UL Evaluation Report

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DIVISION: 06 00 00 - WOOD, PLASTICS, AND COMPOSITES
Sub-level 2: 06 12 00 - Structural Panels
Sub-level 3: 06 12 19 - Shear Wall Panels

Sub-level 2: 06 16 00 - Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION
Sub-level 2: 07 20 00 - Thermal Protection
Sub-level 3: 07 21 00 - Thermal Insulation
Sub-level 4: 07 21 13 - Board Insulation

Sub-level 3: 07 22 00 - Roof and Deck Insulation
Sub-level 4: 07 22 16 - Roof Board Insulation

Sub-level 3: 07 25 00 - Weather Barriers

Sub-level 3: 07 27 00 - Air Barriers

DIVISION: 31 00 00 - Earthworks
Sub-level 3: 31 23 00 - Excavation and Fill
Sub-level 4: 31 23 23 - Fill

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1. SUBJECT:

R-CONTROL® INSULATION BOARDS

R-CONTROL® MAX INSULATION BOARDS

THERMASHIELD INSULATION BOARDS

R-CONTROL® GEOFOAM BLOCK

R-CONTROL® NAILBASE

R-CONTROL® NAILBASE 2Ci

R-CONTROL® NAILBASE 3Ci

Throughout this report, unless specifically indicated otherwise:

- The reference to R-Control Insulation Boards and ThermaShield Insulation Boards will also apply to R-Control Insulation Boards and ThermaShield Insulation Boards with Perform Guard.
- The reference to R-Control Geofoam Blocks will apply to R-Control Geofoam Blocks with Perform Guard.

2. SCOPE OF EVALUATION:

- 2018 and 2015 *International Building Code* ® (IBC)
- 2018 and 2015 *International Residential Code* ® (IRC)
- 2018 and 2015 *International Energy Code* ® (IECC)
- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)
- ICC-ES Acceptance Criteria for Termite Resistant Foam Plastic (AC239)
- ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water Resistive Barriers (AC71)
- ICC-ES Acceptance Criteria for Quality Documentation (AC10)

The products were evaluated for the following properties:

R-Control Insulation Boards:
- Surface Burning Characteristics (UL723)
- Physical Properties (ASTM C578)
- Physical Properties – WSG Insulation only (ASTM E2430)
- Roof Deck Construction Material with Resistance to Internal Fire Exposure (UL1256)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Uplift Tests For Roof Covering Systems (UL1897)
- Flammability Testing for Use in Attics and Crawl Spaces (AC12, App. A and B)
- Termite Resistance –Insulation Boards with Perform Guard (AC239)
- For Use on Exterior Commercial Walls (NFPA 285)

R-Control MAX:
- Surface Burning Characteristics (UL723)
- Physical Properties (ASTM C578)
- Roof Deck Construction Material With Resistance to Internal Fire Exposure (UL1256)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Uplift Tests for Roof Covering Systems (UL1897)
- Flammability Testing for Use in Attics and Crawl Spaces (AC12, App. A and B)
- Termite Resistance –R-Control MAX Insulation Board with Perform Guard only (AC239)
- For Use on Exterior Commercial Walls (NFPA 285)

THERMASHIELD Insulation Boards:
- Surface Burning Characteristics (UL723)
- Physical Properties (ASTM C578)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Air Barrier (ASTM E2178)
- Flammability Testing for Use in Attics and Crawl Spaces (AC12, App. A and B)
- Water-resistive Barrier (AC71)
- Termite Resistance –Insulation Boards with Perform Guard (AC239)

R-Control Geofoam Blocks:
- Surface Burning Characteristics (UL723)
- Physical Properties (ASTM D6817)
- Foam Plastic - Special Approval (UL1715)
- Termite Resistance - Geofoam Blocks with Perform Guard only (AC239)

R-Control Nailbase:
- Surface Burning Characteristics –Insulation Component (UL723)
- Physical Properties –Insulation Component (ASTM C578)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Uplift Tests for Roof Covering Systems (UL1897)

R-Control Nailbase 2-Ci:
- Surface Burning Characteristics –Insulation Component (UL723)
- Physical Properties –Insulation Component (ASTM C578)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Uplift Tests for Roof Covering Systems (UL1897)

R-Control Nailbase 3-Ci:
- Surface Burning Characteristics –Insulation Component (UL723)
- Physical Properties –Insulation Component (ASTM C578)
- Roofing Systems for Exterior Fire Exposure (UL790)
- Uplift Tests for Roof Covering Systems (UL1897)
- Water Resistive Barrier –Insulation Component (AC71)
- Air Barrier –Insulation Component (ASTM E2178)

Table 1 – Properties Evaluated

Properties Evaluated	R-Control Insulation Boards	R-Control MAX	Film Faced R-Control Insulation Boards	R-Control Geofoam Blocks	R-Control Nailbase, R-Control Nailbase 2-Ci, R-Control Nailbase 3-Ci
Surface Burning Characteristics	X	X	X	X	X[3]
Physical Properties (ASTM C578)	X	X	X		X
Physical Properties (ASTM D2430)	X[1]				
Physical Properties (ASTM D6817)				X	
Roofing Systems for Exterior Fire Exposure	X	X	X		X
Uplift Tests for Roof Covering Systems	X	X	X		X
Flammability Testing for Use in Attics and Crawl Spaces	X	X	X		
Termite Resistance[2]	X	X	X	X	
Water-resistive Barrier			X		X[4]
Air Barrier			X		X[4]
Foam Plastic - Special Approval	X	X		X	
Exterior Commercial Walls	X	X			

[1] Only R-Control WSG Insulation Boards

[2] Only the products with Perform Guard have been evaluated for Termite Resistance

