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INSULSTAR® SMARTSPF™
INSULBLOC® SMARTSPF™
INSULSTAR® 1.7SMARTSPF™
INSULSTAR® OPTIMAXX
INSULBLOC® OPTIMAXX AND
INSULSTAR® 1.7 OPTIMAXX
SPRAY POLYURETHANE FOAM
INSULATION SYSTEMS

CSI Section:

07 21 19 Foamed-in-Place Insulation

1.0 RECOGNITION

InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx Spray Polyurethane Foam Insulation Systems as described in this report have been evaluated for use as thermal insulation. The physical properties, thermal resistance, surface burning characteristics, air permeability, water resistance, fire-resistance rating, attic and crawl space installations, and application in Type V construction and in exterior walls of Types I-IV construction. The products were evaluated for compliance with the following codes:

- 2021, 2018, 2015, and 2012 International Building Code® (IBC)
- 2021, 2018, 2015, and 2012 International Residential Code® (IRC)
- 2021, 2018, 2015, and 2012 International Energy Conservation Code® (IECC)

2.0 LIMITATIONS

Use of the InsulStar®SmartSPF™, InsulBloc®SmartSPF™, and InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx Spray Polyurethane Foam Insulation Systems described in this report is subject to the following limitations:

2.1 The insulation shall be installed in accordance with the manufacturer's published installation instructions, this evaluation report, and the applicable code. If there are any conflicts between the manufacturer's published installation instructions and this report, the more restrictive shall govern.

2.2 In accordance with Sections 4.6.2 and 4.6.3 of this report, the insulation shall be separated from the interior of the

building by a code-complying thermal barrier or ignition barrier as appropriate.

2.3 The insulation shall not exceed the nominal density and thickness for the installation conditions described in this report.

2.4 The insulation shall be installed by professional spray polyurethane foam installers approved by NCFI Polyurethanes or by the Spray Polyurethane Foam Alliance.

2.5 Use of the insulation in areas of "very heavy" termite infestation probability shall be in accordance with 2021, 2018, and 2015 IBC Section 2603.8, 2012 IBC Section 2603.9, or IRC Section R318.4, as applicable.

2.6 Labeling and job site certification of the insulation and coatings shall comply with the following code sections as applicable:

- 2021, 2018, 2015, or 2012 IBC Section 2603.2
- 2018, 2015, or 2012 IRC Section R316.2
- 2021, 2018, or 2015 IRC Section N1101.10.1.1
- 2012 IRC Section N1101.12.1.1
- 2021, 2018, 2015, or 2012 IECC Sections C303.1.1.1 or R303.1.1.1

2.7 InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx are produced by NCFI Polyurethanes in Mount Airy, North Carolina, and Missouri City, Texas.

3.0 PRODUCT USE

3.1 Thermal Insulation. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx are non-structural, closed-cell, spray-applied, polyurethane foam plastic insulations complying with IBC Section 2603, IRC Section R316, and IECC Sections C303, C402, R303, and R402. When installed in accordance with Section 4.0 of this report, the foam plastic insulation may be used in wall cavities, floor assemblies or ceiling assemblies, and in attics and crawl spaces as nonstructural thermal insulation material. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx insulation are used in Type V construction under the IBC and in one- and two-family dwellings under the IRC. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx insulation may also be used in Types I, II, III, or IV construction when installed in accordance with Section 4.7 of this report.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.

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3.2 Dampproofing and Waterproofing. The InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx, and InsulBloc® Optimaxx insulations may be installed on the exterior side of the foundation walls and the underside of on-grade slabs. The InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx or InsulBloc® Optimaxx may be used as waterproofing as required in IBC Sections 1805.2.2 or 1805.3.2, and IRC Sections R406.1 or R406.2 when installed as described in UES ER-340.

