

Technical Evaluation Report™

TER 1407-02

R2+ SHEATHE Air Barrier, Water-Resistive Barrier & Fire Performance in Exterior & Interior Walls of Buildings of Type I-IV Construction

Carlisle® Coatings & Waterproofing Inc (CCW)

Product:

R2+ SHEATHE

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SECTION: 07 21 00 - Thermal Insulation

SECTION: 07 27 23 - Board Product Air Barriers

SECTION: 07 48 00 - Exterior Wall Assemblies

1 Innovative Product Evaluated^{1,2}

1.1 R2+ SHEATHE

2 Applicable Codes and Standards^{3,4}

2.1 Codes

- 2.1.1 *IBC—15, 18, 21: International Building Code®*
- 2.1.2 *IRC—15, 18, 21: International Residential Code®*
- 2.1.3 *IECC—15, 18, 21: International Energy Conservation Code®*

2.2 Standards and Referenced Documents

- 2.2.1 *ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*
- 2.2.2 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 2.2.3 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*
- 2.2.4 *ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials*
- 2.2.5 *ASTM E136: Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750C*

¹ For more information, visit drjcertification.org or call us at 608-310-6748.

² **Federal Regulation Definition.** 24 CFR 3280.2 "Listed or certified" means included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner. **International Building Code (IBC) Definition of Listed.** Equipment, materials, products or services included in a list published by an organization acceptable to the [building official](#) and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose Listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose. **IBC Definition of Labeled.** Equipment, materials or products to which has been affixed a [label](#), seal, symbol or other identifying mark of a nationally recognized testing laboratory, [approved agency](#) or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

³ This Listing is a code defined [research report](#), which is also known as a [duly authenticated report](#), provided by an [approved agency](#) (see [IBC Section 1703.1](#)) and/or an [approved source](#) (see [IBC Section 1703.4.2](#)). An approved agency is "approved" when it is ANAB accredited. DrJ Engineering, LLC (DrJ) is listed in the [ANAB directory](#). A professional engineer is "approved" as an [approved source](#) when that professional engineer is properly licensed to transact engineering commerce. Where sealed by a professional engineer, it is also a duly authenticated report certified by an [approved source](#). (i.e., [Registered Design Professional](#)). DrJ is an ANAB accredited [product certification body](#).

⁴ Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

- 2.2.6 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.2.7 *ASTM E1354: Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*
- 2.2.8 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*
- 2.2.9 *ASTM E2357: Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies*
- 2.2.10 *NFPA 259: Standard Test Method for Potential Heat of Building Materials*
- 2.2.11 *NFPA 285-12: Standard Fire Test Method for the Evaluation of Fire Propagation Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components⁵*
- 2.2.12 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*
- 2.2.13 *UL 263: Standard for Fire Tests of Building Construction and Materials*
- 2.2.14 *UL 723: Test for Surface Burning Characteristics of Building Materials*

3 Performance Evaluation

- 3.1 Tests, test reports, research reports, duly authenticated reports and related engineering evaluations are defined as intellectual property and/or trade secrets and protected by Defend Trade Secrets Act 2016 (DTSA).⁶
- 3.2 Testing and/or inspections conducted for this TER were performed at an ISO/IEC 17025 accredited testing laboratory,⁷ an ISO/IEC 17020 accredited inspection body,⁸ which are internationally recognized accreditations through International Accreditation Forum (IAF), and/or a licensed Registered Design Professional (RDP).
- 3.3 R2+ SHEATHE was evaluated to determine:
 - 3.3.1 Performance for use in exterior walls of buildings of any height and of Type I-IV construction in accordance with IBC Section 2603.5
 - 3.3.2 Performance in accordance with UL 723 for flame spread and smoke development ratings in accordance with IBC Section 2603.5.4
 - 3.3.3 Performance for use without a thermal barrier in accordance with IBC Section 2603.5.2
 - 3.3.4 Performance with regard to the potential heat generated by the Foam Plastic Insulating Sheathing (FPIS) in accordance with IBC Section 2603.5.3
 - 3.3.5 Performance with regard to vertical and lateral fire propagation in accordance with 2018 IBC Section 2603.5.5
 - 3.3.6 Performance with regard to ignition in accordance with IBC Section 2603.5.7

⁵ References to NFPA 285-12 in this TER are code compliant through the 2018 version of the IBC.

