Code Compliance Research Report
CCRR-0490

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 21 00 – Thermal Insulation
Section: 07 21 19 – Foamed-In-Place Insulation

REPORT HOLDER:
Nu-Wool Co., Inc.
2477 Port Sheldon St.
Jenison, MI 49428
(616) 669-0100
www.nuwool.com

REPORT SUBJECT:
Nu-Seal 0.5, Nu-Seal 2.0 HFO and Nu-Seal Plus Spray-applied Polyurethane Foam Plastic Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

- 2021, 2018, and 2015 *International Building Code®* (IBC)
- 2021, 2018, and 2015 *International Residential Code®* (IRC)
- 2021, 2018, and 2015 *International Energy Conservation Code®* (IECC)

NOTE: This report references the most recent edition of the Codes cited. Section numbers for earlier Code editions may differ.

1.2 The insulations have been evaluated for the following properties (see Table 1):

- Physical properties
- Surface-burning characteristics
- Thermal resistance
- Air permeance
- Vapor permeance

1.3 The insulations have been evaluated for the following uses (see Table 1):

- Use as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings and the underside of roofs
- Alternative to Code-prescribed thermal barriers
- Alternative to Code-prescribed ignition barriers
- Use as a water-resistive barrier
- Use in Types I, II, III, IV, and V construction (IBC) and buildings regulated under the IRC

2.0 STATEMENT OF COMPLIANCE

Nu-Seal 0.5, Nu-Seal 2.0 HFO, and Nu-Seal Plus insulations comply with the Codes listed in Section 1.1, for the properties stated in Section 1.2, and uses stated in Section 1.3, when installed as described in this report, including the Conditions of Use stated in Section 6.0.

3.0 DESCRIPTION

3.1 Nu-Seal 0.5: The insulation has a nominal in-place density of 0.45 pcf. The insulation is produced in the field by combining a polymeric isocyanate (A component) with a resin (B component). The insulation liquid components are supplied in 55-gallon drums and must be stored at temperatures between 50°F and 80°F. The resin (B component) must be protected from freezing temperatures. The A components have a shelf life of twelve months and B components have a shelf life of six months when stored in factory-sealed containers at these temperatures.

3.2 Nu-Seal 2.0 HFO and Nu-Seal Plus: The insulations are two-component, closed cell, spray-applied polyurethane foam plastics, having a nominal in-place density of 2.0 pcf. The insulations are produced in the field by combining a polymeric isocyanate (A component) with a resin (B component). The insulation liquid components are supplied in 55-gallon drums and must be stored at temperatures between 50°F and 80°F. The resin (B component) must be protected from freezing temperatures. The A components have a shelf life of twelve months and B components have

a shelf life of six months when stored in factory-sealed containers at these temperatures.

3.3 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by International Fireproof Technology, Inc., is a water-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of 24 months when stored in factory-sealed containers at a temperature between 41°F and 95°F. DC315 complies with ICC-ES AC456 and is recognized in ICC-ES ESR-3702.

3.4 No Burn Plus ThB Intumescent Coating: No Burn Plus ThB intumescent coating, manufactured by No Burn, Inc., is a water-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of one year when stored in unopened containers at a temperature between 40°F and 90°F. No Burn Plus ThB complies with ICC-ES AC456 and is recognized in IAPMO ER-0305.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface-burning Characteristics: The insulations, at a maximum thickness of 4 inches and the nominal density stated in Section 3.1 of this report, have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Based on large scale tests in accordance with NFPA 286 and ICC-ES AC377 Appendix X, the insulation can be installed at greater thicknesses as described in Sections 5.3 and 5.4. When the insulations are separated from the interior occupied space of the building with minimum 1/2-inch-thick gypsum board, the maximum insulation thickness is not limited. Under the IRC, a thermal barrier of minimum 23/32-inch-thick wood structural panel is also permitted, and the maximum insulation thickness is not limited.

4.2 Thermal Resistance: The insulations have a thermal resistance, *R*-value, as shown in Table 2.

4.3 Air Permeability: The insulations, at a minimum thickness of 3 inches for Nu-Seal 0.5 and at a minimum thickness of 2-3/16 inches for Nu-Seal 2.0 HFO and Nu-Seal Plus are considered air-impermeable insulation in accordance with IBC Section 1202.3 or IRC Sections R202 and R806.5 and are considered air barrier materials complying with IECC Section C402.5.1.3 based on testing in accordance with ASTM E2178.