4.0 PRODUCT DESCRIPTION

4.1 General: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx are two-component, spray-applied, closed-cell, polyurethane foam plastic insulations. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx and InsulBloc® Optimaxx have a nominal core density of 2.0 lb/ft³ (32 kg/m³) and InsulStar®1.7SmartSPF™ and InsulStar®1.7 Optimaxx have a nominal core density of 1.7 lb/ft³ (27 kg/m³). The foam plastic insulation is generated by combining the isocyanate (NCFI A2-000 series A-component) and a polymeric resin (InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx series B-component) through a dual component, volumetric, positive-displacement proportioner, on-site, in a one-to-one volumetric ratio as specified in the manufacturer's installation instructions. When tested in accordance with the EPA-537 method, these foams returned No Detections for PFAS.

All materials recognized in this report shall be stored in their original containers which shall be kept out of direct sunlight and away from heat and moisture. When stored unopened and indoors at a temperature between 50°F (10°C) and 80°F (27°C), the shelf life for InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx is 6 months.

4.2 Thermal Resistance (R-Values): Spray-applied polyurethane foam plastic insulation has thermal resistance (R-Value) at a mean temperature of 75°F (24°C) as shown in Table 1 of this report.

TABLE 1 - InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx THERMAL RESISTANCE (R-Value) ¹	
Thickness ² (Inch)	R-Value (°F•ft²•hr/Btu)
1.0	7.1
2.0	14
3.0	20
3.5	23
4.0	27
4.5	30
5.5	37
6.0	40
7.0	47
8.0	53
9.0	60

¹ R-values are calculated based on the k-factor test results at 1- and 3.5-inch thicknesses and rounded to the nearest whole number.

² 1 inch = 25.4 mm; and 1°F•ft²•hr/Btu = 0.176110 K•m²•hr/W.

4.3 Surface Burning Characteristics: At a maximum thickness of 4 inches (102 mm) and a nominal density of 2.0 lb/ft³ (32.0 kg/m³), the InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx spray-applied polyurethane foam plastic insulations 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. Greater thicknesses, depending on the end-use, are recognized as noted in Section 4.6 of this report.

4.4 Water Vapor Resistance: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx have a vapor permeance of less than 1 perm (57 ng/Pa-s-m²) at a thickness of 1.7 inches (43 mm) when tested per ASTM E96 Procedure A and qualify as a Class II vapor retarder as defined in IBC Section 202 or IRC Section R202.

4.5 Air Permeability: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx, when tested per ASTM E2178 at a thickness of 0.5 inches (12.7 mm) and a pressure differential of 75 Pa, qualify per 2021, 2018, and 2015 IBC Section 202 or IRC Section R202 as an air-impermeable insulation for use in unvented attics and cathedral ceilings.

4.6 Installation

4.6.1 General: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, and InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx shall not be applied to areas where the maximum service temperature is greater than 180°F (82°C). InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx shall be applied to



substrates that are clean, dry, and free from frost, ice, loose debris, or contaminants that will interfere with the adhesion of the spray foam insulation. The foam shall not be applied in electrical outlets, in junction boxes, to substrates over 120°F (49°C), or in direct contact with water. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx may be applied in passes of uniform thickness from a minimum of ½ inch (12.7 mm) to a maximum of 4 inches (101 mm) per pass. The maximum total thickness shall be as specified in Sections 4.6.2, 4.6.3, and 4.7 of this report, as applicable.

4.6.2 Thermal Barrier

4.6.2.1 General: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx shall be separated from the interior of the building with a thermal barrier except as specifically excluded by the applicable code.

4.6.2.2 Application with a Prescriptive Thermal Barrier: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx may be installed to any thickness in ceiling cavities, floor cavities, and in-wall cavities when separated from the interior of the building by a prescriptive thermal barrier (minimum ½-inch-thick [12.7 mm] gypsum board or other material tested in accordance with NFPA 275). The gypsum board shall be installed in accordance with the applicable provisions of IBC Section 2508 or IRC Section R702.3 in such a manner that the foam plastic is not exposed.