⁶ <https://www.law.cornell.edu/uscode/text/18/part-11/chapter-90>. Given our professional duty to inform, please be aware that whoever, with intent to convert a trade secret (TS), that is related to a product or service used in or intended for use in interstate or foreign commerce, to the economic benefit of anyone other than the owner thereof, and intending or knowing that the offense will, injure any owner of that trade secret, knowingly without authorization copies, duplicates, sketches, draws, photographs, downloads, uploads, alters, destroys, photocopies, replicates, transmits, delivers, sends, mails, communicates, or conveys such information; shall be fined under this title or imprisoned not more than 10 years, or both. Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of \$5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. As the National Society of Professional Engineers states, "Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve." Therefore, to protect intellectual property (IP) and TS, and to achieve compliance with public records and trade secret legislation, requires approval through the use of Listings, certified reports, technical evaluation reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

⁷ Internationally recognized accreditations are performed by members of the International Accreditation Forum (IAF). Accreditation Body and Regional Accreditation Group Members of IAF are admitted to the IAF MLA only after a stringent evaluation of their operations by a peer evaluation team, which is charged to ensure that the applicant complies fully with both international standards and IAF requirements. Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.

⁸ Ibid.

- 3.3.7 Performance for use in exterior walls of buildings as a Water-Resistive Barrier (WRB) in accordance with [IBC Section 1403.2](#)⁹
- 3.3.8 Performance for use in exterior walls of buildings as continuous insulation (ci) in accordance with [IECC Section C402.1.3](#)
- 3.3.9 Performance in exterior walls of buildings as vapor retarding FPIS in accordance with [IBC Section 1404.3](#)¹⁰
- 3.3.10 Performance for use in exterior walls of buildings as an air barrier in accordance with [IECC Section C402.5.1](#)
- 3.4 Wind pressure resistance and other structural requirements in accordance with [IBC Chapter 16](#) is outside the scope of this evaluation.
- 3.5 Any building code and/or accepted engineering evaluations (i.e. research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an [ISO/IEC 17065 accredited certification body](#) and a professional engineering company operated by RDPs / [approved sources](#). DrJ is qualified¹¹ to practice product and code compliance services within its scope of accreditation and engineering expertise, respectively.
- 3.6 Engineering evaluations are conducted with DrJ's ANAB [accredited ICS code scope](#), which are also its areas of professional engineering competence.
- 3.7 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

- 4.1 This innovative product, R2+ SHEATHE, pictured in Figure 1, is a proprietary FPIS product.
 - 4.1.1 R2+ SHEATHE is a composite board consisting of a 25 psi closed cell polyisocyanurate foam core, coated on both sides with a glass-backed aluminum foil facer (ASTM C1289 Type I, Class 1).

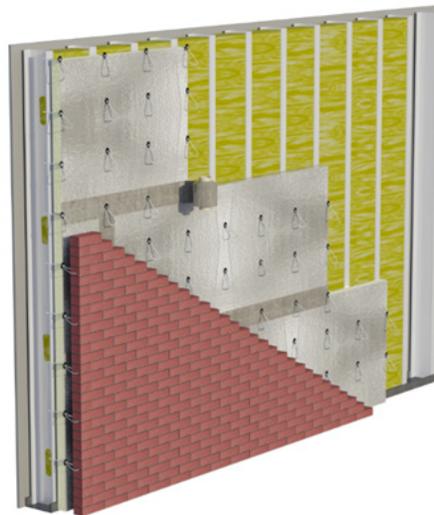


Figure 1. R2+ SHEATHE

⁹ [2015 IBC Section 1404.2](#)

¹⁰ [2015 IBC Section 1405.3](#)

¹¹ Qualification is performed by a legislatively defined [Accreditation Body](#). [ANSI National Accreditation Board \(ANAB\)](#) is the largest independent accreditation body in North America and provides services in more than 75 countries. [DrJ](#) is an ANAB accredited [product certification body](#).

