JOINT APPENDIX ~~8~~ 7

Quality Insulation Installation Procedures for Medium-Density, Closed-Cell Spray Polyurethane Foam (SPF)

~~8~~ 7.1 Purpose and Scope

Joint Appendix ~~8~~ 7 details a procedure for quality installation of Medium-Density, Closed-Cell Spray Polyurethane Foam (SPF) insulation and verification that the procedure has been followed in the installation. All applications of SPF must follow the following procedure. A compliance credit is offered when this procedure is followed for SPF application in low rise-residential buildings and verified by a qualified HERS rater. The procedure and credit applies to wood or metal framed construction with wall stud cavities, ceilings, and/or roof assemblies insulated with SPF insulation. High-rise residential, Hotel/Motel, and Nonresidential Buildings are required to follow the same procedures if SPF Insulation is installed however no compliance credit is available.

A copy of the required SPF Insulation Certificate containing the details for each installation job including a sample label is included at the end of the Appendix. Instructions regarding completion of the form CF-6R are also included.

~~8~~ 7.2 Terminology

Air Barrier	An air barrier is needed in all thermal envelope assemblies to prevent air movement. SPF insulation is designed to stop air movement and an additional air barrier is not required in areas where SPF insulation is applied.
Air-tight	Thermal envelope assemblies (such as wall assemblies) shall be built to minimize air movement. Air movement can move unwanted heat and moisture through or into the assembly. SPF insulation seals construction gaps. For these procedures air-tight shall be defined as an assembly (1) to which SPF has been applied and (2) all openings greater than 1/8 inch are caulked or sealed with foam.
Closed-Cell SPF	See Medium Density SPF
Draft Stops	Draft stops are installed to prevent air movement between wall cavities, other interstitial cavities and the attic. SPF insulation usually provides sufficient draft stops, however supplemental draft stops may be constructed of dimensional lumber blocking, drywall or plywood. Draft stops become part of the attic air barrier and shall be air-tight. Fire blocks constructed of porous insulation materials cannot serve as draft stops since they are not air-tight.
Gaps	A gap is an uninsulated area at the edge of an insulated area or penetrating the insulation. This can occur where insufficient SPF has been applied or SPF insulation has not properly adhered to a stud face, rafter face or other construction detail. Gaps in insulation are avoidable and are not permitted.
Hard Covers	Hard covers shall be installed above areas where there is a drop ceiling. For example, a home with 10 ft ceilings may have an entry closet with a ceiling lowered to 8 ft. A hard cover (usually a piece of plywood) is installed at the 10 ft. level above the entry closet. Hard covers become part of the ceiling air barrier and shall be air-tight.
Medium Density SPF	A structural spray polyurethane foam (SPF) having a nominal density of 2.0 ± 0.5 pounds per cubic foot.
Minimally Expansive Foam	A one- or two-component polyurethane foam system typically in a can formulated to fill construction gaps and crevasses without distorting adjacent framing. Minimally expansive foam typically expands only 2 to 5 times its dispensed volume.
Net Free-Area	The net free-area of a vent cover is equal to the total vent opening less the interference to

	air flow caused by the screen or louver. Screened or louvered vent opening covers are typically marked by the manufacturer with the "net free-area." For example a 22.5 in. by 3.5 in. eave vent screen with a total area of 78.75 square inches may have a net free-area of only 45 square inches.
Nominal Thickness	SPF typically exhibits surface undulations due to the insulation's expansion in the cavity. SPF thicknesses will, therefore, vary from point to point and from side to side of construction cavities (typically thickness will be greater at the perimeter of construction cavities where the SPF is filled onto framing members and thinner toward the center of the cavity). Since the R-value of the SPF insulation is determined by the thickness, it is important that the average thickness of the SPF be sufficient to meet the requirements of the project. However, the minimum thickness at any given point should be no more ½ inch less than the required thickness.
Spray Polyurethane Foam (SPF)	A foamed plastic material formed by the reaction of an isocyanate and a polyol that employs a blowing agent to develop a cellular structure. SPF may be a two-component reactive system mixed at a spray gun or a single-component system that cures by exposure to humidity. SPF can be formulated to have specific physical properties (such as density, compressive strength, closed cell content, and R-value) appropriate for the application requirements. Common uses of SPF include insulation, air barrier and roofing membrane.
Voids	A volume within an enclosed building assembly created when the assembly has been insulated by partial filling with medium-density SPF. The partial fill results in an air space (void) between the SPF surface and the assembly cover or sheathing. Voids are permitted under this Procedure. (Contrast with the definition for Gaps.)

