

## ROOFING APPLICATION STANDARD (RAS) No. 109

### 1. Scope

- 1.1 This Roofing Application Standard sets the requirements to determine whether a substrate and surrounding environmental conditions are appropriate for the application of a spray applied polyurethane foam Roof Assembly; whether the final application is in compliance with the requirements of the *Florida Building Code, Building* and, whether proposed details are in compliance with industry standards.

### 2. Referenced Documents

- 2.1 For definitions of terms used in this application standard, refer to ASTM D 1079; and the *Florida Building Code, Building*.

### 3. Significance and Use

- 3.1 The test procedures outlined herein provide a means for establishing the use of industry accepted details of spray applied polyurethane foam Roof Assemblies, proper substrate and environmental conditions at the time of application, and methods of quality control during and after application of the Roof Assembly.
- 3.2 Quality control test methods are intended to confirm compliance with the wind load requirements of Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building* and compliance with the spray applied polyurethane foam Roof Assembly manufacturer's Product Approval.

### 4. General Requirements

- 4.1 All spray applied polyurethane foam (PUF) Roof Assemblies shall have Product Approval. Spray applied polyurethane manufacturers' Product Approval shall include all components used in accepted systems, and manufacturers environmental constraints concerning application temperatures and relative humidity.
- 4.2 All spray applied polyurethane foam (PUF), and coatings applied over spray applied polyurethane foam shall comply with Section 1521 of the *Florida Building Code, Building*.

- 4.3 All spray applied polyurethane foam applications shall have a minimum slope of  $\frac{1}{4}$  in.:12 in. The application shall be applied to eliminate ponding. Ponding, for the purposes of this Roofing Application Standard, shall be defined as an area of 100 ft<sup>2</sup> or more which holds  $\frac{1}{2}$  in. or more of water as measured 24 hours after a rain fall.

- 4.4 Certification of a completed spray applied polyurethane foam Roof System Assembly shall be provided to the building official within 30 days of job completion as detailed in Section 1521 of the *Florida Building Code, Building*.

- 4.5 The minimum finished thickness of all spray applied polyurethane foam applications shall be not less than 1 in. A foam pass (or lift) shall not be less than 0.50 in. in thickness.

- 4.6 The spray polyurethane foam shall be uniformly terminated a minimum of four inches above the roof line at all penetrations (except drains, parapet walls or building junctions). Foamed in place cants shall be smooth and uniform to allow for positive drainage.

- 4.7 The spray polyurethane foam shall be terminated below existing weep holes at through wall flashings. Weep holes shall not be covered with foam or coatings.

### 5. Details

- 5.1 Model details for spray applied polyurethane foam applications are provided in Appendix "A," herein.

### 6. General Practices – The following general practices shall be observed prior to and during the application of spray applied polyurethane foam:

- 6.1 A Job Log shall be maintained on the job site in a ring binder, including but not limited to:
- Roof Assembly Product Approval
  - Section II of the Uniform Building Permit Application
  - All pre-job testing
  - All job testing detailed in this Roofing Application Standard
  - Daily weather conditions
  - All written or verbal communications with spray applied polyurethane foam

- roof assembly manufacturer relating to the application
  - A list of all accessory products used within the Roof Assembly; and,
  - All material safety data sheets
- 6.2 The building official shall have access to the Job Log during site inspections.
- 6.3 The roof deck shall be securely fastened to the building structure in compliance with the requirements set forth in the relevant decking chapter of the *Florida Building Code, Building*.
- 6.4 Surface preparation of the roof decking shall be in compliance with the Guide Specifications of the Polyurethane Foam Contractors Division, Section 3.02.
- 6.5 For spray applied polyurethane foam applications over an existing built-up Roof Assembly, the existing Assembly shall be tested for uplift resistance in compliance with TAS 124 to confirm compliance with design pressures determined in compliance with Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building*.
- 6.6 Should the existing roof assembly fail to meet the required design pressures, additional mechanical attachment consisting of approved insulation fasteners and stress plate assemblies at a density calculated in compliance with RAS 117 and Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building* may be provided. Alternatively the existing roof assembly, including any insulation substrate, may be removed to the structural deck.

**7. Adhesion to Substrate**

- 7.1 Spray-applied polyurethane foam may be applied to a large variety of substrate materials including but not limited to concrete, painted steel, galvanized steel, gravel-surfaced built-up roofing, smooth surface built-up roofing, synthetic membranes, and coatings. If an adhesion of the spray applied polyurethane foam to the specific existing substrate is not listed in the manufacturer’s Product Approval, ad-

hesion testing may be conducted in compliance with TAS 124.

