

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation

REPORT HOLDER:

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REPORT SUBJECT:

QuadFoam® 500 OC Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

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

NOTE: This report references 2015 Code sections with [2012] Code sections shown in brackets where they differ.

1.2 QuadFoam® 500 OC insulation has been evaluated for the following properties (see Table 1):

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Air permeability
- Moisture vapor permeability

1.3 QuadFoam® 500 OC insulation has been evaluated for the following uses (see Table 1):

- Nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings, and the underside of roof decks
- Alternative to Thermal and Ignition Barriers

- Use in Type I, II, III, IV, and V construction under the IBC and construction under the IRC
- Use in fire-resistance rated construction
- Use as air-impermeable insulation

2.0 STATEMENT OF COMPLIANCE

QuadFoam® 500 OC insulation complies 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.

3.0 DESCRIPTION

3.1 QuadFoam® 500 OC: QuadFoam® 500 OC insulation is a low-density, open cell, polyurethane foam plastic. The insulation is a two-component spray foam plastic with a nominal in-place density of 0.5 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 250-gallon totes, and must be stored at temperatures between 50°F and 80°F. The resin (B component) must be protected from freezing temperatures and has a shelf life of 6 months.

3.2 Intumescent Coatings:

3.2.1 No Burn® Plus XD: No Burn® Plus XD intumescent coating, manufactured by No Burn, Inc., is a latex-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of thirty-six months, when stored in factory-sealed containers at temperatures between 40°F and 90°F.

3.2.2 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by International Fireproof Technology Inc., is a single-component, water-based, liquid-applied intumescent coating. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of twenty-four months when stored in factory-sealed containers at temperatures between 41°F and 95°F. With reference to assemblies recognized in Section 5.3.2, DC315



complies with ICC-ES AC456 and is recognized in Intertek CCRR-1076.

3.2.3 TPR² FIRESHHELL® (IB-4) Coating: TPR² FIRESHHELL® (IB-4) intumescent coating is a proprietary, water-based, one-part, nonflammable coating manufactured by TPR² Corporation. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of twenty-four months when stored in factory-sealed containers at temperatures between 45°F and 75°F.

3.2.4 TPR² FIRESHHELL® (BMS IC) Coating: TPR² FIRESHHELL® (BMS IC) is a proprietary, water-based, one-part, nonflammable, intumescent coating manufactured by TPR² Corporation. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of twelve months when stored in factory-sealed containers at temperatures above 45°F.

3.2.5 TPR² FIRESHHELL® (BMS TC) Coating: TPR² FIRESHHELL® (BMS TC) is a water based, ultra-thin, one component coating manufactured by TPR² Corporation. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of twelve months when stored in factory-sealed containers at temperatures above 45°F. With reference to assemblies recognized in Section 5.3.2, Fireshell® BMS-TC complies with ICC-ES AC456 and is recognized in ICC Evaluation Service Report ESR-3997.

3.2.6 Flame Seal FS-IB: Flame Seal FS-IB is a single component, water-based latex coating using an intumescent technology, manufactured by Flame Seal Products Inc. The coating is supplied in 5-gallon pails and 55-gallon drums, and has a shelf life of six months when stored in factory-sealed containers at temperatures between 60°F and 80°F.

3.2.7 Bayseal IC: Bayseal is a single component, water-based, intumescent coating manufactured by Accella. The coating has a shelf life of six months when properly stored at temperatures above 50°F.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface-burning Characteristics: QuadFoam® 500 OC insulation, at a maximum thickness of 4 inches and a nominal density of 0.5 pcf, has a flame-spread index of 25 or less and a smoke-developed index of 450 or less, when

tested in accordance with ASTM E84. When the insulation is 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 2015 IRC, a thermal barrier of 23/32 inch thick wood structural panel is also permitted and the insulation thickness is not limited.

4.2 Thermal Resistance, R-values: QuadFoam® 500 OC insulation has thermal resistance (R-value) at a mean temperature of 75°F as shown in Table 2.

4.3 Air Permeability: QuadFoam® 500 OC insulation, at a minimum thickness of 3-1/2 inches, has tested values of less than 0.02 L/s-m². Therefore, it is considered air-impermeable insulation in accordance with Section 1203.3 of the 2015 IBC [not applicable in the 2012 IBC] or Section R202 and R806.5 of the IRC, based on testing in accordance with ASTM E283.