~~*8*~~*7.3 General Requirements*

- SPF insulation shall be applied by skilled SPF applicators trained and experienced in the use and maintenance of high-pressure, plural-component equipment.
- SPF insulation shall be installed per the manufacturer's specifications, recommendations and temperature/humidity limitations.
- SPF applicators shall be certified by the SPF insulation manufacturer for the application of SPF residential insulation systems.
- Substrates to which SPF insulation is applied shall be secure and free of surface moisture, frost, grease, oils, dirt, dust or other contaminants that would adversely affect SPF adhesion.
- SPF insulation shall be separated from occupied spaces by an approved thermal barrier in accordance with 2006 IRC Section R314.4.
- Drums or other containers of the polyol blend (a.k.a. B-Component, Resin Component or R-Component) shall include a green-colored label or tag which indicates the manufacturer, SPF tested density, and type (e.g., "Medium-Density, Closed-Cell Structural SPF Insulation"). This label will be detachable so that it may be included with the HERS rater's report.
- SPF insulation shall be installed in a manner such that the average thickness of the applied SPF will achieve the specified R-value of the assembly. Nominal thickness of the SPF insulation shall be such that (1) the average thickness is equal to or greater than that required to meet the design R-value of the assembly and (2) the minimum thickness shall be no more than ½ inch less than the required thickness for the R-value.
- The installer shall certify on forms CF-6R and IC-2 the R-value per inch and that the manufacturer's thickness to achieve the required R-value has been met.
- The HERS rater shall verify that the manufacturer's nominal insulation thickness has been installed and record the thickness on the CF-4R.

~~8~~7.4 Raised Floors and Floors Over Garages

~~8~~7.4.1 Raised Floors

SPF insulation shall be spray-applied to fully adhere to the substrate—usually the subfloor.

~~8~~7.4.2 Floors Over Garages

- There are two ways to insulate the floor over the garage:
  1. Insulate the floor over the garage by spraying SPF insulation to fully adhere to subfloor. . When this method is used the wall between the garage and the conditioned space (house) must be extended up to the subfloor. This extension must be sprayed with SPF insulation and fully air tight. When the subfloor is sprayed the area between the subfloor and garage ceiling is not a nonconditioned space. For this reason the garage must be fully separated from the conditioned space of the floor ceiling of the house which is a conditioned space.
  2. Insulate the rim joists and ceiling of the garage with SPF insulation. The insulation on the rim joists must touch the subfloor. In this scenario the area between the subfloor and the ceiling of the garage is a conditioned space.

~~8~~7.5 Wall Insulation

~~8~~7.5.1. SPF Application

- In wall stud cavities, SPF shall be applied to provide a substantially air-tight envelope to the outdoors, attic, garage and crawl space. Special attention shall be paid to plumbing and wiring penetrations through the top plates, electrical boxes that penetrate the sheathing, and the sheathing seal to the bottom plate.
- Installation shall uniformly cover the cavity side-to-side and top-to-bottom. An air space may be left between the surface of the SPF insulation and the sheathing/drywall provided the appropriate thickness of SPF has been applied to achieve the specified R-value.

~~8~~7.5.2 Narrow-Framed Cavities

- Non-standard width cavities shall be filled with SPF insulation at a depth consistent with the SPF thickness required to achieve the specified R-value. Overfilling is permitted provided any excess which would interfere with drywall or sheathing installation is trimmed or removed.
- Narrow spaces (two inches or less) at windows and door jambs shall be filled with minimally expansive foam.
- Narrow spaces (two inches or less) at corners or other non-opening details shall be filled with SPF or minimally expansive foam.