4.6.2.3 Alternative Thermal Barrier Assemblies: When InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or InsulStar®1.7 Optimaxx is coated in compliance with paragraphs 4.6.2.3.1, 4.6.2.3.3, 4.6.2.3.5, 4.6.2.3.6, or 4.6.2.3.8, it may be installed without a prescriptive thermal barrier.

4.6.2.3.1 DC315 Intumescent Coating Application: When the foam insulation is coated with DC315 as stipulated within this section, the prescriptive thermal barrier is not required. The thickness of the foam plastic on vertical wall surfaces is limited to a maximum of 5.5 inches (140 mm). The thickness on the underside of roof sheathing is limited to a maximum of 9.5 inches (241 mm). The foam shall be covered on all exposed surfaces with a minimum of 14 mils wet film thickness (9 dry mils) of DC315. The DC315 coverage rate is 115 square feet per gallon.

4.6.2.3.2 DC315 Fire Protective Coating: DC315 Intumescent Coating, recognized in IAPMO UES [ER-499](#), is a water-based, latex, intumescent coating manufactured by International Fireproof Technology, Inc. and is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums.

4.6.2.3.3 Staycell ONE STEP®502 Application: When the foam insulation is coated with Staycell ONE STEP®502 as noted in this section, the prescriptive thermal barrier is not required. The foam plastic insulation is limited to a maximum thickness of 3 inches (76 mm) on vertical wall surfaces with the Staycell ONE STEP®502 applied over the foam at a minimum thickness of 1 inch (25.4 mm). The total thickness of the two materials is restricted to a maximum thickness of 4 inches (102 mm) on vertical surfaces. The foam plastic insulation applied to horizontal ceiling/roof assemblies is limited to a maximum thickness of 8 inches (204 mm) with the Staycell ONE STEP®502 applied over the foam at a minimum of 0.5-inch (12.7 mm) thickness. The total thickness of the two materials is restricted to a total thickness of 8½ inches (216 mm) on horizontal surfaces. The Staycell ONE STEP®502 may only be used in lieu of a prescriptive thermal barrier when applied in only one plane of the building assembly, the vertical or the horizontal building assembly.

4.6.2.3.4 Staycell ONE STEP®502: Staycell ONE STEP®502 is two parts, closed-cell intumescent spray-applied polyurethane foam covering recognized in Quality Auditing Institute (QAI) Listing B-1020-1 and has a nominal in-place density of 2.0 lb./ft³ (32 kg/m³). Staycell ONE STEP®502 is manufactured by Preferred Solutions, Inc. Parts A and B are supplied in 55-gallon (208L) drums. When Staycell ONE STEP®502 components are stored in factory-sealed containers at temperatures between 50°F and 75°F (10°C and 24°C), the shelf life is six months. Staycell ONE STEP®502 has a Flame Spread Index of 25 or less and a Smoke Developed Index of 450 or less when tested at four inches in accordance with ASTM E84. The potential heat of Staycell ONE STEP®502 is 1881 BTU/ft² per inch of thickness when tested in accordance with NFPA 259.

4.6.2.3.5 AIS Enclosure Systems LLC (including subsidiary formerly known as AZZ Enclosure Systems): The AIS metal modular equipment structure constructed with a maximum of 3-inch-thick (76 mm) walls and 6-inch-thick (152 mm) ceiling cavities, with each cavity covered on the interior and exterior by No.16 gauge steel [approximately 1/16-inch (1.6 mm)] and ¼-inch (6.4 mm) steel plate flooring is approved for up to full cavity thickness, maximum 3 inches (76 mm) of InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or InsulStar®1.7 Optimaxx insulation in the wall, and up to 5-inches (127 mm) maximum in the ceiling and underfloor cavities. No additional thermal barrier is required over the foam in the walls, ceiling, or floor.

