-site to verify density and ensure that it meets the manufacturer's specifications.
2. Do not use low density spray polyurethane foam for flotation, roofing, inside electrical boxes, beyond temperature limitations listed on product data sheets, or when in contact with rain, ground water or extreme humidity.
3. Because of the rapid reaction, there is less control of the precise thickness of application. Due to its high expansion rate (more than 100 times its original volume, a smooth surface is not typical. See manufacturer's installation instructions regarding minimum and maximum pass thickness for low-density open-cell SPF.
4. When filling cracks and voids, the excess spray polyurethane foam is under pressure and will stream out of the hole where the gun was triggered; therefore position yourself accordingly.

### **CLEAN-UP**

Clean up can be accomplished quickly and easily if the job is masked and/or prepped correctly. After removing the application equipment, clean the stud faces and saw or scarf off any SPF that is past the stud face. A handsaw, sawzall, foam scarfer or curry comb could be utilized. Unmask from top to bottom, removing masking from ceiling or ceiling fixtures, then walls, windows and wall fixtures. After all the high work is complete, ladders and scaffolding can be removed. Now the floor can be rolled up with all your debris into a tight bundle and disposed of. If a covering wasn't used, the floor should be scraped and swept.

Check over the job for any finished surfaces that may have been over-sprayed.



Overspray can be removed from some surfaces with a razor blade, wire wheel, very fine steel wool or a combination of these. Always leave the site broom clean and at least as clean as it was when you arrived.

## SUMMARY

In review, the major points covered in this chapter are:

- Before the bid, establish quality control procedures before making a bid.
  - When in doubt use:
    - AY-111 Spray Polyurethane Foam Systems for Cold Storage Facilities Operating Between  $-40^{\circ}\text{F}$  and  $+50^{\circ}\text{F}$
    - AY-112 Spray Polyurethane Foam for Building Envelope Insulation and Air Seal
    - AY-113 Contractor Applicator Handbook.
    - AY-118 Moisture Vapor Transmission Paper
    - AY-126 Thermal and Ignition Barriers for Spray Polyurethane Foam Industry
    - AY-119 Glossary of Terms Common to the SPF Industry
    - AY-121 SPF Estimating Reference Guide
    - AY-134 Guide for Insulation Metal Buildings with SPF
    - AY-137 SPF Equipment Guidelines
    - AY-140 SPF for Exterior Subgrade Thermal and Moisture Protection
    - AY-141 SPF and Cathedral Roofs & Cathedralized Attics
  - Read the manufacturer's instructions for installing the system.
- Set good job site work and safety procedures.
- Keep accurate job site records before, during, and after every project.
- Before and during SPF application, make the following quality control checks.
  - Masking in place.
  - Material is stored at the proper temperature.
  - Equipment functions properly.
  - Substrate ambient temperature and humidity are within manufacturer's established limits.
  - SPF has acceptable firmness, no stickiness or friability.
  - SPF lifts must meet total thickness specifications.
  - Inspect detailing carefully.
  - Keep accurate records. Some projects require retaining a sample of the SPF.

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