- 7.1.1 A minimum of three adhesion tests shall be conducted in each roof area (i.e. field, perimeter and corner areas). The test report shall include results from each adhesion test as well as a mean value of the sample.
- 7.1.2 Average adhesion test results in each respective roof area shall meet or exceed 1.45 times the design pressure for that respective roof area, calculated in compliance with Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building*.
- 7.1.3 If primer is used in the test specimen construction, then primer shall be required as a part of the application. The spray applied polyurethane foam manufacturer shall provide primer application instructions together with material safety data sheets and acceptable environmental conditions for application.
- 7.1.4 The adhesion test report shall be attached to Section II of the Uniform Building Permit Application, and submitted to the building official for review.
- 7.2 Prior to application of any spray applied polyurethane foam, the substrate surface shall be clean; dry; free from loose dirt or any contaminants that may interfere with proper adhesion of any of the Roof Assembly components. Any deteriorated sections of deck or membrane shall be removed and replaced in compliance with this code.
- 7.2.1 Deck contaminants and debris shall be removed by methods approved by the spray applied polyurethane foam manufacturer. The application substrate shall be in similar condition to the substrate tested for adhesion performance.
- 7.3 Areas to receive spray-applied polyurethane foam shall be thoroughly examined and tested for moisture immediately prior to foam application, particularly early in the morning and late in the afternoon,

when condensation is most likely to be present. Testing shall be carried out on all areas, including those areas that appear dry to sight and touch.

7.3.1 Moisture detection shall be conducted using moisture detection paper or other moisture detection device that is sensitive to small quantities of surface moisture.

7.3.2 Results of all moisture testing shall be recorded in the job log including: 1) the type of testing; 2) the area(s) tested; 3) the time; and 4) the results.

7.3.3 A minimum of six moisture tests shall be conducted. All test results shall be recorded in the Job Log.

7.3.4 Moisture test shall be conducted: 1) not less than three more for every additional 100 squares of roof area; 2) not less than every twelve feet in the direction of the deck slope; and 3) within five feet of each drain.

7.3.5 The building official may, at his/her discretion, request additional moisture tests in areas to be foamed and/or may require examination of foam already in place to examine cell structure.

7.3.6 Where testing is carried out at areas already foamed, a minimum of 3 to 4 inches in diameter core sample of foam shall be removed to the substrate level. Where the foam has been applied to a monolithic substrate, the sample shall be scraped from the substrate, bagging all pieces of the sample and labeling the bag with: 1) the date of application; 2) the date of sampling; 3) the person taking the sample; and 4) a general description of material bagged.

7.3.6.1 Samples shall be forwarded to an approved testing agency for cell analysis. If inferior or irregular cell structure is observed, a "Bonded Pull Test," in compliance with TAS 124, shall be carried out in areas of inferior or irregular cell struc-

ture or as directed by the building official.

7.3.6.2 Results of all testing shall be submitted to building official for review.

## 8. Moisture at Application Nozzles

8.1 Functional air dryers shall be installed on all air inlets to spray equipment to eliminate moisture contamination. The building official may, at his/her discretion, test the spray gun assembly for moisture using moisture detection paper or some other type of moisture detection to verify dry purge air.

8.2 The roofing contractor shall test nozzles not less than twice each day and record the results in the Job Log.

## 9. Humidity

9.1 Water vapor in humid air can react with a curing foam surface resulting in a weakened bond with the ensuing layer of foam. Humidity can create a weakness in the bond lines of multiple foam passes.

9.2 Care shall be taken to monitor humidity conditions during applications. Application shall cease when humidity levels are above the acceptable levels described in the foam manufacturer's Product Approval.

9.3 The building official may direct testing of areas installed during high humidity conditions.

9.4 All spray-applied polyurethane foam Roof Assemblies Product Approval shall include a chart of ambient temperature and humidity application limits. Ambient humidity shall be monitored in all projects with a sling or self-contained psychrometer. Readings shall be taken before spray applications commence and every two hours while spraying. All readings shall be recorded in the Job Log.

**10. Visual Inspections**

- 10.1 Slit test samples of a minimum  $\frac{1}{2}$  in. wide, 2 in. to 3 in. long and least  $\frac{3}{4}$  in. deep shall be cut at a minimum of one sample every 2,500 ft<sup>2</sup> for visual observation and testing. In addition, one slit sample within ten feet of each drain shall be taken.
- 10.2 Samples shall be marked and bagged in an air tight polyurethane bags and stored until project completion. Bags shall be identified with date and location of core sampling.
- 10.3 A list of all stored samples shall be maintained in the Job Log. The building official may request laboratory testing of samples during the period of construction or prior to final inspection.
- 10.4 Applied foam shall be visually examined for cell structure and uniformity of color. Bond lines shall also be examined for adhesion. Results of the visual examination shall be recorded in the Job Log.

**11. Laboratory Examination**

- 11.1 Round core samples having a diameter not less than 3 inches shall be taken at a minimum of one sample every 10,000 ft<sup>2</sup> at the thickest application of foam.
- 11.2 Samples shall be taken by approved testing agency, and shall provide a written report of the visual examination of color, cell structure and adhesion at bond lines. Copies of the reports shall be kept in the Job Log for reference by the building official.
- 11.3 Final inspection shall not be complete without satisfactory test reports on file at job completion.

**12. Remedial Repairs**

- 12.1 Should irregularities be found during visual or laboratory examination of slit or core samples, the surrounding area shall be examined by removing additional slit or core samples working outward from the initial sample location until the foam is determined to be satisfactory by an ap-

proved testing agency. All inferior foam shall be removed and replaced.