4.6.2.3.6 No-Burn® Plus ThB Intumescent Coating Application: When the foam insulation is coated with Plus ThB as stipulated within this section, the prescriptive thermal barrier is not required. The thickness of the foam plastic on vertical wall surfaces is limited to a maximum of 6.5 inches (165 mm). The thickness on the underside of roof sheathing is limited to a maximum of 9.5 inches (241 mm). The foam shall be covered on all exposed surfaces with a minimum of



14 mils wet film thickness (9 dry mils) of Plus ThB. The Plus ThB coverage rate is 115 square feet per gallon.

4.6.2.3.7 Plus ThB Intumescent Coating: Plus ThB coating, recognized in IAPMO UES ER-305, is a water-based latex, intumescent coating manufactured by No-Burn Inc. and is supplied in 5-gallon pails and 55-gallon drums.

4.6.2.3.8 Flame Control 60-60A Intumescent Coating Application: When the foam insulation is coated with 60-60A as stipulated within this section, the prescriptive thermal barrier is not required. The thickness of the foam plastic on vertical wall surfaces is limited to a maximum of 8 inches (203 mm). The thickness on the underside of roof sheathing is limited to a maximum of 12 inches (304 mm). The foam shall be covered on all exposed surfaces with a minimum of 14 mils wet film thickness of 60-60A coating. The 60-60A coverage rate is 115 square feet per gallon.

4.6.2.3.9 60-60A Intumescent Coating: 60-60A coating, recognized in IAPMO UES ER-596, is a water-based latex, intumescent coating manufactured by Flame Control Coatings and is supplied in 5-gallon pails and 55-gallon drums.

4.6.3 Installation in Attics or Crawl Spaces

4.6.3.1 General: When installing InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx in attics and/or crawl spaces and a thermal barrier is omitted in accordance with IBC Section 2603.4.1.6, IRC Sections R316.5.3 or R316.5.4, installation shall comply with either Sections 4.6.3.3 or 4.6.3.4 of this report.

4.6.3.2 Unvented Attics: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx qualify as air-impermeable insulations and, when installed in accordance with Section 4.6.3.3 or 4.6.3.4 of this report, may be used to insulate unvented attics and unvented enclosed roof framing assemblies in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) or IRC Section R806.5 (2012 IRC Section R806.4).

4.6.3.3 Application with a Prescriptive Ignition Barrier: When InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or InsulStar®1.7 Optimaxx is installed within attics and crawl spaces where entry is made only to service utilities, the insulation shall be protected by an ignition barrier in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and R316.5.4 as applicable. The ignition barrier shall be consistent with the construction type of the building. The ignition barrier shall be installed in accordance with the provisions applicable to the material referenced in

the IBC or IRC in such a manner that the foam plastic is not exposed.

4.6.3.4 Alternative Ignition Barrier Assemblies: When InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or InsulStar®1.7 Optimaxx insulation is installed without a prescriptive ignition barrier, the following conditions shall apply:

- Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
- Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when an air-impermeable insulation is permitted in unvented attics in accordance with 2021 and 2018 IBC Section 1202.3 (2015 IBC Section 1203.3) or IRC Section R806.5. Under-floor (crawl space) ventilation is provided when required by 2021 and 2018 IBC Section 1202.4 (2015 IBC Section 1203.4 and 2012 IBC Section 1203.3) or IRC Section R408 as applicable.
- The foam plastic insulation is limited to the maximum thickness and density stated in Section 4.6.3.4.1 of this report.
- Combustion air is provided in accordance with the Uniform Mechanical Code (UMC) Section 701.1 or International Mechanical Code (IMC) Section 701 as applicable.
- Attic and crawl spaces do not have interconnected areas.
- Air in the attic or crawl space is not circulated to other parts of the building.

4.6.3.4.1 Attic and Crawl Space Overhead and Vertical Surfaces without an Ignition Barrier: InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx may be installed without an ignition barrier, coating or covering when installed as prescribed in this section. It may be spray-applied in attics to the underside of roof sheathing, roof rafters, vertical surfaces, and in crawl spaces to the underside of floors and vertical surfaces. When applied to the underside of the top of the space, the thickness of the insulation shall not exceed 10 inches (254 mm) and when applied to vertical surfaces, the maximum thickness shall not exceed 8 inches (203 mm).