4.4 Water Vapor Permeability: QuadFoam® 500 OC insulation has a moisture vapor permeance of less than 10 perms at a minimum thickness of 3 inches and qualifies a Class III moisture vapor retarder based on testing in accordance with ASTM E96.

5.0 INSTALLATION

5.1 General: QuadFoam® 500 OC insulation 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: QuadFoam® 500 OC insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the manufacturer's application instructions. The insulation must be applied when the ambient temperature is between 40°F and 120°F. The resin component should be warmed to minimum 70° before use. Refer to the manufacturer's Application Guidelines for further information. The insulation must not be used in areas that have a maximum in-service temperature greater than 180°F. The foam plastic must not be used in electrical outlet or junction boxes, or in contact with water, rain, or soil. The foam plastic must not be sprayed onto a substrate that is wet, or covered with frost or ice, loose scales, rust, oil, or grease. Substrates with high heat absorption properties (such as concrete and





metals) must be warmed to approximately 60°F to 70°F prior to foam application. The insulation must be protected from the weather during and after application. The insulation may be applied to a maximum thickness of 6 inches per pass. Allow for full expansion of the previous pass before applying an additional pass. Where the insulation is used as an air-impermeable insulation, such as in unvented attic assemblies under IRC Section R806.5, the insulation must be installed at a minimum thickness of 3-1/2 inches.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: QuadFoam® 500 OC insulation 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, except where installation is in an attic or crawl space as described in Section 5.4.

When the insulation is 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 2015 IRC, a thermal barrier of 23/32 inch thick wood structural panel is also permitted and the insulation thickness is not limited.

5.3.2 Application without a Prescriptive Thermal Barrier: QuadFoam® 500 OC insulation 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 this section. The insulation may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces provided the assembly conforms to one of the assemblies described in Table 3. The coatings identified in Table 3 must be applied over all surfaces and in accordance with the coating manufacturer's installation 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: QuadFoam® 500 OC insulation may be applied in attics and crawl spaces as described in Sections 5.4.1 through 5.4.4. 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 crawlspace, but is required between the insulation and the interior living space.

5.4.1 Application with a Prescriptive Ignition Barrier: When QuadFoam® 500 OC insulation is 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. The insulation as described in this section may be installed in unvented attics in accordance with IRC Section R806.5 [R806.4] at a minimum thickness of 3-1/2 inches.

5.4.2 Application without a Prescriptive Ignition Barrier: QuadFoam® 500 OC insulation 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:

- Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
- Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with IRC Section R806.5 [R806.4].
- Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701.

In attics, the insulation may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces, provided the assembly conforms to one of the assemblies described in Table 4. In crawl spaces, the insulation may be spray-applied to the underside of floors and/or vertical surfaces, provided the assembly conforms to one of the assemblies described in Table 4. When an intumescent coating is used, surfaces to be coated must be dry, clean, and free of dirt, loose debris, and any other substances that could interfere with adhesion of the





coating. The intumescent coating must be applied to all surfaces in accordance with the respective coating manufacturer's installation instructions. The coating must be applied when ambient and substrate temperatures are above of 50°F unless otherwise permitted by the intumescent coating manufacturer's installation instructions.

When installed in accordance with this section, the insulation may be installed in unvented attics as described in this section in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5, when applied at a minimum thickness of 3-1/2 inches.

5.4.3 Use on Attic Floors: QuadFoam® 500 OC insulation may be installed between and over joists in attic floors in accordance with this section, conditions a. through f. of Section 5.4.2, and Table 4 based on testing in accordance with AC377 Appendix X. The insulation must be separated from the interior of the building by an approved thermal barrier.

5.4.4 Unvented Attics: Accella has conducted end use configuration testing (per IBC Section 2603.9 [2603.10] and IRC Section R316.6) and analysis to qualify the use of QuadFoam® 500 OC insulation without a prescriptive ignition barrier or intumescent coating in unvented attics conforming with 2015 IBC Section 1203.3 or IRC Section R806.5. (Note that unvented attics were not addressed in the 2012 and earlier versions of the IBC.) The testing and analysis is described in Priest & Associates EEV 10437b, revised September 28, 2017. The conclusions of that evaluation (and associated Engineering Letters) are as follows: When QuadFoam® 500 OC insulation is applied in unvented attics conforming to IBC Section 1203.3 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 penetrating item must be covered with a minimum of 1-1/2 inches of QuadFoam® 500 OC insulation.