4.2 Material Availability

- 4.2.1 Thickness: 1" (25.4 mm) through 3.5" (88.9 mm)
- 4.2.2 Standard product width: 48" (1219 mm)
- 4.2.3 Standard length: 96" (2438 mm), 120" (3048 mm) and 144" (3657 mm)
- 4.2.4 Custom widths, lengths, and thicknesses available are upon request.

5 Applications

5.1 General

- 5.1.1 R2+ SHEATHE is a FPIS product complying with [IBC Section 2603](#).
- 5.1.2 R2+ SHEATHE is used in exterior walls of buildings of any height and of Type I-IV construction in accordance with [IBC Section 2603.5](#).
- 5.1.3 Environmental Product Declarations (EPD) for R2+ SHEATHE are available at polyiso.org.

5.2 Vapor-Retarding Insulated Sheathing

- 5.2.1 R2+ SHEATHE has a permeance rating of <1. Per [IBC Section 1404.3.2](#),¹² only Class III vapor retarders shall be used on the interior side of walls framed with insulated sheathing with <1 perm installed on the exterior side of the framed wall. Water vapor permeance of R2+ SHEATHE is presented in Table 1.

Table 1. R2+ SHEATHE Water Vapor Permeance

Test Method	Water Vapor Permeance (grains/h*ft ² *in Hg) ¹
ASTM E96 A (Desiccant Method)	0.000
ASTM E96 B (Water Method)	0.009

SI: 1 in = 25.4 mm
 1. Results for 1" board thickness

5.3 Air Barrier

- 5.3.1 R2+ SHEATHE meets the requirements of [IECC Section C402.5.1](#) for use as an air barrier material and an air barrier assembly when installed in accordance with the manufacturer installation instructions and this TER, with all seams including the top and bottom edges taped. See Table 2.

Table 2. R2+ SHEATHE Air Barrier Properties

Test Method	Air Barrier Property
ASTM E2178	≤0.0000 L/s.m ² @ 75 Pa [0.0000 CFM/ft ² @ 1.57 PSF]
ASTM E2357	≤ 0.2 L/s.m ² @ 75 Pa [0.04 CFM/ft ² @ 1.57 PSF] ^{1, 2}

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m², 1 psi = 0.00689 MPa
 1. All seams and joints between boards shall be covered by 4" wide Carlisle® Coatings & Waterproofing Foil-Grip™ 1402 pressure sensitive foil-faced flashing tape.
 2. All fenestrations and penetrations shall be sealed with 9" wide Carlisle® Coatings & Waterproofing Aluma-Grip™ 701 foil-faced self-adhering flashing tape with the top of the flashing sealed with butyl-based sealant.

¹² 2015 IBC Section 1405.3.2

5.4 **Water-Resistive Barrier (WRB)**

- 5.4.1 R2+ SHEATHE may be used as a WRB as prescribed in [IBC Section 1403.2](#)¹³ and [IRC Section R703.2](#),¹⁴ when installed on exterior walls as described in this section.
- 5.4.2 R2+ SHEATHE shall be installed horizontally or vertically with board joints placed directly over exterior framing spaced a maximum of 24" (610 mm) o.c. The fasteners used to attach the board shall be installed in accordance with Section 6.
- 5.4.3 All seams and joints between boards shall be covered by 4" wide Carlisle® Coatings & Waterproofing Foil Grip™ 1402 pressure sensitive foil-faced flashing tape.
- 5.4.4 A separate WRB may also be provided. If a separate WRB method is used, taping of the sheathing joints is not required.
- 5.4.5 Flashing of penetrations is required and shall comply with the applicable code.

5.5 **Fire Safety Performance**

5.5.1 **Surface Burn Characteristics:**

- 5.5.1.1 R2+ SHEATHE was evaluated to assess performance with regard to the flame spread and smoke developed index in accordance with ASTM E84 as shown in Table 3.

Table 3. Fire Performance^{1,2}

Product Name	Flame Spread Index	Smoke-Developed Index
R2+ SHEATHE	≤ 25	< 250
1. Foam core tested in accordance with UL 723 (ASTM 84). Flame spread and smoke-developed indexes are shown for comparison purposes only and are not intended to represent the performance under actual fire conditions.		