[3] Foam plastic component only

[4] Applicable to R-Shield Nailbase 3-Ci only

3. REFERENCED DOCUMENTS

- ICC-ES:
  - ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)
  - ICC-ES Acceptance Criteria for Quality Documentation (AC10)
  - ICC-ES Acceptance Criteria for Termite Resistant Foam Plastic (AC239)
- UL:
  - UL723 (ASTM E84), Test for Surface Burning Characteristics of Building Materials
  - UL790 (ASTM E108), Standard Test Methods for Fire Tests of Roof Coverings
  - UL1256, Standard for Fire Test of Roof Deck Constructions
  - UL 1897, Uplift Tests for Roof Covering Systems
  - UL 1715, Fire Test of Interior Finish Material
- ASTM:
  - ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
  - ASTM D6817, Standard Specification for Rigid Cellular Polystyrene Geofoam
  - ASTM D7180, Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects
  - ASTM D7557, Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens
  - ASTM E2178, Standard Test Method for Air Permeance of Building Materials
  - ASTM E2430, Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for Use in Exterior Insulation and Finish Systems (EIFS)
- U.S. Department of Commerce:
  - DOC PS-2, Performance Standard for Wood-Based Structural-Use Panels
- NFPA:
  - NFPA 285, Standard Fire Test for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Assemblies Containing Combustible Components

4. USES

4.1 R-Control Insulation Boards:

R-Control and R-Control MAX Insulation Boards are used as nonstructural insulation on the interior or exterior of above grade walls, on the interior or exterior of below grade walls, below concrete slabs, around concrete slab edges, or as roof insulation. Installation shall be in accordance with Section 6.2 of this report.

The insulation boards may be used on walls in attics and crawl spaces when installation is in accordance with Section 6.2.2 of this report.

4.2 R-Control Geofoam Blocks:

R-Control Geofoam Blocks are used as lightweight structural fill in floor cavities. Installation shall be in accordance with Section 6.3 of this report.

4.3 R-Control Nailbase:

R-Control Nailbase is used as insulation on the interior or exterior of above grade walls or as roof insulation. Installation shall be in accordance with Section 6.4 of this report.

4.4 R-Control Nailbase 2-Ci:

R-Control Nailbase 2-Ci is used as insulation on the interior or exterior of above grade walls. Installation shall be in accordance with Section 6.5 or Section 6.7 of this report.

4.5 R-Control Nailbase 3-Ci:

R-Control Nailbase 3-Ci is used as insulation on the interior or exterior of above grade walls. Installation shall be in accordance with Section 6.6 or Section 6.8 of this report.

The insulation may be used as an alternative to the water-resistive barrier specified in Section 1403.2 of the 2018 IBC, Section 1404.2 of the 2015 IBC, and Section R703.2 of the 2018 and 2015 IRC when installation is in accordance with Section 6.8 of this report.

The insulation may be used as an air barrier to limit air infiltration in accordance with Section C402.5.1 of the 2018 and 2015 IECC when installation is in accordance with Section 6.6 of this report.

5. PRODUCT DESCRIPTION

5.1 General:

R-Control Insulation Boards, ThermaShield Insulation Boards, and R-Control Geofoam Blocks described in 5.2, 5.3, and 5.4 are molded, closed-cell expanded polystyrene having a flame spread index not exceeding 25 and a smoke developed index not exceeding 450 for thicknesses up to 5 inches for the R-Control Insulation Boards and R-Control Geofoam Blocks and for thicknesses up to 4 inches for ThermaShield, when tested in accordance with UL723 (ASTM E84) as required by Section 2603.3 of the 2018 and 2015 IBC or Section R316.3 of the 2018 and 2015 IRC, as applicable.

The following products are treated for termite resistance in accordance with Section 2603.9 of the 2018 IBC and Section 2603.8 of the 2015 IBC, or Section R318.4, of the 2018 and 2015 IRC, as applicable:

- R-Control Insulation Boards with Perform Guard
- ThermaShield Insulation Boards with Perform Guard
- R-Control Geofoam with Perform Guard

R-Control Nailbase, R-Control Nailbase 2-Ci and R-Control Nailbase 3-Ci described in 5.6, 5.7, and 5.8 are insulation products consisting of R-Control Insulation Boards laminated to Oriented Strand Board (OSB). The OSB facing is $^{7}/_{16}$-inch thick in compliance with U.S. Department of Commerce, DOC PS-2, Performance Standard for Wood-Based Structural-Use Panels.

5.2 R-Control Insulation Boards:

R-Control-50, 100, 130, 150, 250, 400, and 600 Insulation Boards are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 3.00 lbs/ft^3 and comply with ASTM C578 designations of Type XI, Type I, Type VIII, Type II, Type IX, Type XIV, and Type XV, respectively.

See Table 2 for thermal resistance and Table 3 for potential heat.

Table 2 – Thermal Resistance of R-Control Insulation Boards

PRODUCT	ASTM C578 Type	DENSITY, min., lb/ft^3	THERMAL RESISTANCE[1], min., °F-ft^2-h/Btu
R-Control 50	XI	0.70	3.1
R-Control 100	I	0.90	3.6
R-Control 130	VIII	1.15	3.8
R-Control 150	II	1.35	4.0
R-Control 250	IX	1.80	4.2
R-Control 400	XIV	2.40	4.2
R-Control 600	XV	3.00	4.3

[1] Thermal resistance (R) values are based on tested values at 1-inch thickness and 75°F mean temperature and must be multiplied by the installed thickness for thicknesses greater than 1 inch.