~~8~~7.5.3 Special Situations

~~8~~7.5.4 Installations Prior to Exterior Sheathing or Lath

- Hard to access wall stud cavities such as corner channels, wall intersections, and behind tub/shower enclosures shall be insulated to the proper R-value. This may have to be done prior to the installation of the tub/shower or the exterior sheathing or stucco lath.

~~8~~7.5.5 Obstructions / Wall Penetrations

- SPF insulation shall be spray-applied to fully adhere and seal around wiring and plumbing.
- SPF insulation shall be placed spray-applied to fully adhere and seal between the sheathing and the rear of electrical boxes and phone boxes.

- In cold climates, where water pipes may freeze (Climate Zones 14 and 16) pipes shall have at least two-thirds of the insulation between the water pipe and the outside. If the pipe is near the outside, as much insulation as possible shall be placed between the pipe and the outside and no insulation (minimal amounts of SPF overspray are acceptable) shall be allowed between the pipe and the interior wall.

~~8~~7.5.6 Rim Joists

- All rim-joists shall be insulated to the same R-Value as the adjacent walls.
- The insulation shall be installed without gaps.

~~8~~7.5.7 Kneewalls and Skylight Shafts

- All kneewalls and skylight shafts shall be insulated to a minimum of R-19 or a higher level as specified in the compliance documentation.
- The insulation shall be installed without gaps.
- For steel-framed kneewalls and skylight shafts, external surfaces of steel framing members shall be covered with SPF or rigid foam boardstock unless otherwise specified on the CF-1R using correct U-factors from Joint Appendix IV, Table IV-11R (or U-factors approved by the CEC Executive Director).
- The interior side of the SPF insulation is not required to be in contact with the drywall or other wall finish when the SPF is sprayed onto a backing board from the inside of the building and the top, bottom and sides of each frame assembly is sealed with the SPF.
- The SPF insulation shall be fully adhered and self-supporting so that it will remain in place.

~~8~~7.5.8 HVAC/Plumbing Closet

- Walls of interior closets for HVAC and/or water heating equipment that require combustion air venting, shall be insulated to the same R-value as the exterior walls.

~~8~~7.6 Ceiling and Roof Insulation

~~8~~7.6.1 General Requirements

- SPF insulation shall be spray-applied to fully adhere to the substrate (roof deck or ceiling).
- SPF insulation shall be spray-applied to fully adhere to the joist and other framing faces to form a complete air seal within the construction cavity.
- SPF insulation shall be installed in a continuous and fully adhered manner to form an air barrier.
- SPF insulation shall be spray-applied to fully adhere to and seal around wiring and plumbing.
- Hard covers or draft stops shall be placed over all drop ceiling areas and interior wall cavities to keep insulation in place and stop air movement. If hard covers or draft stops are missing or incomplete, they shall be completed before insulation is installed.
- In vented attics, required eave ventilation shall not be obstructed; the net free-ventilation area of the eave vent shall be maintained. (For unvented, conditioned attics refer to IRC 806 Section.6.1.2.4.)
- SPF insulation shall not be applied directly to recessed lighting fixtures. Recessed lighting fixtures must be either insulated by methods other than SPF (such as mineral fiber) or enclosed in a box fabricated from ½-inch plywood, 18 ga. sheet metal, 1/4-inch hard board or drywall. The exterior of the box may then be insulated with SPF. If the fixtures are not rated for insulation contact (IC) and air tight, the fixtures shall either be replaced or eliminated.
- All recessed light fixtures that penetrate the ceiling shall be IC and air tight (AT) rated and shall be sealed with a gasket or caulk between the housing and the ceiling.

~~8~~7.6.2 Rafter Ceilings

- SPF insulation shall be kept away from combustion appliance flues in accordance with flue manufacturers' installation instructions or labels on the flue.