5.5.2 **Ignition:**

- 5.5.2.1 R2+ SHEATHE was evaluated to assess performance with regard to ignition in accordance with [IBC Section 2603.5.7](#).
- 5.5.2.2 R2+ SHEATHE complies with this section, when the exterior side of the sheathing is protected with one of the following materials:
 - 5.5.2.2.1 A thermal barrier complying with [IBC Section 2603.4](#)
 - 5.5.2.2.2 A minimum 1" (25.4 mm) thickness of concrete or masonry
 - 5.5.2.2.3 Glass fiber reinforced concrete panels. Minimum thickness of 3/8" (9.5 mm)
 - 5.5.2.2.4 Metal faced panels having a minimum 0.019 inch (0.48mm) thick aluminum or 0.016" (0.41mm) thick corrosion resistant steel outer facings
 - 5.5.2.2.5 A minimum 3/8" (22.2mm) thickness of stucco complying with [IBC Section 2510](#)
 - 5.5.2.2.6 A minimum 1/4" (6.35 mm) thickness of fiber cement siding complying with [IBC Section 1404.16](#)¹⁵ and [IBC Section 1404.16.1](#)¹⁶ or [IBC Section 1404.16.2](#)¹⁷

¹³ [2015 IBC Section 1404.2](#)

¹⁴ WRB is not required for detached accessory buildings.

¹⁵ [2015 IBC Section 1405.16](#)

¹⁶ [2015 IBC Section 1405.16.1](#)

¹⁷ [2015 IBC Section 1405.16.2](#)

5.5.3 *Potential Heat:*

5.5.3.1 R2+ SHEATHE was tested in accordance with NFPA 259 to assess the potential heat generated by the FPIS in accordance with IBC Section 2603.5.3, as shown in Table 4.

Table 4. Potential Heat

Product	Potential Heat (Btu/lb) ¹
R2+ SHEATHE	11,587
St: 1 lb = 4.45 N 1. Tested in accordance with NFPA 259.	

5.5.4 *Vertical and Lateral Fire Propagation:*

5.5.4.1 R2+ SHEATHE was tested to assess its performance with regard to vertical and lateral fire propagation in accordance with NFPA 285 and 2018 IBC Section 2603.5.5.

5.5.4.2 Engineering analysis has also been conducted to assess substitution of other products within the approved wall assemblies.

5.5.4.3 The wall assemblies listed in Table 5 and Table 6 are approved for use in building of Type I-IV construction.

Table 5. Approved NFPA 285 Assemblies with R2+ SHEATHE Exterior Insulation¹

Wall Component	Materials
Base Wall System Use one Option: 1, 2, 3 or 4	<ol style="list-style-type: none"> 1. Cast concrete walls 2. CMU concrete walls 3. 25-gauge min. 3⁵/₈" (min.) steel studs spaced 24" o.c. (max.) <ol style="list-style-type: none"> a. 5/8" Type X gypsum wallboard interior b. Lateral bracing every 4' 4. FRTW (fire-retardant-treated wood) studs: min. nominal 2x4 dimension, spaced 24" o.c. (max.) <ol style="list-style-type: none"> a. 5/8" Type X gypsum wallboard interior b. Bracing as required by building code
Fire-Stopping at Floor Lines	<ol style="list-style-type: none"> 1. Any approved mineral-fiber-based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth. 2. Solid FRTW fire blocking at floor line in accordance with building code requirements for Type III construction.

