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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:
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REPORT SUBJECT:
InsulStar®Light 12-008, InsulStar®Light 12-075,
InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-
177109 Spray Foam Systems

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 Code edition noted. Section numbers for earlier Code editions may differ.

1.2 InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 have been evaluated for the following properties (see Table 1):

- Physical properties
- Surface burning characteristics
- Thermal resistance (R-value)
- Air permeability
- Moisture vapor permeability

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

- Use as nonstructural thermal insulation material on or in interior and exterior walls, floors, ceilings and the underside of roof decks
- Alternatives to thermal barriers
- Alternatives to ignition barriers
- Use in Type I, II, III, and IV construction under the IBC
- Use in Type V construction under the IBC and buildings regulated under the IRC
- Use as air-impermeable insulation

2.0 STATEMENT OF COMPLIANCE

InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 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 InsulStar®Light 12-008, InsulStar®Light 12-177109, InsulStar®Light 12-075 and InsulStar®Light Optimaxx 12-008: The insulations are two-component, low-density, open-cell, spray-applied polyurethane foam insulation. They are produced in the field by combining an isocyanate (A-component), A2-000, with a proprietary resin (B-component). InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 have a nominal density of 0.5 pounds per cubic foot. InsulStar®Light 12-075 has a nominal density of 0.75 pounds per cubic foot. The insulation components are supplied in factory-sealed containers. The resin (B-component) has a shelf life of six months when stored in factory-sealed containers at temperatures between 40°F and 85°F.

3.2 DC315: DC315 intumescent coating is a single-component, water-based, liquid-applied coating, manufactured by International Fireproof Technology Inc. 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. DC315 complies with ICC-ES AC456 and is recognized in ICC-ES ESR-3702 and IAPMO-UES ER-0499.



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4.0 PERFORMANCE CHARACTERISTICS

4.1 Surface Burning Characteristics: The insulations, at a maximum thickness of 4 inches, 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. The insulations can be installed at greater thicknesses as described in Sections 5.3 through 5.5. When the insulation is separated from the interior occupied space of the building with minimum 1/2-inch-thick gypsum board or a thermal barrier complying with NFPA 275, 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 (R-value): The insulations have a thermal resistance (R-value), at a mean temperature of 75°F, as shown in Table 2.

4.3 Air Permeability: The insulations, at a minimum thickness of 4 inches, are considered air-impermeable insulation in accordance with IBC and IRC Sections 202 and R202, respectively, based on testing in accordance with ASTM E2178.

4.4 Moisture Vapor Permeability: The insulations, at a minimum thickness of 2.8 inches, qualify as Class III vapor retarders based on testing in accordance with ASTM E96, Procedure A (Desiccant Method).

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. The installation requirements in Sections 5.1 through 5.4 apply to all Types of construction.

5.2 Application: The insulations are spray-applied on the jobsite using plural-component metering and processing equipment as recommended in the manufacturer's published installation instructions. The insulations must be applied when the ambient and substrate temperature is between 50°F and 120°F. Refer to the manufacturer's application instructions for further information.

The insulations must not be used in areas that have a maximum in-service temperature 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 foam plastic must not be sprayed onto a substrate that is wet or covered with frost, ice, loose scale, rust, oil, or grease. The insulations must be protected from the weather during and after application. The insulations may be applied in multiple passes, with each pass not to exceed the maximum individual pass thickness stated in the manufacturer's installation instructions. Allow for full expansion of the previous pass before applying an additional pass. Where the insulations are used as an air-impermeable insulation, such as in unvented attic assemblies under IBC Section 1202.3 and IRC Section R806.5, the insulation must be installed at a minimum thickness of 4 inches to achieve air-impermeability.

5.3 Thermal Barrier:

5.3.1 Application with a Prescriptive Thermal Barrier: The insulations must be separated from the interior of the building by an approved thermal barrier of 1/2-inch-thick gypsum wallboard, or an approved equivalent 15-minute thermal barrier complying with IBC Section 2603.4 or IRC Section R316.4.

Exceptions: The prescriptive thermal barrier is not required under the following conditions:

- When the insulation is used in sill plates and headers or in perimeter joist spaces at no more than 3-1/4 inches thickness as permitted by IRC Section R316.5.11
- When the insulation is used in an attic or crawl space as described in Section 5.4

When the insulations are separated from the interior living space of the building with minimum 1/2-inch-thick gypsum board or a thermal barrier complying with NFPA 275, the maximum thickness of insulation 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 of insulation is not limited.