4.4 Vapor Permeance: Nu-Seal 2.0 HFO and Nu-Seal Plus insulations, at a minimum thickness of 2.2 inches, have a vapor permeance no greater than 1.0 perm (5.7×10^{-11} kg/Pa-s-m^2) and may be used where a Class II vapor retarder is required by the applicable Code.

4.5 Water-resistive Barrier: Nu-Seal 2.0 HFO and Nu-Seal Plus insulations may be used as a water-resistive barrier as required by IBC Section 1403.2 and IRC Section R703.2 when spray-applied to the exterior side of exterior sheathing, masonry or other suitable exterior wall substrates to form a continuous layer of 1 inch minimum thickness. All construction joints and penetrations must be sealed with the insulation. The insulation must be covered with an exterior wall covering within the time specified in the manufacturer's installation instructions.

5.0 INSTALLATION

5.1 General: The insulations must be installed in accordance with the manufacturer's published installation instructions, the applicable Code, and this Research Report. A copy of the manufacturer's instructions must be available on the jobsite during installation.

5.2 Application: The insulations are spray-applied on the jobsite using a volumetric positive displacement pump as identified in the manufacturer's application instructions. The insulations must be applied when the ambient temperature is greater than 32°F. The insulations must not be used in areas that have a maximum in-service temperature of greater than 180°F. The insulations must not be used in electrical outlet or junction boxes or in contact with water, rain, or soil. The insulations must not be sprayed onto a substrate that is wet or covered with frost or ice, loose scales, rust, oil, or grease. The insulations must be protected from the weather during and after application. Nu-Seal 0.5 is applied in passes a minimum of 3 inches thick and a maximum of 14 inches thick. Nu-Seal 2.0 HFO is applied in passes a minimum of 1/2 inch thick and a maximum of 2 inches thick. Nu-Seal Plus is applied in passes a minimum of 1/2 inch thick and a maximum of 3 inches thick.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: The insulations must be separated from the interior living space of the building by an approved thermal barrier of 1/2-inch-thick gypsum board or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as applicable. Exceptions are provided in Sections 5.3.2 and 5.4.

When the insulations are separated from the interior living space of the building with minimum 1/2-inch-thick gypsum board, the maximum thickness is not limited. Under the IRC, a thermal barrier of 23/32-inch-thick wood structural panel is also permitted, and the maximum insulation thickness is unlimited.

5.3.2 Application without a Prescriptive Thermal Barrier: The insulations may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in the following options:

- Nu-Seal 0.5 must be a maximum of 8-1/2 inches on walls and 14 inches on ceilings and be covered on all surfaces with No Burn Plus ThB applied at 14 wet mils (0.90 gal/100 ft^2)
- Nu-Seal 2.0 and Nu-Seal Plus must be a maximum of 8 inches on walls and 12 inches on ceilings and be covered on all surfaces with either DC315 applied at 16 wet mils (1.01 gal/100ft^2) or No Burn Plus ThB applied at 14 wet mils (0.87 gal/100 ft^2)
- Nu-Seal 0.5 must be a maximum of 8 inches on walls and 14 inches on ceilings and be covered on all surfaces with DC315 applied at 21 wet mils (1.31 gal/100 ft^2)

The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with adhesion of the coating. The coating is applied with low-pressure airless spray equipment.

5.4 Attics and Crawl Spaces: The insulations may be applied in attics and crawl spaces as described in either 5.4.1 or 5.4.2. When the insulation is installed in an attic or crawlspace in accordance with this section, a thermal barrier is not required between the insulation and the attic or crawl space but is required between the insulation and the interior living space. Attics and crawl spaces must be ventilated in accordance with the applicable Code.

5.4.1 Application with a Prescriptive Ignition Barrier: When the insulations are installed within attics and crawl spaces where entry is made only for service of utilities, the ignition barrier must be installed in accordance with IBC Section 2603.4.1.6, or IRC Section R316.5.3 or R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable Code and must be installed in a manner so the foam plastic insulation is not exposed.

5.4.2 Application without a Prescriptive Ignition Barrier: The insulations may be installed in attics and crawl spaces without the ignition barrier prescribed in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, subject to the following conditions:

a. Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
b. There are no interconnected attic or crawl space areas.
c. Air in the attic or crawl space is not circulated to other parts of the building.
d. Under-floor (crawl space) ventilation is provided when required by IBC Section 1202.4 or IRC Section R408.1, as applicable.
e. Attic ventilation is provided when required by IBC Section 1202.2.1 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with IBC Section 1202.3 or IRC Section R806.5.
f. Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701.