4.7 Exterior Walls of Types I, II, III, and IV Construction (IBC)

4.7.1 General: When used on exterior walls of Type I, II, III, and IV construction, InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx shall comply with Section 2603.5 of the IBC and Section 4.7.2 of this report and may be installed at a maximum thickness of 4 inches (102 mm). The potential heat of InsulStar®SmartSPF™, InsulBloc®SmartSPF™,



InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx is 1834 BTU/ft² (17.1 MJ/m²) per inch of thickness when tested in accordance with NFPA 259.

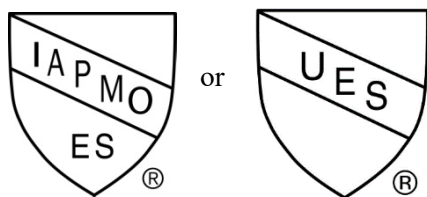
4.7.2 Specific Wall Assemblies: Wall assemblies shall be constructed as described in Tables 2 or 3 of this report.

5.0 IDENTIFICATION

Job site labeling and certification of the insulation shall comply with IBC Section 2603.2, IRC Section 1101.10.1 (2012 IRC Section 1101.12.1), and IECC Sections C303.1.1 and R303.1.1 as applicable. The B-component for the InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx is identified with the following:

- Manufacturer's name, address, and telephone number
- Product trade name
- Flame spread and smoke-developed indices
- Evaluation report number and the name of the inspection agency

Either IAPMO Uniform Evaluation Service Mark of Conformity may also be used as shown below:



IAPMO UES ER-667

6.0 SUBSTANTIATING DATA

6.1 Data in accordance with IAPMO/ANSI ES1000-2020, Standard for Building Code Compliance of Spray-Applied Polyurethane Foam.

6.2 Reports of room corner fire testing in accordance with NFPA 286.

6.3 Reports on air leakage tests in accordance with ASTM E2178.

6.4 Reports on flame spread index and smoke-developed index in accordance with ASTM E84.

6.5 Engineering analysis to define various NFPA 285 Complying Wall Constructions.

6.6 Reports on Potential Heat tests in accordance with NFPA 259.

6.7 Reports of testing in accordance with AC377 Appendix X.

6.8 Report on AIS (formerly AZZ) Enclosure System tested per NFPA 286.

6.9 Priest & Associates Engineering Evaluation of AIS's (formerly AZZ's) Enclosure System tested per NFPA 286.

6.10 Reports on water vapor transmission tests in accordance with ASTM E96.

6.11 Data in accordance with ICC-ES Acceptance Criteria for Spray-Applied Foam Plastic Insulation (AC377), approved April 2020 (editorially revised July 2020).

6.12 Data in accordance with 2019 ICC 1100 Standard for Spray-applied Polyurethane Foam Plastic Insulation.

6.13 Quality Auditing Institute Listing Report of Staycell ONE STEP®502 covering fire performance in accordance with ASTM E84 and UL 1715.

6.14 Reports on Fire Tests of Interior Finish Materials in accordance with UL 1715 and NFPA 286.

6.15 Priest & Associates Engineering Analysis 11009 - Staycell ONE STEP®502 covering.

6.16 Jensen Hughes Engineering Analysis "NFPA 285 Testing Analysis and Allowable Assembly Modifications for Precast Concrete Exterior Wall Systems", dated January 18, 2022.