5.3.2 Application without a Prescriptive Thermal Barrier: The insulations may be installed without the 15-minute thermal barrier prescribed in the IBC Section 2603.4 and IRC Section R316.4, as described in this section and Table 3.





The insulations may be spray-applied to the interior surface of walls, the underside of roof sheathing, and in crawl spaces, provided the assembly conforms to one of the assemblies described in Table 3. The insulations and coating may be left exposed as an interior finish without the prescriptive thermal or ignition barrier in assemblies as indicated in Table 3.

When an intumescent coating is used, it 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 50°F, unless otherwise permitted by the coating manufacturer's installation instructions. Surfaces to be coated must be clean, dry, and free of loose dirt, loose debris, and any other substances that could interfere with the adhesion of the coating.

5.4 Attics and Crawl Spaces: The insulations may be applied in attics and crawl spaces as described in either Section 5.4.1 or 5.4.2. When foam insulation is installed in an attic or crawl space in accordance with this section, a thermal barrier, as described in Section 5.3.1, is not required between the foam plastic insulation and the attic or crawl space but is required between the insulation and the interior occupied space. Attics and crawl spaces must be vented in accordance with the applicable Code, except as permitted in Sections 5.4.1, 5.4.2, or 5.4.3, as applicable.

5.4.1 Application with a Prescriptive Ignition Barrier: Where the insulations are installed within attics or crawl spaces, and where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and 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 that the foam plastic insulation is not exposed. The insulations, as specified in this section, may be installed in unvented attics and unvented enclosed rafter assemblies in accordance with IBC Section 1202.3 or IRC Section R806.5.

5.4.2 Application without a Prescriptive Ignition Barrier: The insulations may be installed in attics and crawl spaces, as described in this section and Table 4, 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 crawlspace 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 is not circulated to other parts of the building.
- d. Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806.1, as applicable, except when insulation is permitted in unvented attics in accordance with IBC Section 1202.3, or IRC Section R806.5.
- e. Under-floor (crawl space) ventilation is provided in accordance with IBC Section 1202.4 or IRC Section R408.1, as applicable.
- f. Combustion air is provided in accordance with IMC (International Mechanical Code®) Section 701.

In attics, the insulations 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 insulations 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, it 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 50°F, unless otherwise permitted by the coating manufacturer's installation instructions. Surfaces to be coated must be clean, dry, and free of loose dirt, loose debris, and any other substances that could interfere with the adhesion of the coating.

The insulations may be installed in unvented attics as described in this section and in accordance with IBC Section 1202.3 or IRC Section R806.5.

5.4.2.1 Use on Attic Floors: The insulations 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 insulations must be separated from the interior of the building by an approved thermal barrier. The ignition barrier required in IBC Section 2604.4 and IRC R316.5.3 may be omitted.



Exception: If installed in the attic floor only, the ignition barrier required in IBC Section 2604.4 and IRC R316.5.3 may be omitted and the InsulStar®Light 12-008 insulation may be left fully exposed with no covering up to a maximum thickness of 14 inches, based on testing in accordance with ASTM E970 and NFPA 286. The insulation must be separated from the interior occupied space of the building by an approved thermal barrier.

5.4.3 Unvented Attics (InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109): NCFI has conducted end-use configuration testing (per IBC Section 2603.9 and IRC Section R316.6) and analysis to qualify the use of InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, or InsulStar®Light 12-177109 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 Priest & Associates EEV 10656B, dated February 27, 2019. The conclusions of that evaluation (and associated Engineering Letters) are as follows: When InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, or InsulStar®Light 12-177109 are 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 4 inches. Rafters may be left without insulation coverage or may be covered with the insulation up to the maximum thickness permitted. The 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 and penetrating item must be covered with a minimum of 3 inches of the InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008 insulation, or InsulStar®Light 12-177109.

5.5 Exterior Walls of Type I, II, III, and IV Construction: The insulation may be installed in framed cavities of exterior walls of buildings of Type I, II, III, and IV construction complying with IBC Section 2603.5 and as described in this section.