The insulations may be spray-applied to the underside of the roof sheathing and/or rafters in attics; the underside of wood floors in crawl spaces; and to vertical surfaces in both attics and crawl spaces, as described in this section.

The thickness of Nu-Seal 0.5 insulation applied to the underside of horizontal surfaces must not exceed 14 inches, and to vertical surfaces must not exceed 8-1/2 inches. The insulation must be covered on all exposed surfaces with DC315 intumescent coating at a nominal thickness of 6 wet mils (0.38 gal/100 ft^2). The coating is applied with low-pressure airless spray equipment in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other

substances that could interfere with the adhesion of the coating.

The thickness of Nu-Seal 2.0 HFO or Nu-Seal Plus insulation applied to the underside of horizontal surfaces must not exceed 12 inches, and to vertical surfaces must not exceed 8 inches.

The insulation may be installed without the prescriptive ignition barrier required by IBC Section 2603.4 and IRC Section R316.5.3 or a protective coating.

5.4.3 Unvented Attics: End use configuration testing (per IBC Section 2603.9 and IRC Section R316.6) and analysis were conducted to qualify the use of Nu-Seal 0.5 insulation without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with IBC Section 1202.3 or IRC Section R806.5. The testing and analysis are described in Intertek Report 104294990SAT-010, dated July 31, 2020. The conclusions of that evaluation are as follows: When the insulation is applied in unvented attics conforming to IBC Section 1202.3 or IRC Section R806.5, the insulation may be applied to the underside of roof sheathing and/or rafters, and to vertical surfaces to a minimum thickness of 3-1/2 inches. Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 16 inches. The insulation may be left exposed to the attic without a prescriptive ignition barrier or an intumescent coating. The attic must have attic access complying with IRC Section R807, horizontally placed in the attic floor and opening outward toward the living space. For items penetrating the roof deck or walls, such as skylight wells or vents, the annular space must be covered with a minimum of 3 inches of insulation.

5.4.4 Use on Attic Floors: Nu-Seal 0.5 may be applied between and over the joists in attic floors to a maximum thickness of 8-1/2 inches and must be covered with DC315 intumescent coating as described in Section 5.4.2.

Nu-Seal 2.0 HFO and Nu-Seal Plus may be applied between and over the joists in attic floors to a maximum thickness of 12 inches. The insulation may be installed without the prescriptive ignition barrier required by IBC Section 2603.4 and IRC Section R316.5.3, or a protective coating.

The insulation must be separated from the interior occupied space by an approved thermal barrier.

5.5 Use in Types I, II, III, and IV Construction:

5.5.1 Nu-Seal 0.5: When used in exterior walls of Type I, II, III, or IV construction, the assembly must comply with IBC Section 2603.5 and this section. Intertek Design Listing NWC/FI 30-01 describes the assembly tested and certified by Intertek as complying with NFPA 285. The potential heat of the foam plastic is 534 Btu/ft^2 per inch of insulation thickness with a maximum permitted thickness of 6 inches.

Details of exterior wall coverings and fenestration details must be provided to the building official along with an engineering analysis demonstrating that the addition of the wall covering and fenestration details will not negatively impact conformance of the assembly with the requirements of IBC Section 2603.5.

5.5.2 Nu-Seal 2.0 HFO and Nu-Seal Plus: The insulations may be installed in exterior walls of buildings of Types I, II, III, and IV construction complying with IBC Section 2603.5 and as described in this section. Intertek Design Listings NWC/FI 30-02 and NWC/FI 30-03 describe the assemblies tested and certified by Intertek as complying with NFPA 285, including extensions for various wall constructions determined through engineering analysis. The potential heat the foam plastic in any portion of the wall must not exceed 6448 Btu/ft^2.

6.0 CONDITIONS OF USE

6.1 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict, this report governs.

6.2 The insulations must be separated from the interior occupied space of the building by a thermal barrier as described in Section 5.3, except as described in Section 5.3.2 and 5.4.