Table 3 – Potential Heat of R-Control Insulation Boards

PRODUCT	ASTM C578 TYPE	HEAT POTENTIAL[1], Btu/ft^2	HEAT POTENTIAL[1], mJ/m^2
R-Control 50	XI	1165	13.2
R-Control 100	I	1500	17.0
R-Control 130	VIII	1875	21.3
R-Control 150	II	2250	25.5
R-Control 250	IX	3000	34.0
R-Control 400	XIV	4000	45.4
R-Control 600	XV	5000	56.8

[1]Based on 1 in. thickness

5.3 R-Control MAX Insulation Boards:

R-Control MAX 100, 130, 150, 200, and 250 Insulation Boards are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.45, and 1.80 lbs/ft^3, respectively and comply with ASTM C578 designations of Type I, Type VIII, Type II, Type II, and Type IX, respectively. See Table 4 for applicable thermal resistance values for each Type.

Table 4 – Thermal Resistance of R-Control IMAX Insulation Boards

PRODUCT	ASTM C578 Type	DENSITY, min., lb/ft^3	THERMAL RESISTANCE[1], min., °F-ft^2-h/Btu
R-Control MAX 100	I	0.90	5.0
R-Control MAX 130	VIII	1.15	5.0
R-Control MAX 150	II	1.35	5.0
R-Control MAX 250	IX	1.80	5.0

[1]Thermal resistance (R) values are based on tested values at 1-1/16 inch thickness and 75°F mean temperature.

5.4 ThermaShield Insulation Boards:

ThermaShield 100, 130, 150, and 250 Insulation Boards consist of R-Control Insulation Boards laminated with polyethylene or polyester film on both faces. The facers may also be a metalized polypropylene film. ThermaShield 100, 130, 150, and 250 are manufactured at minimum core densities of 0.90, 1.15, 1.35, and 1.80lbs/ft^3 and comply with ASTM C578 designations Type I, Type VIII, Type II, and Type IX, respectively. R-Control MAX 100, 130, 150, and 250 Insulation Boards may be used as an alternate to ThermaShield.

5.5 R-Control Geofoam Blocks:

R-Control Geofoam EPS12, EPS15, EPS19, EPS22, EPS29, EPS39, AND EPS46 blocks are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 2.85 lbs/ft^3 and comply with ASTM D6817 designations of EPS12, EPS15, EPS19, EPS22, EPS29, EPS39, and EPS46, respectively. See Table 4.

Table 5 – Compressive Resistance of R-Control Geofoam Block

PRODUCT	ASTM D6817 Type	DENSITY, min., lb/ft^3	COMPRESSIVE RESISTANCE AT 1% STRAIN, min., psi
R-Control EPS12	EPS12	0.70	2.2
R-Control EPS15	EPS15	0.90	3.6
R-Control EPS19	EPS19	1.15	5.8
R-Control EPS22	EPS22	1.35	7.3
R-Control EPS29	EPS29	1.80	10.9
R-Control EPS39	EPS39	2.40	15.0
R-Control EPS46	EPS46	2.85	18.6

5.6 R-Control Nailbase:

R-Control Nailbase consists of R-Control 100 laminated to a $^7/_{16}$-inch OSB facing. R-Control Nailbase is available in thicknesses of 2, 4, 6, 7-¾, 9-¾, and 11-¾ inches. R-Control MAX may be used as an alternate insulation component in Nailbase products.

Table 5 –Thermal Resistance of R-Control Nailbase

THICKNESS, in.	THERMAL RESISTANCE[1], min., °F-ft^2-h/Btu
2	6.2
4	13.4
6	20.6
7-¾	26.9
9-¾	34.1
11-¾	41.3

[1]Overall R-value is calculated based on a combination of the R-value of the OSB and the EPS at 75°F mean temperature

5.7 R-Control Nailbase 2-Ci:

R-Control Nailbase 2-Ci consists of R-Control 100 laminated to a $^7/_{16}$-inch OSB facing. R-Control Nailbase 2-Ci is available in thicknesses of 1-$^5/_{16}$, 1-$^9/_{16}$, 2-¼, and 2-⅞ inches. R-Control MAX may be used as an alternate insulation component in Nailbase products.

Table 6 – Thermal Resistance of R-Control Nailbase 2-Ci

THICKNESS, in.	THERMAL RESISTANCE[1], min., °F-ft^2-h/Btu
1-$^5/_{16}$	3.8
1-$^9/_{16}$	5.1
2-¼	7.6
2-⅞	10.1

[1]Overall R-value is calculated based on a combination of the R-value of the OSB and the EPS at 75°F mean temperature

5.8 R-Control Nailbase 3-Ci:

R-Control Nailbase 3-Ci consists of R-Control 100 laminated to a $^{7}/_{16}$-inch OSB facing on one side and polymeric film on the other side. R-Control Nailbase 3-Ci is available in thicknesses of 1-$^{5}/_{16}$, 1-$^{9}/_{16}$, 2-¼, and 2-⅞ inches. R-Control MAX may be used as an alternate insulation component in Nailbase products.

Table 8 – Thermal Resistance of R-Control Nailbase 3-Ci

THICKNESS, in.	THERMAL RESISTANCE[1], min., °F-ft²-h/Btu
1-$^{5}/_{16}$	3.8
1-$^{9}/_{16}$	5.1
2-¼	7.6
2-⅞	10.1

[1]Overall R-value is calculated based on a combination of the R-value of the OSB and the EPS at 75°F mean temperature

6. INSTALLATION

6.1 General:

R-Control Insulation Boards, ThermaShield Insulation Boards, R-Control MAX Insulation Boards, and R-Control Geofoam blocks, R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci are installed in accordance with the manufacturer's published installation instructions and this evaluation report. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions shall be available on the jobsite during installation.