Wall Component	Materials
<p>Cavity Insulation Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15.</p> <p>Items 8, 9, 10 and 11 may only be used with exterior sheathing 2.</p>	<ol style="list-style-type: none"> 1. None 2. 1½" (min.) of Covestro EcoBay CC SPF (up to full cavity thickness) 3. 1½" (min.) of BASF Walltite SPF (up to full cavity thickness) 4. Any noncombustible insulation per ASTM E136 5. Any mineral fiber (Board type Class A ASTM E84 faced or unfaced) 6. Any fiberglass (Batt type Class A ASTM E84 faced or unfaced) 7. Any foam plastic insulation (SPF or board type) that has been tested per ASTM E1354² (at a min. of 20 kW/m² heat flux) and shown by analysis to be less flammable (improved T_{ign}, PK. HRR)³ than Covestro EcoBay CC or BASF Walltite 8. NCFI InsulBloc SPF (up to full cavity thickness) 9. Icynene MD-C-200v3 (Proseal) up to 5½ inches (only with ½ in. [min.] exterior gypsum sheathing) 10. SWD Urethane Quik-Shield 112 up to 6 inch (max.) stud cavities with an air gap not exceeding 2½" 11. 1½" (min.) Thermosteal 2000 (up to full cavity thickness) 12. Carlisle® SealTite PRO High Yield, SealTite PRO Open Cell, SealTite PRO No Mix, SealTite PRO No Trim 21, or SealTite PRO OCX – up to full cavity thickness with ½" (min.) exterior gypsum sheathing 13. Gaco (Firestone) F6500R, 052N, F4500, 183M, F1850, F1880 – 3½" (max.) for use with 5/8" Exterior Gypsum Sheathing 14. JM Corbond III or Corbond IV – Full stud cavity depth or less for use with 5/8" exterior gypsum sheathing 15. Huntsman ProSeal HFO (8 in. max. thickness with no air gap, 6 inch max. thickness with air gap) for use with ½" or thicker exterior gypsum sheathing
<p>Exterior Sheathing Use either 1, 2 or 3</p>	<ol style="list-style-type: none"> 1. None (only with cavity insulation 1, 4, 5 or 6) 2. ½" or thicker exterior gypsum sheathing 3. ½" (min.) FRTW structural panels in Type III construction
<p>Multi-Function Sheathing and WRB Products Use 1 or 2</p>	<ol style="list-style-type: none"> 1. USG Securock® Exoair® 430 System – See note and Table 7 2. 5/8" Georgia Pacific DensElement, flashed with Prosoco R-Guard FastFlash on sheathing joints 3. Note: Item 1 or 2 replaces the exterior sheathings above. When either of these items are used, do not use exterior sheathings or WRB's on base wall surface in Table 7
<p>WRB Over Base Wall Surface</p>	See Table 7
<p>Exterior Insulation</p>	<ol style="list-style-type: none"> 1. 3½" thick (max.) R2+ SHEATHE for all claddings 2. 4" thick R2+ SHEATHE for claddings 1-6
<p>WRB Over Exterior Insulation</p>	<p>See Table 7</p> <p>The exterior insulation may be used with or without CavClear® Masonry Mat over the insulation with a maximum 1" air gap between the CavClear® and the cladding. When CavClear® is used, this may only be used with Cladding 1, 2, 3, 4, 5, or 6 or with thin brick/thin stone adhered to stucco as long as the total thickness is ¾" min.</p>

Wall Component	Materials
<p>Exterior Cladding Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17</p> <p>Item 7 may use any tested/approved installation technique.</p> <p>Items 8, 9, or 12 may use any standard installation technique.</p>	<ol style="list-style-type: none"> 1. Brick – Nominal 4" thick, clay or concrete brick or veneer with maximum 2" air gap behind the brick. Brick ties/Anchors 24" o.c. (max.). 2. Stucco – Minimum 3/4" thick, exterior cement plaster and lath. For systems that require a more durable WRB system, any building wrap or 15# felt that meets requirement #9 in WRB Over Exterior Insulation (Table 7) can be used as a slip sheet between the WRB/external insulation and the lath. 3. Limestone – Minimum 2" thick using any standard non-open joint installation technique such as shiplap. 4. Natural stone veneer – Minimum 2" thick using any standard non-open joint installation technique such as grouted/mortared stone. 5. Cast Artificial Stone – Minimum 1 1/2" thick complying with ICC-ES AC 51 using any standard non-open joint installation technique such as shiplap. 6. Terra Cotta Cladding – Minimum 1 1/4" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap. 7. Any MCM that has passed NFPA 285. 8. Uninsulated sheet metal building panels including steel, copper and aluminum. 9. Uninsulated fiber-cement siding. 10. Stone/Aluminum honeycomb composite building panels that have successfully passed NFPA 285 criteria. 11. Autoclaved-aerated-concrete (AAC) panels that have successfully passed NFPA 285 criteria. 12. Terra Cotta Cladding – Any Rain-screen Terra Cotta (min. 1/2" thick) with ventilated shiplap. 13. 1/2" stucco – any one coat stucco (1/2" min.) which meets AC11 acceptance criteria or is approved for use in Type I-IV construction or has been tested per NFPA 285 or stays in place when tested per ASTM E119 (stucco exposed to fire) for at least 30 minutes. 14. Thin brick/cultured stone set in thin set adhesive and metal lath that has been tested to ASTM E119 (brick exposed to furnace) and remains in place for a minimum of 30 minutes, or has passed an NFPA 285 test. Minimum 3/4". For these systems which require a more durable WRB system, any building wrap or 15# felt that meets requirement #9 in WRB Over Exterior Insulation (Table 7) can be used as a slip-sheet between the WRB/AVP and the lath. 15. Glen Gery Thin Tech Elite Series Masonry Veneer or TABS II Panel System with 1/2" thick bricks using TABS Wall Adhesive. 16. Natural Stone Veneer – minimum 1 1/4" thick using any standard installation technique. 17. FunderMax m.look Grey Core – minimum 1/4" thick using any standard installation technique
<p>SI: 1 in = 25.4 mm</p> <ol style="list-style-type: none"> 1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis. 2. Acceptance criteria for ASTM E1354 testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis. 3. T_{ign} is the time to ignition from the start of the test until the sheathing ignites. Pk. HRR is the peak heat release rate during the test. 	