5.5 Exterior Walls in Type I, II, III, and IV Construction:

5.5.1 When used in or on exterior walls of Types I, II, III, or IV construction, the assembly must comply with IBC Section 2603.5 and this section. The potential heat of the QuadFoam® 500 OC insulation is 488 Btu/ft² per inch of insulation thickness with a maximum permitted thickness, in any part of the wall, of 3-5/8 inches.

5.5.1.1 Exterior Face: Install DensGlass® Exterior Sheathing over the studs with 1-1/4 inch long self-tapping screws, spaced 8 inches around the perimeter and 12 inches in the field.

5.5.1.2 Interior Face: Install 3-5/8 inch, 20 GA steel studs, 24 inches on center (oc). The QuadFoam® 500 OC insulation is filled to the full depth of the studs. Install one layer of 5/8 inch thick Type X Gypsum wallboard, with the long seams perpendicular to the studs, with 1-1/4 inch long self-tapping screws, spaced 8 inches around the perimeter and 12 inches in the field.

5.5.2 Exterior Wall Covering: 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.

5.6 Fire-resistance Rated Construction:

5.6.1 One-hour Non-loadbearing Wall Assembly:

5.6.1.1 Exterior Face: Nominal 6 inch deep, 20 GA galvanized steel studs, spaced 24 inches oc, floated between 20 GA steel tracks. Fasten one layer of 5/8 inch Type X exterior gypsum sheathing, installed vertically, using #6 x 1-1/4 inch self-drill drywall screws, spaced 8 inches oc around the perimeter and 12 inches oc in the field. Install Dupont® Tyvek® HomeWrap® vapor barrier over the exterior of the sheathing and secure in accordance with the manufacturer's installation instructions.

5.6.1.2 Wall Covering: The exterior wall covering must be one of the following:

5.6.1.2.1 HardiPanel® 5/16 inch thick cement board installed horizontally with joints offset from joints in the



exterior sheathing, attached with 1-5/8 inch Deck Mate Lifetime Coated all-purpose screws, spaced 6 inches oc at the vertical joints and around the perimeter and 12 inches oc in the field. Caulk all joints with OSI® QUAD® Break-A-Way Seal™ Advanced Formula Sealant.

5.6.1.2.2 Minimum 3/4 inch thick Portland cement-sand-type stucco over metal lath or mesh base fastened to the steel studs.

5.6.1.2.3 Minimum 2 inch thick natural stone or minimum 1-1/2 in. thick cast artificial stone.

5.6.1.2.4 Minimum 2 inch thick concrete masonry units.

5.6.1.2.5 Minimum 2 inch thick clay brick units with metal brick ties.

5.6.1.3 Interior Face: Fasten one layer of 5/8 inch Type X gypsum wallboard using #6 x 1-1/4 inch self-drilling drywall screws, spaced 8 inches oc around the perimeter and 12 inches oc in the field. Gypsum wallboard joints and fasteners must be treated to a minimum Level 2 finish in accordance with GA-214 published by the Gypsum Association.

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 insulation must be separated from the interior living space of the building by a thermal barrier as described in Section 5.3.1, except as described in Sections 5.3.2.

6.3 The insulation must not exceed the thicknesses noted in Sections 4.1, 5.3, 5.4, 5.5, and 5.6, as applicable.

6.4 The insulation must be protected from the weather during and after application as specified in the manufacturer's installation instructions.

6.5 A vapor barrier must be installed when required by the applicable Code.

6.6 The insulation must be applied by contractors accredited by Accella Polyurethane Systems, LLC.

6.7 When QuadFoam® 500 OC insulation is installed under the conditions of Section 5.4.4 of this report, the following conditions apply:

6.7.1 Since the performance of QuadFoam® 500 OC 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 5.4.4 and conditions a. through c. and condition f. of Section 5.4.2. A copy of the Priest & Associates Engineering Evaluation (referenced in Sections 5.4.4 and 7.3) must be provided to the Code Official upon request.