6.2 R-Control Insulation Boards, R-Control MAX Insulation Boards, and ThermaShield Insulation Boards:

R-Control Insulation Boards, R-Control MAX, or ThermaShield must be attached to the structure in a manner that will hold the insulation securely in place. The insulation boards must not be used structurally to resist transverse, axial, or shear loads.

The interior of the building must be separated from the R-Control Insulation Boards and ThermaShield Insulation Boards with a thermal barrier as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.

R-Control Insulation Boards may be used as vapor retarders based on perm values described in Tables 9 and 10, respectively, when required in accordance with the applicable sections of the IBC, IRC, and IECC. Vapor retarders are certified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 Class III: 1.0 <perm ≤ 10 perm

Table 9 – Water Vapor Permeance of R-Control Insulation Boards

PRODUCT	ASTM C578 Type	DENSITY, min., lb/ft^3	PERMEANCE[1], max., perms
R-Control 50	XI	0.70	5.0
R-Control 100	I	0.90	5.0
R-Control 130	VIII	1.15	3.5
R-Control 150	II	1.35	3.5
R-Control 250	IX	1.80	2.5
R-Control 400	XIV	2.40	2.5
R-Control 600	XV	3.00	2.5

[1]Water vapor permeance values are based on 1-inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values may be calculated based on insulation thickness, by dividing the perm value shown by the installed thickness in inches.

Table 10 – Water Vapor Permeance of ThermaShield Insulation Boards

PRODUCT	ASTM C578 Type	DENSITY, min., lb/ft^3	PERMEANCE[1], max., perms
R- Control 100	I	0.90	0.3
R- Control 130	VIII	1.15	0.3
R- Control 150	II	1.35	0.3
R- Control 250	IX	1.80	0.3

[1]Water vapor permeance values are based on 1-inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values vary based on insulation thickness.

Table 11 – Water Vapor Permeance of Film Faced R-Control Insulation Boards

PRODUCT	ASTM C578 Type	DENSITY, min., lb/ft^3	PERMEANCE[1], max., perms
R-Control 100	I	0.90	0.3
R-Control 130	VIII	1.15	0.3
R-Control 150	II	1.35	0.3
R-Control 250	IX	1.80	0.3

[1]Water vapor permeance values are based on 1-inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values vary based on insulation thickness.

6.2.1 R-Control Insulation Boards, R-Control MAX Insulation Boards, and R-Control Nailbase Used in Roofing:

R-Control Insulation Boards and R-Control MAX are used as a roofing insulation as follows:

- As part of a UL Certified Class A, B or C roof-covering assembly in accordance with UL 790,
- As part of a UL Certified Roof Deck Construction in accordance with UL 1256, or
- As part of a UL Certified Roofing System, Uplift Resistance, in accordance with UL 1897.

ThermaShield Boards are used as a roofing insulation as follows:

As part of a UL Certified Class A, B or C roof-covering assembly in accordance with UL790.

6.2.2 R-Control Insulation Boards, R-Control MAX Insulation Boards, and ThermaShield Insulation Boards Used in Attics and Crawl Spaces:

R-Control Insulation Boards and ThermaShield Insulation Boards may be used in attics and crawl spaces, without the ignition barrier listed in Section 2603.4.1.6 of the IBC or Sections R316.5.3 and R316.5.4 of the IRC, as follows:

1. Attic ventilation is provided when required by Section 1202.1 of the 2018 IBC, Section 1203.2 of 2015 IBC or Section R806.1 of the IRC, as applicable.

2. Under-floor (crawl space) ventilation is provided when required by Section 1203.3 of the IBC, or Section R408.1 or Section R408.3 of the IRC, as applicable.

3. Combustion air is provided in accordance with Section 701.1 of the IMC.

4. Insulation boards are limited to a maximum thickness of 4 inches (102 mm) for R-Control 100 and R-Control MAX 100, or a maximum thickness of 3-¼ inches (82.6 mm) for R-Control 130 and R-Control MAX 130, or a maximum thickness of 2-⅔ inches (67.8 mm) for R-Control 150 and R-Control MAX 150, or a maximum thickness of 2-⅓ inches (60 mm) for R-Control 200 and R-Control MAX 200, or a maximum thickness of 2 inches (51 mm) for R-Control 250 and R-Control MAX 250.

6.2.3 ThermaShield Insulation Board Used as a Water-Resistive Barrier

ThermaShield Insulation Board with a minimum of 1 inch (25.4 mm) thickness may be used as an alternative to the water-resistive barrier required by Section 1403.2 of the 2018 IBC, Section 1404.2 of the 2015 IBC, and Section R703.2 of the IRC when installed in accordance with this Section.

ThermaShield Insulation Board must be installed directly to framing members spaced a maximum of 24 inches (610 mm) on center. ThermaShield Insulation Board must be installed horizontally with tongue edges facing upward or installed vertically with no horizontal joints. Vertical joints must be backed by framing members. ThermaShield Insulation Board is attached with 1 inch (25.4 mm) wide crown No. 16 gage corrosion-resistant staples spaced 6 inched (152mm) on center. Fastener crowns and joints between boards must be covered with ThermaShield Tape. A minimum 0.019-inch (0.48 mm) corrosion-resistance weep screed with a vertical attachment flange measuring a minimum of 3-½ inches (89mm) must be provided at the bottom of the wall. The installation of the weep screed must be in accordance with Section 2512.1.2 of the IBC or Section R703.7.2.1 of the IRC, as applicable.

Flashing of flanged window penetrations must be installed in accordance with Section 1404.4 of the 2018 IBC and Section 1405.4 of the 2015 IBC. The flashing tape must completely cover the framing sill and extend a minimum of 8 inches (203 mm) up the sides of the opening and 6 inches (152 mm) onto the face of the ThermaShield at the front of the window opening.