6.3 The insulations must not exceed the thicknesses noted in Sections 4.1, 5.3, and 5.4, as applicable.

6.4 When Nu-Seal 0.5 insulation is installed under the conditions of Section 5.4.3 of this report, the following conditions apply:

6.4.1 Since the performance of the insulation, when installed in unvented attics without a Code-prescribed ignition barrier or an intumescent coating, is based on fire performance of an unvented attic, the installation must be approved by the Code official. The installation must conform with the provisions of Section 5.4.3 and Conditions a through c, and Condition f of Section 5.4.2. A copy of the Intertek report (referenced in Section 7.0) must be provided to the Code official upon request.

6.4.2 Signage shall be permanently affixed in the attic and shall be visible from all points within the attic. The sign shall state “Caution, this is an unvented attic by design. No modification may be made to this unvented condition. The attic shall not be vented. Holes into the unvented attic shall be immediately repaired and sealed. Penetrations of the ceiling or wall membrane between the unvented attic and living space, other than the horizontal access hatch, must be protected in an approved manner. This unvented attic shall not be used for storage. See Intertek Code Compliance Research Report CCRR-0490 on the Intertek Website.”

6.5 Use of the insulations in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or IBC Section 2603.8, as applicable.

6.6 Walls must include a vapor retarder complying with the Code.

6.7 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10, N1101.14, and IECC Sections C303.1 or R303.1 and R403.1, as applicable.

6.8 The insulations are manufactured under a quality control program with inspections by Intertek Testing Services NA, Inc.

7.0 SUPPORTING EVIDENCE

7.1 Reports of tests in accordance with ASTM E84, ASTM E96, ASTM E970, ASTM E2178, NFPA 259, NFPA 285, NFPA 286, and UL 1715.

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated April 2020, including reports of tests in accordance with Appendix X.

7.3 Data in accordance with ICC 1100 (2019).

7.4 Research Reports for evaluation of data in accordance with ICC-ES Acceptance Criteria for Fire-protective Coatings Applied to Spray-applied Foam Plastic Insulation Installed without a Code-prescribed Thermal Barrier (AC456), dated October 2015.

7.5 Intertek Listing Report "Nu-Wool Nu-Seal 0.5, Nu-Seal 2.0 HFO and Nu-Seal Plus Spray-applied Polyurethane Foam Plastic Insulation", on the Intertek Directory of Building Products.

8.0 IDENTIFICATION

The A and B components of the insulations described in this Research Report are identified with the report holder’s name, address and telephone number; the product name; use instructions; the flame-spread and smoke-developed indices; the lot number; the Intertek Mark as shown below; and the Code Compliance Research Report number (CCRR-0490).



9.0 OTHER CODES

This section is not applicable.

10.0 CODE COMPLIANCE RESEARCH REPORT USE

10.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

10.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

10.3 Reference to the https://bpdirectory.intertek.com is recommended to ascertain the current version and status of this report.

TABLE 1 - PROPERTIES EVALUATED

PROPERTY	2021 IBC SECTION[1]	2021 IRC SECTION[1]	2021 IECC SECTION[1]
Physical properties	2603.1.1	Not required	Not required
Surface-burning characteristics	2603.3	R316.3	Not applicable
Thermal barrier/ignition barrier	2603.4	R316.4	Not applicable
Air permeability	1202.3	R806.5	C402.5 R402.4
Vapor permeance	202, 1404.3	R202, R702.7.1	Not applicable
Thermal resistance	1301	N1101.10 N1102	C303.1 R303.1
Water-resistive barrier	1403.2	R703.2	Not applicable

[1] Section numbers may be different for earlier versions of the International Codes.

TABLE 2 - THERMAL RESISTANCE – R-VALUE (°F.ft².h/Btu)

THICKNESS (inches)	NU-SEAL 0.5	NU-SEAL 2.0 HFO and NU-SEAL PLUS
1	3.9	6.7
2	7.5	14
3	11	21
3.5	13	24
4	15	28
6	22	41
8	29	55
10	36	69
12	44	83
14	51	--

[1] R-values are calculated based on tested K-values at 1-inch and 4-inch thicknesses.
[2] R-values greater than 10 are rounded to the nearest whole number.
[3] To determine R values for thickness not listed:
a. Between 1 inch and 4 inches is determined through linear interpolation or
b. For Nu-Seal 0.5, greater than 3.5 inches is calculated based on R=3.64
c. For Nu-Seal 2.0 HFO and Nu-Seal Plus, greater than 4 inches is calculated based on R= 6.9/inch