- 12.2 If areas requiring remedial repair have been determined to be inferior by the designated testing agency, core samples on all sides of the repair area shall be taken and forwarded to the approved testing agency for examination. If the repair area is coated prior to the return of the results, the area shall be delineated for identification purposes.

**13. Wood Decks and Surfaces**

- 13.1 Wood deck application shall comply with Section 1521.5 of the *Florida Building Code, Building*.

**14. Steel Decks and Surfaces**

- 14.1 All structural steel decks shall be not lighter than 22 ga. unless examined by a professional structural engineer, prior to application, confirming the suitability of application. In addition, a letter shall be provided by the spray applied polyurethane foam manufacturer confirming the specific application is in compliance manufacturer's guidelines. A copy of the structural report and manufacturers letter shall be attached to Section II of the Uniform Building Permit application and submitted to the building official for review.
- 14.2 Nonstructural metal panels forming the substrate for a spray applied polyurethane foam Roof Assembly shall be not lighter than 24 ga.
- 14.3 All steel deck joints shall be correctly lapped, fastened and sealed prior to application of spray applied polyurethane foam.
- 14.4 If an approved insulation board is applied to a fluted deck, the board shall be attached in compliance with RAS 117 and the wind load requirements set forth in Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building*. Insulation boards shall be of sufficient dimension to span deck flutes.

**15. Concrete Decks and Surfaces**

- 15.1 All concrete shall be free of contaminants and chemical release agents.
- 15.2 Priming of all concrete surfaces is required. New concrete decks shall have a cure period of not less than 28 days prior to the application of spray applied polyurethane foam.
- 15.3 All joints greater than  $\frac{1}{8}$  in. shall be filled or bridged with an acceptable product to the spray applied polyurethane foam manufacturer.
- 15.4 Spray-applied polyurethane foam shall not be applied to lightweight insulating concrete.

**16. Wind Speeds**

- 16.1 Spray-applied polyurethane foam may be applied up to wind speeds of 25 mph if effective wind screens, tenting, robotic equipment, are used to prevent over spray damage and unacceptable surface texture.

**17. Coatings**

- 17.1 All coatings shall be approved for use with the spray-applied polyurethane foam Roof Assembly and shall be noted as such in the coating manufacturer's Product Approval and the spray applied polyurethane foam manufacturer's roof assembly Product Approval.
- 17.2 Coating may be one of the following:
- Acrylics
  - Butyls
  - Chlorinated synthetic rubbers
  - Silicones
  - Polyurethanes
  - Modified asphalts.
- 17.3 All coatings shall be in compliance with applicable physical properties noted in Chapter 15 (High-Velocity Hurricane Zone) of the *Florida Building Code, Building* and TAS 110. Additionally,

coatings shall be tested for peel strength of the coatings to foam in compliance with TAS 114(H) and RAS 109(A).

- 17.4 The coatings shall be applied in compliance with coating manufacturer's Product Approval, and spray applied polyurethane foam manufactures Product Approval.
- 17.5 The base coat, if necessary, shall be applied the same day as the spray applied polyurethane foam. The base coats shall be allowed to cure as specified by the coating manufacturer prior to the application of the final top coat.
- 17.6 After application of top coating, the surface shall be allowed to fully cure prior to inspection for pin holes, thin coated areas and other defects.

**18. Coating Testing**

- 18.1 Slit test samples of a minimum  $\frac{1}{2}$  in. wide, 2 in. to 3 in. long and least  $\frac{3}{4}$  in. deep shall be cut at a minimum of one sample every 2,500 ft<sup>2</sup> for visual observation and testing. In addition, one slit sample within ten feet of each drain shall be taken.
- 18.2 Four thickness measurements shall be taken from each sample.
- 18.3 Results of the tests shall be provided in the Job Log for review by the building official.
- 18.4.1 If any samples in the random sampling are determined to be inferior, additional test samples shall be taken at an interval of one sample every 2,500 ft<sup>2</sup> to determine the extent of inferior application.
- 18.4.2 Any areas found to be inferior shall be recoated following methods published by the component manufacturer and maintained in the Job Log.

**19. Walkways**

19.1 Walkways, when installed, shall be breathable walk pads approved by the coating manufacturer, and shall be installed and bonded to the coating surface.

**20. Perimeter Metal**

20.1 All perimeter metal shall be in compliance with RAS 111 for retrofit, reroof and new applications.

**21. Final Inspection**

21.1 A final inspection of the completed Roof Assembly shall be conducted by the building official to confirm compliance with the requirements of this Application Standard and the requirements set forth in the *Florida Building Code, Building*.

21.2 A final inspection shall also be conducted by the Roof Assembly manufacturer, or an inspection service designated by the manufacturer, confirming the application is in compliance with the material requirements and application standards established by the manufacturer.

21.3 The Roof Assembly manufacturer shall complete a final inspection certification not later than 30 days after completion of the application, as required in Section 1521.18.2 of the *Florida Building Code, Building*.