Flashing of small penetrations (e.g., pipes) must be with a silicone sealant complying with ASTM C920.

6.2.4 R-Control Insulation Boards, R-Control MAX Insulation Boards, and ThermaShield Insulation Boards used on the exterior of above grade walls:

R-Control Insulation Boards, R-Control MAX, and ThermaShield Insulation Boards are used on the exterior of above grade walls as follows:

- Exterior Walls of One- and Two-Family Dwellings in accordance with the 2015 IRC,
- Exterior walls of one story buildings of Types I, II, III, or IV construction in accordance with Section 2603.4.1.4 of the IBC,
- Exterior walls of Type V construction in accordance with Sections 2603.2, 2603.3, and 2603.4 of the IBC.
- Exterior walls of buildings more than one story of Types I, II, III, or IV construction in accordance with Section 2603.5 of the 2018 and 2015 IBC, when part of:
    - A UL Classified Exterior Wall System in accordance with NFPA 285. See Section 7.2.
    - An Exterior Wall System in accordance with NFPA 285. See Table 12.

Figure 1 – NFPA 285 Wall Assembly

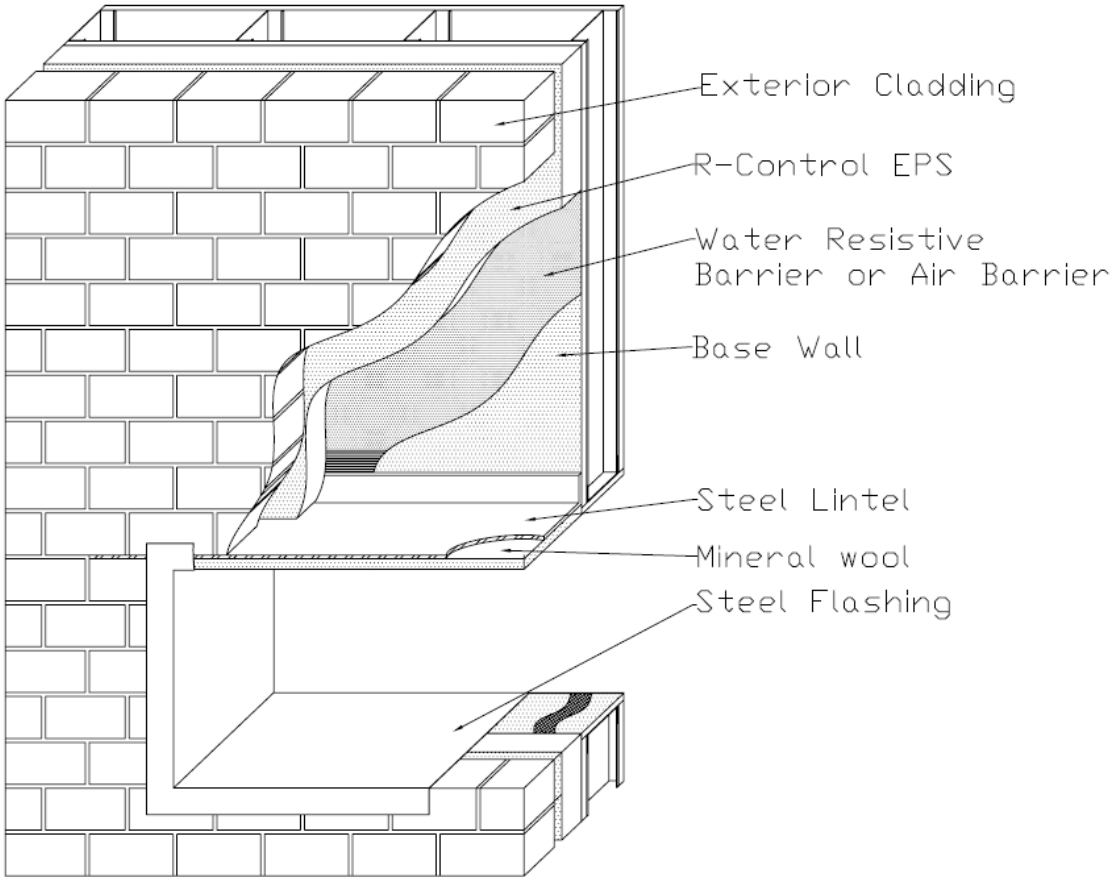


Table 12 – NFPA 285 Compliant Assembly Options – See Figure 1

Base Wall Options
1) Cast Concrete Walls 2) CMU Cast Concrete Walls 3) Steel Stud Framed Wall a. 25 GA. (min.) 3-⅝" (min.) steel studs spaced 24" o.c. (max.) b. Lateral Bracing Every 4 ft. vertically c. ⅝" Type X Gypsum Wallboard Interior d. Cavity Insulation i. None ii. Any Class A, B, or C Fiberglass batt insulation (faced or unfaced) iii. Any noncombustible insulation e. Any ½" (min.) Exterior Gypsum Sheathing
Water Resistive Barrier / Air Barrier Options Over Base Wall
1) None 2) BASF Enershield HP 3) BASF Enershield I 4) Carlisle Barritech NP 5) Carlisle Barritech VP 6) Dupont Fluid Applied WB 7) Dupont Tyvek Commercialwrap (1 or 2 layers) 8) Grace Perm-A-Barrier VPS 9) Tremco EXOAir 230
R-Control EPS Exterior Insulation Options
1) 10-¾" (max.) R-Control 100 or R-Control MAX 100 2) 8-¼" (max.) R-Control 130 or R-Control MAX 130 3) 7" (max.) R-Control 150 or R-Control MAX 150 4) 6" (max.) R-Control 200 or R-Control MAX 200 5) 5-¼" (max.) R-Control 250 or R-Control MAX 250
Exterior Cladding Options
1) Brick - Nominal 4" clay brick or veneer with 2" (max.) air gap behind the cladding. Brick with ties/anchors 24" o.c. (max.) 2) Concrete - 2" (min.) with 2" (max.) air gap behind the cladding 3) Concrete Masonry Units - 4" (min.) with 2" (max.) air gap behind the cladding 4) Limestone - 2" (min.) with non-open joints installation technique such as shiplap 5) Natural Stone Veneer - 2" (min.) with non-open joints installation technique such as shiplap 6) Precast Artificial Stone - 1-½" (min.) complying with ICC-ES, AC 51 with non-open joint installation technique 7) Terra Cotta Cladding - 1-¼" (min.) solid with non-open joint installation technique such as shiplap 8) Stucco - ¾" (min.) exterior cement plaster and lath