6.17 Testing of PFAS in polyurethane foam in accordance with EPA-537-2018

6.18 Test reports are from laboratories accredited in accordance with ISO/IEC 17025.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed by IAPMO Uniform Evaluation Service on NCFI Polyurethanes InsulStar®SmartSPF™, InsulBloc®-SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, and InsulStar®1.7 Optimaxx to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product's certification. Products are manufactured at locations in Section 2.7 of this report under a quality control program with periodic inspections under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org



TABLE 1 – NFPA 285 COMPLYING EXTERIOR WALLS – NCFI INSULSTAR®SMARTSPF™, INSULBLOC®SMARTSPF™, INSULSTAR® OPTIMAXX, AND INSULBLOC® OPTIMAXX, CLOSED-CELL SPF ON EXTERIOR SIDE OF BASE WALL SYSTEM

WALL COMPONENT	MATERIALS
Base Wall System – Use either 1, 2, or 3	1 – Concrete wall – minimum 2-inch thick 2 – Concrete Masonry wall 3 – One layer – 5/8-inch thick Type X Gypsum wallboard on the interior, installed over steel studs: minimum 3 5/8-inch depth, minimum No. 20-gauge at a maximum of 24-inches OC with lateral bracing every 4 ft. vertically.
Floor-Line Firestopping	4 lb/cu ft. mineral wool (e.g., Thermafiber) in each stud cavity and at each floor-line – attached with Z-clips or equivalent. Mineral wool is not required in stud cavities at floor-lines when infill stud-wall construction ¹ is employed for exterior wall construction.
Cavity Insulation – Use either 1, 2, or 3	1 – None 2 – Full cavity depth or less of InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or Staycell ONE STEP® 502 covering applied using sheathing as substrate and covering the width of the cavity and inside the stud flange. 3 – Any noncombustible insulation (if batts, may be either faced or unfaced)
Exterior Sheathing – Use either 1 or 2	1 – 1/2-inch-thick, exterior type gypsum sheathing 2 – 5/8-inch-thick, exterior type gypsum sheathing
Exterior Insulation – Use either 1 or 2	1 – None 2 – InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or Staycell ONE STEP® 502 covering – Total thickness to be a maximum of nominal 4 inches
Exterior Veneer – Use either 1, 2, 3, 4, 5, 6, 7, or 8	1 – Brick – Standard nominal 4-inch thick, clay brick. Installed with brick veneer anchors – standard types – installed maximum 24 inches OC vertically on each stud. A maximum 2-inch air gap between exterior insulation and brick 2 – Stucco – Minimum 3/4-inch-thick, exterior cement plaster, and lath. A secondary water-resistive barrier may be installed between the exterior insulation and the lath. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes. 3 – Minimum 2-inch-thick Limestone, natural stone, or minimum 1 1/2 -inch-thick cast artificial stone. Any standard non-open-jointed installation technique such as shiplap, etc. may be used. 4 – Terracotta cladding – Use any terracotta cladding system in which the terracotta is a minimum of 1 1/4 -inches thick. Any standard non-open-jointed installation technique such as shiplap etc. may be used. 5 – Minimum 1-inch thick, Clark Pacific glass-fiber-reinforced-concrete (GFRC) panels, or the minimum 2 1/4-inch thick Infinite Façade precast concrete panels. Standard installation techniques may be used. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx or InsulBloc® Optimaxx, are sprayed onto the interior face of the GFRC panels or the Infinite Façade concrete panels up to a maximum of 4 inches (101 mm). 6 – Minimum 1-inch-thick, Gate Precast Gate Litter precast concrete panels. Standard installation techniques may be used. InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar® Optimaxx or InsulBloc® Optimaxx, is sprayed onto the interior face of the precast concrete panels up to a maximum of 4-inches (101 mm). 7 – Minimum 3/4-inch thick, Willis Construction precast concrete panels. Willis Construction standard installation technique shall be used. SPF installation as specified in note below. 8 - Minimum 3/4-inch thick precast concrete panels. SPF installation as specified in note below. SPF Installation Note: ‘Exterior Veneer - Items 5, 6, 7, and 8 use spray polyurethane foams from the ‘exterior insulation’ category and are sprayed onto the interior face of the concrete panels to a maximum thickness of 4 inches. Items 5, 6, 7, and 8 may be used with any item from ‘Base Wall System’ and do not require an ‘Exterior Sheathing’. These items shall not be used with SPF as specified in ‘Cavity Insulation’.