6.7.2 Signage shall be permanently affixed in the attic and shall be visible from all entry points into 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-1111 on the [Intertek website](#).*"

6.8 Use of the insulation 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 [2603.9], as applicable.

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

6.10 QuadFoam® 500 OC insulation is manufactured in Spring, Texas and Cartersville, Georgia, under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).





7.0 SUPPORTING EVIDENCE

- 7.1** Reports of tests in accordance with ASTM C518, ASTM E84, ASTM E96, ASTM E119, ASTM E283, NFPA 285, NFPA 286, and NFPA 259.
- 7.2** Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated April 2016, including reports of test in accordance with Appendix X.
- 7.3** 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.
- 7.4** Hughes Associates, Inc. letter dated March 09, 2010, regarding HAI Project No. 1JJB00032.000.
- 7.5** Priest & Associates Engineering Evaluation, Project 10437b, revised September 28, 2017.
- 7.6** Intertek Listing Report "QuadFoam® 500 OC", on the [Intertek Directory of Building Products](#).

8.0 IDENTIFICATION

The A and B components are identified with the manufacturer’s name (Accella Polyurethane Systems, LLC), address and telephone number, the product name (QuadFoam® 500 OC), the mixing instructions, the flame-spread and smoke-developed indices, date of manufacture, the Intertek Mark, and the Code Compliance Research Report number (CCRR-1111).

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.

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TABLE 1 - PROPERTIES EVALUATED

PROPERTY	IBC SECTION ¹	IRC SECTION ¹	IECC SECTION ¹
Physical properties	Not required	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	1203.3	R806.5	C402.4 R402.4
Fire-resistance rated construction	703	R302	Not applicable
Exterior walls of Type I-IV construction	2603.5	Not applicable	Not applicable
Thermal resistance	1301	N1101.10 N1102	C303.1.1 C303.1.4 R303.1.1 R30301.4

¹ Section numbers may be different for earlier editions of the International Codes.

TABLE 2 – THERMAL RESISTANCE (R Values)^{1,2,3}

THICKNESS (inches)	R-VALUE (°F·ft ² ·h/Btu)
1	3.7
2	7.3
3	11
3.5	13
4	15
5	18
5.5	20
6	22
7	25
7.25	26
8	29
9	33
9.25	34
10	36
11	40
11.25	41
12	44

¹ R-values are calculated based on tested K-values at 1 inch and 4 inches 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 can be determined through linear interpolation, or
- b. Greater than 4 inches can be calculated based on R= 3.61 /inch





TABLE 3 – ASSEMBLIES WITHOUT A PRESCRIPTIVE THERMAL BARRIER (See Section 5.3.2)

Coating	Maximum Insulation Thickness (in.) Vertical Surfaces	Maximum Insulation Thickness (in.) Ceiling Surfaces	Fire Protective Coating (Applied to all Foam Surfaces)			Method
			Minimum Thickness (mils)		Minimum Application Rate	
			Dry film (dft)	Wet film (wft)		
TPR2 Fireshell® BMS TC	7.5	9.5	12	20	1.3 gal/100-ft ²	NFPA 286
DC 315	10	11.5	14	22	1.4 gal/100-ft ²	NFPA 286

TABLE 4 – ASSEMBLIES WITHOUT A PRESCRIPTIVE IGNITION BARRIER (See Sections 5.4.2 and 5.4.3)

Coating	Maximum Insulation Thickness (in.) Vertical Surfaces	Maximum Insulation Thickness (in.) Ceiling Surfaces	Fire Protective Coating (Applied to all Foam Surfaces)			Method
			Minimum Thickness (mils)		Minimum Application Rate	
			Dry film (DFT)	Wet film (WFT)		
Bayseal IC	11.25	16	4	7	0.5 gal/100-ft ²	Appendix X
Flame Seals FS-IB™	12	16	4	8	0.5 gal/100-ft ²	Appendix X
NO BURN PLUS XD	11.25	16	4	7	0.4 gal/100-ft ²	Appendix X
Fireshell® BMS IC	7	9.5	4	7	0.4 gal/100-ft ²	Appendix X
TPR ² Fireshell® IB4	7.5	9.5	3	5	0.3 gal/100-ft ²	Appendix X