Fire Stopping at Floor Line Options
1) Mineral wool fiber fire stop in each stud cavity at floor line. Thickness equal to stud cavity depth. Follow manufacturer instruction for installation.

Window Header Detail
1) 25 GA. (min.) sheet metal (steel) flashing with 1" thick, 4 pcf mineral wool over interior of sheet steel 2) Header design equal or better than item 1

6.3 R-Control Geofoam Blocks:

R-Control Geofoam blocks are placed loosely on a level surface or existing structural slab. The blocks may be installed in a single layer or in multiple layers.

Structural loads on the R-Control geofoam blocks shall not exceed the compressive resistance at 1% strain in accordance with ASTM D6817. Additional design considerations are included in ASTM D7180, "Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam" and ASTM D7557, "Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens". When R-Control geofoam blocks are less than 4 in. in thickness, the interior of the building must be separated from the geofoam blocks with a thermal barrier as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.

When R-Control geofoam blocks are greater than 4 in. in thickness, a minimum 1 in. concrete or masonry must cover the geofoam blocks on all faces.

6.4 R-Control Nailbase:

R-Control Nailbase must be attached to the structure in a manner that will hold the insulation securely in place.

The interior of the building must be separated from the EPS component of R-Control Nailbase Boards with a thermal barrier as required by Section 2603.4 of the 2018 and 2015 IBC or Section R316.4 of the 2018 and 2015 IRC, as applicable.

R-Control Nailbase may be used as vapor retarders based on perm values described in Tables 4 when required in accordance with the applicable sections of the IBC, IRC and IECC. Vapor retarders are Certified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 Class III: 1.0 <perm ≤ 10 perm

Table 13 – Water Vapor Permeance of R-Control Nailbase

THICKNESS,+- in.	PERMEANCE[1], max., perms
2	1.2
4	0.8
6	0.6
7-¾	0.5
9-¾	0.4
11-¾	0.4

[1]Overall Perm Rating is calculated based on a combination of the perm rating of the OSB (at 50% RH) and the EPS

6.4.1 R-Control Nailbase may be used as a roofing insulation as follows:

- As part of a UL Certified Class A, B, or C roof-covering assembly in accordance with UL790
- As part of a UL Certified Roofing System, Uplift Resistance, in accordance with UL 1897

6.5 R-Control Nailbase 2-Ci:

R-Control Nailbase 2-Ci must be attached to the structure in a manner that will hold the insulation securely in place.

The interior of the building must be separated from the EPS component of R-Control Nailbase 2-Ci boards with a thermal barrier as required by Section 2603.4 of the 2018 and 2015 IBC or Section R316.4 of the 2018 and 2015 IRC, as applicable.

R-Control Nailbase 2-Ci may be used as vapor retarders based on perm values described in Tables 5 when required in accordance with the applicable sections of the IBC, IRC and IECC. Vapor retarders are Certified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 Class III: 1.0 <perm ≤ 10 perm

Table 5 – Water Vapor Permeance of R-Control Nailbase 2-Ci

THICKNESS, in.	PERMEANCE[1], max., perms
1-5/16	1.5
1-9/16	1.3
2-¼	1.1
2-⅞	1.0

[1]Overall Perm Rating is calculated based on a combination of the perm rating of the OSB (at 50% RH) and the EPS

6.6 R-Control Nailbase 3-Ci:

R-Control Nailbase 3-Ci must be attached to the structure in a manner that will hold the insulation securely in place.

The interior of the building must be separated from the EPS component of R-Control Nailbase 3-Ci boards with a thermal barrier as required by Section 2603.4 of the 2018 and 2015 IBC or Section R316.4 of the 2018 and 2015 IRC, as applicable.

R-Control Nailbase 3-Ci may be used as vapor retarders based on perm values described in Table 5 when required in accordance with the applicable sections of the IBC, IRC and IECC. Vapor retarders are Certified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 Class III: 1.0 <perm ≤ 10 perm

Table 15 – Water Vapor Permeance of R-Control Nailbase 3-Ci

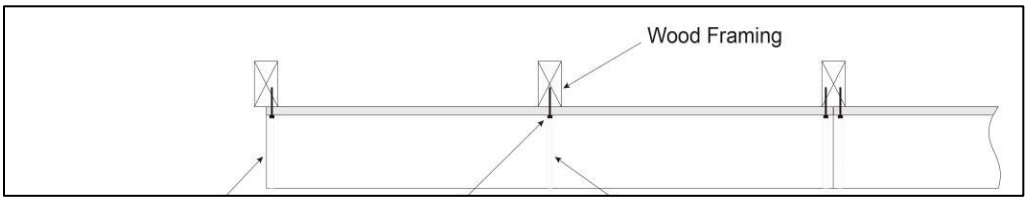
THICKNESS, in.	PERMEANCE[1], max., perms
1-5/16	0.2
1-9/16	0.2
2-¼	0.2
2-⅞	0.2

[1]Overall Perm Rating is calculated based on a combination of the perm rating of the OSB (at 50% RH) and the EPS

6.7 R-Control Nailbase 2-Ci and R-Control Nailbase 3-Ci Used as Wall Bracing:

R-Control Nailbase 2-Ci and R-Control Nailbase 3-Ci are used as a wall bracing material for exterior walls when installed with the OSB side applied directly to wood framing members. Installation requires a specialty nail gun which installs code specified diameter fasteners through the insulation and flush against the OSB surface. Minimum fastener diameter must be 0.113 inch. Minimum fastener penetration into framing members must be 1-½ inch.

