



## Code Compliance Research Report

**Subject:** Alternative Assembly to Thermal Barrier Requirement

**Date:** December 27, 2010

**Materials:**

1. NCFI Polyurethanes InsulStar® Closed-Cell Spray Polyurethane Foam (SPF)
2. International Fireproof Technology DC 315 Fireproof Paint

**Test Standard:** NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

### Summary:

Based on the test data submitted and the reference documents, NCFI InsulStar spray polyurethane foam at a maximum thickness of 5.5 inches, coated with a minimum application of 21 wet mils (or 14 dry mils) of DC 315 coating qualifies under 2006 IBC, 2006 IRC, 2009 IBC and 2009 IRC as an alternative assembly to covering the foam plastic with a thermal barrier.

### Labeling Requirements:

R-component for InsulStar insulation must be identified with the manufacturer's name (NCFI Polyurethanes), address and telephone number; the name of the insulation product (InsulStar); the flame spread and smoke developed indices; and the name of the third-party inspection agency (PRI Construction Materials Technologies, LLC).

### Discussion:

The 2009 IBC and IRC (and earlier editions) require that unless otherwise allowed, "foam plastic shall be separated from the interior of a building by an approved thermal barrier of minimum ½ inch (12.7 mm) gypsum wallboard or an approved finish material equivalent to a thermal barrier that will limit the average temperature rise of the unexposed surface to no more than 250°F (139°C) after 25 minutes of fire exposure complying with the ASTM E 119 or UL 263 standard time temperature curve. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on NFPA 286 with the acceptance criteria of Section R302.9.4, FM 4880, UL 1040 or UL 1715." [Quoted here from 2009 IRC, Section R316.4.]

The building codes permit alternative assemblies to the above quoted thermal barrier requirements under 2009 IBC Section 2603.9 Special Approval and 2009 IRC Section R316.6 Specific Approval. In essence, these sections permit approval based on the NFPA 286 test (and others) related to actual end-use configurations. Since NFPA 286 does not provide a pass/fail acceptance criteria, the code specifically provides that the test must pass in accordance with the acceptance criteria in 2009 IBC Section 803.1.2.1 or 2009 IRC Section R302.9.4. (Note: 2009 IBC actually references the NFPA 286

acceptance criteria in Section 803.2, but this is a typographical error due to section renumbering of the 2006 IBC; 803.1.2.1 is the intended section.)

2009 IBC 803.1.2.1 reads as follows:

**803.1.2.1 Acceptance criteria for NFPA 286.** During the 40 kW exposure, the *interior finish* shall comply with Item 1. During the 160 kW exposure, the *interior finish* shall comply with Item 2. During the entire test, the *interior finish* shall comply with Items 3 and 4.

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. During the 160 kW exposure, the *interior finish* shall comply with the following:
  - 2.1. Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
  - 2.2. Flashover, as defined in NFPA 286, shall not occur.
3. The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.
4. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m<sup>2</sup>.

IRC R302.9.4 provides for the same NFPA 286 acceptance criteria except that Item 3 (peak rate of heat release) is omitted. Therefore, the IBC is the more stringent standard: if the acceptance criteria of the IBC is met, so will the acceptance criteria of the IRC.

The referenced materials were tested as a system in accordance with NFPA 286 at Intertek and reported in the report listed in the Reference Documents. The following table compares the results of that testing with the NFPA 286 acceptance criteria of 2009 IBC Section 803.1.2.1:

Criteria	Test Result	Pass/Fail
During the 40kW exposure, flames shall not spread to the ceiling.	Negative	Pass
During the 160 kW exposure, flame shall not spread to the outer extremity of the sample on any wall or ceiling.	Negative	Pass
During the 160 kW exposure, flashover, as defined in NFPA 286, shall not occur	Negative	Pass
The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.	~265 kW	Pass
The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m <sup>2</sup>	170 m <sup>2</sup>	Pass

## **Conclusions:**

NCFI's InsulStar closed-cell at a maximum thickness of 5.5 inches, SPF coated with a minimum of 21 mils wet film thickness or 14 mils dry film thickness of International Fireproof Technology DC 315 Fireproof Paint **qualifies** under the 2006 and 2009 International Building Code and the 2006 and 2009 International Residential Code as an alternative assembly to those requiring a thermal barrier as provided under 2009 IBC 2603.9 Special Approval and 2009 IRC R316.6 Specific Approval.

Respectfully submitted,  
Deer Ridge Consulting, Inc.

Roger V. Morrison, PE, RRC  
President

## **Reference Documents:**

1. 2009 International Building Code: Sections 803.1.2.1; 2603.4; 2603.9.
2. 2009 International Residential Code: Sections R302.9.4; R316.4; R316.6.
3. 2006 International Building Code: Sections 803.2.1; 2603.4; 2603.9.
4. 2006 International Residential Code: Sections R315.4; R314.4; R314.6.
5. Intertek Test Report No. 100220209SAT-002B, November 22, 2010.
6. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.