Table 6. Approved NFPA 285 Wall Assemblies with R2+ SHEATHE Interior Insulation^{1,4}

Wall Component	Materials
Base Wall System Use either 1 or 2	1. Cast concrete walls (min. 8" thick) 2. CMU concrete walls (min. 8" thick)
Exterior Coating Use one Option: 1, 2, 3 or 4	1. Portland cement or lime stucco 2. Any ASTM E84 Class A Point or Elastomeric Coating 3. Any ASTM E84 Class A Clear Sealer 4. None
Air/Vapor Barrier Membrane Position 1 Over Base Wall Interior² Note: Some WRBs are only allowed with specific systems	See Table 7 – WRB over Base Wall Surface.
Continuous Insulation⁵	1. R2+ SHEATHE, max. 3½" thick
Air/Vapor Barrier Membrane Position 2 Over Insulation³ Note: Some WRB's are only allowed with specific systems	See Table 7 – WRB over Base Wall Surface Note: Insulation Joints may be taped with Foil-Grip™ 1402, 4" width (max.)
Interior Cladding	5/8" type X interior gypsum sheathing installed directly over the insulation or installed to 35/8" (max. depth) studs or Metal Hat or Z Furring directly (no gap between stud/hat/Z and insulation). If an air gap between the stud/hat/Z and insulation is created, fire blocking with mineral wool per IBC Section 718 shall be installed. Mass wall designs are assumed to use platform construction (concrete floor line intersects exterior concrete creating a firestop at floor lines). If the floor line is separated from the exterior concrete, fireblocking with mineral wool must be installed to prevent uncontrolled vertical flame spread.
SI: 1 in = 25.4 mm 1. The assembly combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis. 2. Position 1 – Air vapor barrier installed directly on interior side of the base wall system. 3. Position 2 – Air vapor barrier installed over continuous insulation on interior side of the wall assembly. 4. CCW Membrane Used in Position 1 or 2, not both. 5. R2+ SHEATHE insulation can be tacked in place with CAV-Grip® or Travel-Tack™ during installation. Follow instructions on product data sheet.	