* Note. An air space shall be maintained between the insulation and roof sheathing if required by California Building Code section 1505.3. Verify that the building official in your area permits SPF directly applied to the underside of the roof since this construction results in no ventilation layer.

78.6.3 HVAC Platform

- In vented attics, a minimum of 3 inches of SPF insulation shall be placed below any plywood platform or cat-walks for HVAC equipment and access to assure that the overall assembly meets the required values listed in the Compliance Documentation..
- SPF insulation shall be installed in a continuous and fully adhered manner to form an air barrier.

~~8~~7.6.4 Attic Access

- Apply a minimum of 3 inches of SPF insulation to the access door or permanently attach rigid foam with adhesive or mechanical fastener.. The compliance requirements shall be met with this insulation..

~~8~~7.6.5 Unvented-Conditioned Attics and Cathedral Ceilings

- Unvented-conditioned attics and cathedral ceilings are permitted when consistent with the provisions of 2006 IRC Section R806.
- In unvented-conditioned attics where entry is made for the service of utilities, SPF applied in direct contact with the underside of the roof deck will be protected from ignition in accordance with 2006 IRC Section R314.5.3.
- In cathedral ceilings where restricted spaces do not allow entry, SPF does not require protection from ignition.

~~8~~7.7 Materials

- Materials shall comply with Uniform Building Code (including, but not limited to, 1997 UBC Chapter 26) and installed to meet all applicable fire codes.
- Materials shall meet California Quality Standards for Insulating Material, Title 24, Chapter 4, Article 3, listed in the California Department of Consumer Affairs Consumer Guide and Directory of Certified Insulating Materials.
- Materials shall comply with flame spread rating and smoke density requirements of Section 2602 of the Title 24, Part 2.
- Materials shall be installed according to manufacturer specifications and instructions.

~~8~~7.8 Equipment

Probes: Insulation thickness measurements shall be accurate to within ± 1/8 inch.

~~8~~7.9 R-Value and U-Value Specifications

See CF-1R for minimum R-value requirements;

~~8~~7.10 Certificates

An Insulation Certificate (IC-2) signed by the SPF applicator shall be provided that states that the installation is consistent with the plans and specifications for which the building permit was issued. The certificate shall also state the installing company name, insulation manufacturer's name and material identification, the labeled R-value per

the manufacturer's Insulation Fact Sheet (consistent with FTC requirements), the installed nominal thickness as specified in Section 8.3, and the installed R-value. The SPF applicator shall also complete form CF-6R and attach a drum label/tag or a manufacturer's coverage chart for every insulation material used.

~~8~~7.11 Certificates and Availability

The SPF Insulation Certificate (SPFIC) with the drum or container label attached and the CF-6R Installation Certificate, signed by the SPF applicator, shall be available on the building site for each of the HERS rater's verification inspections. Note: The HERS rater cannot verify compliance credit without these completed forms.

SPF INSULATION CERTIFICATE

In order to comply with the State of California building code, this Certificate along with the CF-6R Installation Certificate must be filled out by the SPF Applicator and posted on the jobsite near the electrical panel for the HERS rater. The HERS rater cannot verify insulation compliance without the information provided on this Certificate. DO NOT REMOVE from jobsite until Certificate of Occupancy has been issued.

Jobsite Location _____ Building Permit No. _____

Builder/General Contractor _____

SPF Application Company _____ Phone _____

Name of person filling out this form (please print) _____

Date(s) of SPF application _____

SPF insulation manufacturer (Name and primary location) _____

Product(s) installed _____

Building Assembly Insulated	Nominal SPF Thickness (inches)	R-Value per inch	Average R-Value
Floor			
Walls			
Attic Floor			
Roof (unvented conditioned attics)			
Crawlspace Perimeter			
Basement Walls			

Declaration: To the best of my knowledge, the above information accurately represents the SPF insulation installed in the above referenced project and that this SPF insulation was installed in a workmanlike manner consistent with the plans and specifications for which the building permit was issued.

Signed_____

SPF Applicator Authorized Representative

Date _____

ATTACH SPF DRUM OR CONTAINER LABEL / TAG HERE