

TECHNICAL BULLETIN — Residential Building Products

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Johns Manville SPIDER® Custom Spray Insulation as an Ignition Barrier

JM Spider® Insulation can be used as the ignition barrier over spray polyurethane foam (SPF) in vertical and overhead applications such as conditioned attics, SPF insulated or foam sheathed kneewalls and ICF walls in basements and crawlspaces.

Within an attic or crawl space, the International Building Code recognizes 1.5" of mineral fiber (including fiber glass insulation) as an acceptable ignition barrier over foamed plastic¹. Testing was conducted at Southwest Research Institute (SwRI) on JM Spider Insulation to confirm that it provides acceptable ignition barrier performance.

Testing per the SwRI-99-02 Attic/Crawl Space criteria, ASTM E-84 tunnel test and the ASTM E-136 non-combustibility test demonstrate that Spider Insulation at 1.8 pcf density and ≥ 2 " thickness meets the International Building Code and ICC ES criteria for use as an ignition barrier over foamed plastic.

Background

Spray foam insulation is often applied to the underside of the residential roof deck in an unvented cathedral attic². This practice is commonly referred to as either a "conditioned attic" or a "sealed attic". Spray polyurethane foam properly used in this application has been proven to provide energy efficient buildings especially when a significant portion of the HVAC ducting is in the attic space. This conditioned attic practice is popular in the southern states (zones 1-3) using open cell spray polyurethane foam. It is gaining acceptance in the colder climates using closed cell spray polyurethane foam.

The current International Building Code (IBC) requires spray polyurethane foam to be separated from the building occupants with a 15 minute thermal barrier (e.g. 1/2" gypsum wall board) or in attics and crawl spaces by an ignition barrier^{1,3}.

In order to evaluate the performance of JM Spider Insulation as an ignition barrier over foamed plastics, three different test methods were used. The first is the simulated Attic/Crawl Space Test conducted in accordance with SwRI-99-02 criteria. The second is the ASTM E-84 tunnel test and the third is the ASTM E-136 non-combustibility test.

JM Spider Ignition Barrier over SPF - Test Results

The SwRI-99-02 method is the criteria used for building code compliance by the ICC Evaluation Service. A snapshot of the attic/crawl space testing⁴ recently conducted per the SwRI-99-02 method is presented in the Table 1. These results represent relative rankings based on the test method. A result is considered a pass per the ICC ES criteria if the flashover and burn through times are greater than the baseline structure insulated with kraft faced fiberglass batts in both the wall and deck cavities.

Table 1: Attic / Crawl Spaced Tests per SwRI-99-02

Substrate Structure	Framing	Wall & Deck FG batts	SPF on Walls	SPF on Deck	Ignition Barrier (IB) Topcoat - over spray foam	Flashover Time	Burn Through Time
BASELINE	Walls 2x4 Joists 2x8	3.5" kraft faced R13	None	none	none	2:11	9:03
Bare Wood	Walls 2x4 Joists 2x8	none	None	none	none	4:57	9:18
FSK 25 Insulation	Walls 2x4 Joists 2x8	3.5" FSK25 faced batts R13	None	none	none	6:42	11:21
ICC ES approved 0.5 pcf SPF Assembly I	Walls 2x4 Joists 2x8	none	0.5 pcf at 3.5"	0.5 pcf at 6"	Coating I applied to walls only at 1.5 gal/100sf	2:58	10:48
ICC ES approved 0.5 pcf SPF Assembly II	Walls 2x6 Joists 2x12	none	0.5 pcf at 5.5"	0.5 pcf at 10"	Coating II applied to walls only at 1.5 gal/100sf	2:06	10:29
Spider IB over SPF	Walls 2x4 Joists 2x8	none	1.9 pcf at 1"	1.9 pcf at 2"	JM Spider 2.5" on walls and 4" on deck	4:57	15:56
Spider IB over SPF	Walls 2x6 Joists 2x12	none	0.5 pcf at 2"	0.5 pcf at 2"	JM Spider 3.5" on walls and 8" on deck	6:24	16:09
Spider IB over SPF	Walls 2x6 Joists 2x12	none	0.5 pcf at 2"	0.5 pcf at 8"	JM Spider 3.5" on walls and 2" on deck	5:54	>20

JM Spider Insulation applied at standard 1.8 pcf density passes the SwRI-99-02 Attic/Crawl Space criteria and provides equal or more time to flame flashover than the baseline control, bare wood, SPF insulated substrates, and SPF insulation coated with accepted intumescent ignition barriers. These SwRI-99-02 results clearly demonstrate that Spider Insulation applied over SPF insulation significantly increase the flashover time and deck burn through time as compared to foam only insulated structures. Pictures of some of the test results are included on the last two pages of this bulletin.

ASTM E-84 tunnel and ASTM E-136 non-combustibility results^{5,6} as tested by SwRI® are summarized in Table 2. The results indicate that Spider Insulation applied over SPF provides ASTM E-84 surface burning characteristics of Flame Spread / Smoke Developed of 10/20 and passes the non-combustibility requirements of ASTM E-136.

Table 2: ASTM E-84 Tunnel and ASTM E-136 Non-Combustibility Results

ASTM E-84	5" thick 0.5 pcf SPF Insulation only	FS/SD 25/550
ASTM E-84	5" thick 0.5 pcf SPF Insulation painted w/ Intumescent IB Coating I at 1.5 gal/100sf	FS/SD 15/630
ASTM E-84	3" thick 0.5 pcf SPF Insulation covered with 2" thick 1.8 pcf Spider Insulation	FS/SD 10/20
ASTM E-136	1.8 pcf Spider Insulation	Pass

Conclusion and Recommendation

The test results indicate that JM Spider Insulation applied at standard 1.8 pcf density and a thickness of 2" or more provides an acceptable ignition barrier for use over both open cell and closed spray polyurethane foam (SPF) insulation.

Insulation contractors should get pre-approval from their local code inspector prior to using JM Spider Insulation as the ignition barrier.

¹IBC Section 2603.4.1.6 Attics and crawl spaces.

Within an attic or crawl space where entry is made only for service of utilities, foam plastic insulation shall be protected against ignition by 1.5-inch-thick (38 mm) mineral fiber insulation; 0.25-inch-thick (6.4 mm) wood structural panel, particleboard or hardboard; 0.375-inch (9.5 mm) gypsum wallboard, corrosion-resistant steel having a base metal thickness of 0.016 inch (0.4 mm) or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction.

²Understanding Attic Ventilation, BSD-102,
<http://www.buildingscience.com/documents/digests/bsd-102-understanding-attic-ventilation/>

³IBC Section 2603.4 Thermal barrier.

Except as provided for in Sections 2603.4.1 and 2603.8, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 0.5-inch (12.7mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with Section 717.

⁴Samples prepared, tested and reported by SwRI® per Project No. 01.12703.01.216.

⁵ASTM E-84 samples prepared, tested and reported by SwRI® per Project No. 01.13536.01.013.

⁶ASTM E-136 samples prepared, tested and reported by SwRI® per Project No. 01.13544.01.301.

Baseline – Kraft faced R13 insulated ceiling and walls (Note the time clock on right)



Bare Wood - No insulation in wood ceiling and gypsum/wood walls



0.5 pcf SPF with Ignition Barrier Coating I on walls
(An ICC-ES Approved Configuration)



JM SPIDER™ Insulation at 1.8 pcf density over SPF