Figure 2 – Installation of R-Control Nailbase 2-Ci and R-Control Nailbase 3-Ci as Wall Bracing



When installed in accordance with Figure 2, R-Control Nailbase 2-Ci and R-Control Nailbase 3-Ci are sheathing alternatives to:

- IRC bracing methods using wood structural panels (WSP), including portal frames, in accordance with Section R602.10 and R602.12 of the 2018 and 2015 IRC.
- IBC Conventional Wall Bracing provisions, Section 2308.9.3 for Type V construction and the alternative bracing methods in accordance with Section 2308.6.5.
- IBC performance-based provisions, Section 2306.1 and 2306.3 of the 2018 and 2015 IBC for light-frame wood wall assemblies

6.8 R-Control 3-Ci Used as a Water-Resistive Barrier:

R-Control Nailbase 3-Ci may be used as an alternative to the water-resistive barrier required by Section 1403.2 of the 2018 IBC, Section 1404.2 of the 2015 IBC, and Section R703.2 of the 2018 and 2015 IRC when installed in accordance with this Section.

Holes from fastener installation and joints between boards must be covered with R-Control Tape.

A minimum 0.019-inch (0.48 mm) corrosion-resistance weep screed with a vertical attachment flange measuring a minimum of 3-½ inches (89mm) must be provided at the bottom of the wall. The installation of the weep screed must be in accordance with Section 2512.1.2 of the 2018 and 2015 IBC or Section R703.7.2.1 of the 2018 and 2015 IRC, as applicable.

Flashing of flanged window penetrations must be installed in accordance with Section 1404.4 of the 2018 IBC and Section 1405.4 of the 2015 IBC. The flashing tape must completely cover the framing sill and extend a minimum of 8 inches (203 mm) up the sides of the opening and 6 inches (152 mm) onto the face of the Foam-Control R-CONTROL 3-Ci at the front of the window opening.

Flashing of small penetrations (e.g., pipes) must be with a silicone sealant complying with ASTM C920.

7. CONDITIONS OF USE

7.1 General:

The R-Control Insulation Boards, ThermaShield Insulation Boards and the R-Control Geofoam blocks described in this report comply with, or are suitable alternatives to what is specified in those codes listed in Section 2 of this report, subject to the following conditions. The R-Control Insulation Boards, ThermaShield Insulation Boards and R-Control Geofoam Blocks must be produced, identified, and installed in accordance with the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions this report governs.

In areas where the probability of termite infestation is defined as "very heavy", R-Control Insulation Boards, ThermaShield Insulation Boards and R-Control Geofoam Blocks without the Perform Guard treatment must be installed in accordance with Section 2603.9 of the IBC or Section R318.4 of the IRC, as applicable.

The use of R-Control Insulation Boards, R-Control MAX Insulation Boards, ThermaShield Insulation Boards and R-Control Geofoam Blocks with the Perform Guard treatment are not restricted in areas where the probability of termite infestation is defined as "very heavy" in accordance with Section 2603.9 of the IBC or Section R318.4 of the IRC, as applicable.

The R-Control Nailbase, R-Control 2-Ci, and R-Control Nailbase 3-Ci described in this report comply with, or are suitable alternatives to, what is specified in those codes listed in Section 2 of this report, subject to the following conditions. The R-Control Nailbase, R-Control Nailbase 2- Ci, and R-Control Nailbase 3-Ci must be produced, identified, and installed in accordance with the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions this report governs.

7.2 R-Control Insulation Boards, R-Control MAX Insulations Boards, and ThermaShield Insulation Boards:

The R-Control Insulation Boards and ThermaShield must be separated from the building interior with a thermal barrier, such as ½ in. gypsum board, as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.

For a listing of applicable UL Certifications for R-Control Insulation Boards and R-Control MAX Insulations Boards, see the Product iQ™ database for the following categories. ThermaShield is UL Certified for BRYX and QORW only.

See UL Product iQ™ database for the following:

- Foamed Plastic, UL Certified for Surface Burning Characteristics in accordance with UL723 (BRYX)
- Polystyrene Thermal Insulation, Rigid Cellular, UL Certified in accordance with ASTM C578 (QORW)
- Class A, B or C roof-covering assemblies UL Certified in accordance with UL 790 (TGFU)
- Roof Deck Constructions for assemblies UL Certified in accordance with UL 1256 (TJBX)
- Roof Deck Constructions for assemblies UL Certified in accordance with UL 1897 (TGIK)

For a listing of applicable UL Certifications for R-Control Insulation Boards and R-Control MAX Insulation Boards, see the Product iQ™ database for the following Exterior Walls for assemblies UL Classified in accordance with NFPA 285 (FWFO):

EWS0001
EWS0002
EWS0003

7.3 R-Control Geofoam Blocks:

R-Control Geofoam Blocks less than 4 in. in thickness must be separated from the building interior with a thermal barrier such as ½ inch thick gypsum board, as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable. R-Control Geofoam Blocks greater than 4 in. in thickness must be separated from the building interior with a minimum 1 in. thick concrete or masonry on all faces as required by Section 2603.4.1.1 of the IBC.