5.5.1 Potential Heat: The maximum potential heat of insulation in the wall assembly is 7,210 Btu/ft² based on full-scale testing in accordance with NFPA 285. The potential heat of the InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 insulations is 506 Btu/ft² per inch of thickness. The potential heat of the InsulStar®Light 12-075 insulation is 759 Btu/ft² per inch of thickness. Tested wall assemblies were extended through engineering analysis to include additional wall constructions described in Table 5.

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 an approved 15-minute thermal barrier, as described in Section 5.3.1, except as described in Section 5.3.2 and Section 5.4.

6.3 The insulation thickness must not exceed that noted in Sections 4.1, 5.3, 5.4, and 5.5 as applicable.

6.4 The insulations must be applied by professional spray polyurethane foam installers approved by NCFI Polyurethanes or certified by the Spray Polyurethane Foam Alliance (SPFA) for the installation of spray polyurethane foam insulation.

6.5 The insulations must be protected from the weather during and after installation as specified in the manufacturer's installation instructions.

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

6.7 When InsulStar®Light 12-008, InsulStar®Light Optimaxx 12-008, or InsulStar®Light 12-177109 is installed under the conditions of Section 5.4.3 of this report, the following conditions apply:

6.7.1 Since the performance of the insulations, 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 f. of Section 5.4.2. A copy of the Priest & Associates Consulting LLC Engineering Evaluation (referenced in Sections 5.4.3 and 7.5) 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 points within the attic. The signage 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-0323 on the [Intertek website](#)."*

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

6.9 Jobsite certification and labeling of the insulations must comply with IRC Section N1101.10, N1101.14 and IECC Section C303.1 or R303.1 and R401.3, as applicable.

6.10 InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 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 C518, ASTM E84, ASTM E970, ASTM E2178, NFPA 259, NFPA 285, and NFPA 286.

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-Applied Foam Plastic Insulation (AC377), dated February 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 (Editorially Revised July 2018).

7.5 Priest & Associates Consulting, LLC, Engineering Evaluation - For Inclusion of *NCFI Polyurethane's 12-008 SPF* Insulation in Unvented Attics without and Ignition Barrier in an Intertek CCRR, Project No. 10656B, dated February 27, 2019.

7.6 Jensen Hughes Letter regarding Project Number 1JJB00035.000 - Various NFPA 285 Complying Exterior Wall Constructions, dated July 05, 2016.

7.7 Jensen Hughes Letter regarding Project Number 1JJB00035.000 - Technical Justification for Alternate Exterior Wall Constructions Incorporating Various NCFI's Spray Polyurethane Foam Plastic Insulation, dated July 18, 2016.

7.8 Jensen Hughes Letter regarding Project Number 1JJB00035.000 - Various NFPA 285 Complying Exterior Wall Constructions, dated October 04, 2018.

7.9 Jensen Hughes Letter regarding Project Number 1JJB00035.000 - Analysis of SealTite™ (ID No. 12-008) for Use in NFPA 285 Complying Exterior Wall Assemblies, dated October 04, 2018.

7.10 Intertek Listing Report "InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109" on the [Intertek Directory of Building Products](#).

8.0 IDENTIFICATION

The InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 are identified with the manufacturer's name (NCFI Polyurethanes), address and telephone number, the product name, flame spread index, smoke developed index, lot number, the Intertek Mark as shown below, and the Code Compliance Research Report number (CCRR-0323).



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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	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
Alternatives to thermal / ignition barrier	2603.4	R316.4 R316.5	Not Applicable
Thermal resistance	1301	N1101.10 N1102	C303.1 R303.1
Air permeability / air barrier	1202.3	R806.5	C402.4
Exterior walls of Type I - IV Construction	2603.5	Not Applicable	Not Applicable

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

TABLE 2 - THERMAL RESISTANCE (R-value)^{1, 2, 3}

THICKNESS (inches)	InsulStar®Light 12-008(°F.ft ² .h/Btu)	InsulStar® Optimaxx 12-008 InsulStar®Light 12-177109 (°F.ft ² .h/Btu)	InsulStar®Light 12-075 (°F.ft ² .h/Btu)
1	3.7	3.7	4.0
2	7.6	7.6	8.0
3	11	11	12
3.5	13	13	14
4	15	15	16
5	19	19	20
5.5	21	21	22
6	23	23	24
7	27	27	28
7.25	28	28	29
8	31	31	32
9	34	34	36
9.25	35	35	37
10	38	38	40
11	42	42	44
11.25	43	43	45
12	46	46	48
13	50	50	52
14	54	54	56
15	57	57	60
16	61	61	64

¹ R-values are calculated based on tested k-factors at 1 inch and 4 inches thicknesses.