(Table 1 continued on next page)



TABLE 1 – NFPA 285 COMPLYING EXTERIOR WALLS – NCFI INSULSTAR®SMARTSPF™, INSULBLOC®SMARTSPF™, INSULSTAR® OPTIMAXX, AND INSULBLOC® OPTIMAXX, CLOSED-CELL SPF ON EXTERIOR SIDE OF BASE WALL SYSTEM

WALL COMPONENT	MATERIALS
Exterior Wall Openings (Doors/Windows) Perimeter Protection Materials	<p>Where openings in exterior walls occur (i.e., windows, doors, etc.), the gap between the exterior sheathing and interior face of the exterior façade shall be closed off with one of the following materials at the sill, jambs, and header:</p> <ol style="list-style-type: none"> 1 - Minimum 25-ga thick steel flashing 2 - Minimum 2-inch thick, min 4-pcf, mineral wool insulation, compressed into the gap between the exterior sheathing and exterior façade. When mineral wool is used, steel flashing is not required.

¹Infill stud wall construction refers to the condition where the stud framing of an exterior wall is interior to the floor-line slab edges, effectively terminating the stud cavity at each floor-line and creating sectioned stud bays in between sequential floors.

TABLE 2 --NFPA 285 COMPLYING WALLS – NCFI INSULSTAR®SMARTSPF™, INSULBLOC®SMARTSPF™, INSULSTAR®1.7 SMARTSPF™, INSULSTAR® OPTIMAXX, INSULBLOC® OPTIMAXX AND INSULSTAR®1.7 OPTIMAXX, CLOSED-CELL SPF IN WALL CAVITY ONLY

WALL COMPONENT	MATERIALS
Base Wall System – Use either; 1 with the interior, steel studs, minimum 3½-inch depth, minimum No. 20-gauge at a maximum of 24-inch on center with lateral bracing every 4 ft. vertically; or 2 or 3	<ol style="list-style-type: none"> 1 - 1 layer of ½-inch-thick Type X exterior gypsum sheathing installed on the exterior side of the steel studs 2 - Concrete wall – minimum 2-inch-thick 3 - Concrete Masonry wall
Floor-Line Firestopping	4 lb/ft³ mineral wool (e.g., Thermafiber) friction-fit in each wall stud cavity at each floor-line. Mineral wool is not required in stud cavities at floor-line when infill floor-line construction ¹ is employed for exterior wall construction.
Cavity Insulation – Use either 1 or 2	<ol style="list-style-type: none"> 1 - None 2 - Full cavity depth or less of InsulStar®SmartSPF™, InsulBloc®SmartSPF™, InsulStar®1.7SmartSPF™, InsulStar® Optimaxx, InsulBloc® Optimaxx, or InsulStar®1.7 Optimaxx spray polyurethane foam or Staycell ONE STEP® 502 covering applied using sheathing or concrete or masonry as substrate and covering the width of the cavity and inside the stud flange
Interior Gypsum Wallboard	Minimum ½-inch-thick Type X gypsum wallboard
Exterior Wall Covering – Use either 1, 2, or 3 with note 4.	<ol style="list-style-type: none"> 1 - Any non-combustible exterior wall covering material 2 - Any combustible exterior wall covering system that has successfully been tested in accordance with NFPA 285 3 - Any combustible exterior wall covering system up to a maximum wall height of 40 ft. above grade plane. If the combustible material is fire retardant treated wood, the maximum wall height can be 60 ft. above grade plane 4 - For base wall 2 or 3, a covering is optional but not required. Use an Exterior wall covering as described in 1, 2, or 3 above
Window/Door Perimeters	Framed as required for the base wall. Use No.25-gauge(min) sheet steel for flashing area outside of the base wall.

¹Infill stud wall construction refers to the condition where the stud framing of an exterior wall is interior to the floor-line slab edges, effectively terminating the stu cavity at each floor-line and creating sectioned stud bays in between sequential floors.