Design loads to be resisted by the R-Control Geofoam Blocks must be determined in accordance with the IBC or IRC, as applicable, and must not exceed the allowable loads noted in this report.

All construction documents specifying the R-Control Geofoam Blocks must comply with the design limitations of this report. Design calculations and details for the specific applications must be furnished to the code official, verifying compliance with this report and applicable codes. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

For a listing of applicable UL Certifications for R-Control Geofoam Blocks, see the Product iQ™ database for the following categories:

- Foamed Plastic, UL Certified for Surface Burning Characteristics in accordance with UL723 (BRYX).
- Foamed Plastic, UL Certified for Interior BuildingConstruction in accordance with UL1715 (OERU).

7.4 R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci:

The EPS component of R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci must be separated from the building interior with a thermal barrier, such as ½-inch thick gypsum board, as required by Section 2603.4 of the 2018 and 2015 IBC or Section R316.4 of the 2018 and 2015 IRC, as applicable.

For a listing of applicable UL Certifications, see the Product iQ™ database for the following categories.

- Foamed Plastic, UL Certified for Surface Burning Characteristics in accordance with UL723 (BRYX) for the R-Control EPS component of R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci.
- Class A, B or C roof-covering assemblies UL Certified in accordance with UL 790 (TGFU) for R-Control Nailbase.
- Roof Deck Constructions for assemblies UL Certified in accordance with UL 1897 (TGIK) for R-Control Nailbase.
- Polystyrene Thermal Insulation, Rigid Cellular, UL Certified in accordance with ASTM C578 (QORW) for the R-Control EPS component of R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci.

7.5 Manufacturing Locations:

The products are manufactured at the following locations described in Table 8 under the UL LLC Listing or Certification and Follow-Up Service Program, which includes audits in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC 10.

Table 8 – Manufacturing Locations

LISTEE	LOCATION	PLANT ID NO.
PowerFoam, LLC	550 Murray Street Midlothian, TX 76065	TF-2
ThermaFoam Operating, LLC	1240 Hwy 77 N Hillsboro, Texas 76645	TF-1
ThermaFoam R-Control, LLC	203 South Redmond Road Jacksonville, AR 72076	TF-3

8. SUPPORTING EVIDENCE

8.1 R-Control Insulation Boards and R-Control Max Insulations Boards:

8.1.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)

8.1.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239)

8.1.3 UL Certification reports in accordance with UL 723, ASTM C578, UL 790, UL 1256, and UL 1897. See UL Product Certification Categories (BRYX), (QORW), (TGFU), (TJBX), and (TGIK), respectively

See links to UL, LLC's Product iQ™ database in Section 7.2

8.1.4 Documentation of quality system elements described in AC10

8.2 ThermaShield Insulation Boards:

8.2.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)

8.2.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239)

8.2.3 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water Resistive Barriers (AC71)

8.2.4 Data in accordance with ASTM E2178 Standard Test Method for Air Permeance of Building Materials

8.2.5 UL Certification reports in accordance with UL 723, ASTM C578, and ASTM E2430. See UL Product Certification Categories (BRYX), and (QORW).

See links to UL, LLC's Product iQ™ database in Section 7.2.

8.2.6 Documentation of quality system elements described in AC10

8.3 R-Control MAX Insulation Boards:

8.3.1 UL Certification reports in accordance with UL 723, ASTM D6817, and UL 1715. See UL Product Certification Categories (BRYX), (QORW) and (OERU), respectively

See links to UL, LLC's Product iQ™ database for BRYX and QORW in section 7.3.

8.3.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239)

8.3.3 Documentation of quality system elements described in AC10

8.4 R-Control Geofoam Blocks:

8.4.1 UL Certification reports in accordance with UL 723, ASTM D6817, and UL 1715. See UL Product Certification Categories (BRYX), (QORW) and (OERU), respectively.

See links to UL, LLC's Product iQ™ database for BRYX and QORW in section 7.3.

8.4.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008.

8.4.3 Documentation of quality system elements described in AC10

8.4 R-Control Nailbase:

8.4.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12).

See links to UL, LLC's Product iQ™ database for BRYX and QORW in section 7.3.

8.4.2 Documentation of quality system elements described in AC10.

8.5 R-Control Nailbase 2-Ci:

8.5.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12).

8.5.2 Documentation of quality system elements described in AC10.

8.6 R-Control Nailbase 3-Ci:

8.6.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12).

8.6.2 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water Resistive Barriers (AC71).

8.6.3 Data in accordance with ASTM E2178 Standard Test Method for Air Permeance of Building Materials.

8.6.4 Documentation of quality system elements described in AC10.

9. IDENTIFICATION

The R-Control Insulation Boards, R-Control MAX Insulation Boards, ThermaShield Insulation Boards, and R-Control Geofoam Blocks, R-Control Nailbase, R-Control Nailbase 2-Ci, and R-Control Nailbase 3-Ci products described in this evaluation report are identified by a marking bearing the report holder's name (ThermaFoam Operating, LLC), the plant identification, the product name, the ASTM type designation, the UL Certification Mark, and the evaluation report number UL ER40338-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Certification Mark certificate.

10. USE OF UL EVALUATION REPORT

10.1 The approval of building products, materials or systems is under the responsibility of the applicable authorities having jurisdiction.

10.2 UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.

10.3 The status of this report, as well as a complete directory of UL Evaluation Reports may be found at UL.com via the Product iQ™ database.