² R-values less than 10 are rounded to the nearest 0.1 unit; greater than 10 are rounded to the nearest whole unit.

³ To determine R-values for thicknesses not listed: between 1 inch and 4 inches can be determined through linear interpolation or greater than 4 inches can be calculated on R = 3.8/inch for InsulStar®Light 12-008, InsulStar® Optimaxx 12-008, and InsulStar®Light 12-177109, and R = 3.95/inch for InsulStar®Light 12-075





TABLE 3 - USE OF INSULATION WITHOUT A PRESCRIPTIVE THERMAL BARRIER

INSULATION TYPE	MAXIMUM THICKNESS (in.) (Wall Cavities)	MAXIMUM THICKNESS (in.) (Underside of Roof Sheathing / Rafters and Floors)	INTUMESCENT COATING, MINIMUM THICKNESS (Applied to all Exposed Foam Surfaces)	MINIMUM APPLICATION RATE OF INTUMESCENT COATING	MAY BE LEFT EXPOSED AS AN INTERIOR FINISH	TEST SUBMITTED (AC377)
InsulStar®Light 12-008, InsulStar® Optimaxx 12-008, and InsulStar®Light 12-177109	8	14	DC315 14 wet mils (9 dry mils)	0.9 gal / 100 ft²	Yes	NFPA 286
InsulStar®Light 12-075	5.3	9.3	DC315 14 wet mils (9 dry mils)	0.9 gal / 100 ft²	Yes	Evaluation

TABLE 4 - USE OF INSULATION WITHOUT A PRESCRIPTIVE IGNITION BARRIER

INSULATION TYPE	MAXIMUM THICKNESS (in.) (Wall Cavities and Attic Floors)	MAXIMUM THICKNESS (in.) (Underside of Roof Sheathing / Rafters and Floors)	INTUMESCENT COATING, MINIMUM THICKNESS (Applied to all Exposed Foam Surfaces)	MINIMUM APPLICATION RATE OF INTUMESCENT COATING	TEST SUBMITTED (AC377)
InsulStar®Light 12-008, InsulStar® Optimaxx 12-008, and InsulStar®Light 12-177109	8	14	DC315 7 wet mils (4 dry mils)	0.5 gal / 100 ft²	Appendix X
InsulStar®Light 12-075	5.3	9.3	DC315 7 wet mils (4 dry mils)	0.5 gal / 100 ft²	Evaluation

**TABLE 5 - NFPA 285 COMPLYING WALLS - InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Light Optimaxx 12-008, and InsulStar®Light 12-177109 IN FRAMED CAVITIES OF EXTERIOR WALLS**

WALL COMPONENT	MATERIALS
Base Wall System – Use either 1, 2, or 3	1 – One layer of 5/8-inch-thick Type X exterior gypsum sheathing installed on the exterior side of steel studs of minimum 3-5/8-inch depth and minimum 20 GA thickness spaced at maximum 24-inches on center and with lateral bracing every 4 ft. 2 – Concrete wall – minimum 2 inches thick 3 – Concrete masonry wall
Floorline Firestopping –	4 pcf mineral wool friction-fit in each wall stud cavity at each floorline. Mineral wool not required in stud cavities at floorlines when infill studwall ¹ construction is employed for exterior wall construction.
Cavity Insulation – Use either 1, 2, or any combination of 2 and 3	1 – None 2 – Full cavity depth or less of InsulStar®Light 12-008, InsulStar®Light 12-075, InsulStar®Optimaxx 12-008, or InsulStar®Light 12-177109 using either the cavity side of the exterior sheathing or concrete or masonry as the substrate and covering the width of the cavity and inside the stud flange. 3 – Any noncombustible insulation (if batts, then either faced or unfaced is permitted)
Interior gypsum wallboard	Minimum 5/8-inch-thick Type X gypsum wallboard
Exterior Wall Covering – Use either 1, 2, 3, or 4.	1 – Any noncombustible exterior wall covering material 2 – Any combustible exterior wall covering system that has successfully 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 (FRTW), then the maximum wall height is 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 of this section.

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