Table 7. NFPA 285 Allowable WRB Materials with R2+ SHEATHE^{1,2,3,4,5,6,7,8}

Wall Component	Materials
<p>WRB Over Base Wall Surface Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, or None.</p> <p>Note: Some WRBs are only allowed with specific systems.</p> <p>Item 24 (Securock® Exoair® 430) or 25 (DensElement w/ FastFlash) replaces the exterior sheathings in Tables 5-7. When either of these items are used, do not use exterior sheathings listed in Tables 5-7 or WRB's on base wall surface in this table.</p>	<ol style="list-style-type: none"> 1. Hunter Xci VP-SA WRB 2. Carlisle® Fire Resist 705 RS, Fire Resist Barrithane VP, Fire Resist 705 VP, Fire Resist 705 FR-A, Fire Resist Barritech NP, Fire Resist Barritech VP (or VP LT). Fire Resist 705 VP may be used with 702 WB, Cav-Grip, or Low VOC Travel-Tack adhesives. Fire Resist FR-A may be used with CCW 702, 702LV, 702 WB, CAV-Grip, and Low VOC Travel-Tack adhesives. 3. CCW-705 (with 702 LV, 702 WB, Cav-Grip, Low VOC Travel-Tack, or 702 adhesives may) be used with R2+ SHEATHE, or unfaced noncombustible insulation and cladding options 1-6 (Table 3) 4. GE Momentive SEC 2500 SilShield, Elemax 2600 5. Vaproshield Wrapshield SA, RevealShield SA 6. WR Grace Perm-A-Barrier® VPS, Perm-A-Barrier® NPL (AKA: PAB NP20), Perm-A-Barrier® VPL, Perm-A-Barrier® Aluminum Wall Membrane (AWM), Perm-A-Barrier® VPL LT. The following may only be used with claddings 1-6 - Perm-A-Barrier® NPL 10, Perm-A-Barrier® VPL 50. 7. StoGuard Vaporseal 8. 3M 3015 (with Hold Fast 70 adhesive @ 6 mils) 9. Henry Air-Bloc 17MR, 21S, 31MR, 33MR, 16MR. 10. Tyvek CommercialWrap or CommercialWrap D, Fluid Applied WB (only with Xci Ply [Class A]). 11. PolyGuard Air Lok Flex VP, FlexGuard, Air Lok Flex (only with claddings 1-6) (Table 3) 12. Prosoco R-Guard Cat 5, R-Guard Cat 5 Rainscreen, R-Guard VB or R-Guard Spray Wrap MVP 13. Dryvit Backstop NT 14. WR Meadows Air Shield LMP (Gray), Air Shield LMP (Black), Air Shield TMP, Air Shield LSR 15. Cosella-Dörken Products, Inc., Delta-Vent SA, Delta-Vent S, Delta-Fassade S, Delta Maxx. 16. Any WRB that has been tested per ASTM E1354 (at a minimum of 20 kW/m² heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than those listed above 17. BASF Enershield HP or Enershield I 18. Soprema Sopraseal Stick VP, Soprasolin HD, Stick 1100T with Elastacool 600c Primer (for use with R2+ SHEATHE) 19. Pecora XL Perm Ultra VP 20. Siga Majvest or Majvest 500 SA 21. Sto Gold Coat or Emerald Coat 22. Tremco ExoAir 230 and ExoAir 130 23. Fortifiber Building Systems Group WeatherSmart Housewrap, WeatherSmart Drainable, WeatherSmart Commercial or Super Jumbo Tex 60 24. USG Securock® Exoair® 430 System – see note on left and Air/Vapor System sections in Table 5 through Table 7. 25. 5/8" Georgia Pacific DenElement, flashed with Prosoco R-Guard FastFlash on sheathing joints. 26. Dow Corning Dowsil DefendAir200 27. Hohmann & Barnard Enviro Barrier and Enviro Barrier VP 28. STS FW100 or FW100A 29. Karnak 321 K-NRG 30. NaturaSeal AirSeal NS-A-250LP, AirSeal NS-A-250HP 31. Jumpstart HWW-65A, HWW-65B, HWHP-80A, HWMP-90A, HWD2-72A, HWHPT-92A, HWMPC-105A 32. Master Wall Rollershield 33. Parex WeatherSeal Spray & Roll-On

Wall Component	Materials
<p>WRB Over Exterior Insulation Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, or None.</p> <p>Note: Some WRB's are only allowed with specific systems.</p>	<ol style="list-style-type: none"> 1. Hunter Xci VP-SA WRB 2. Carlisle® Fire Resist 705 RS, Fire Resist Barrithane VP, Fire Resist 705 VP (with 702 WB, Cav-Grip, or Low VOC Travel-Tack adhesives), Fire Resist 705 FR-A (with CCW 702, 702LV, 702 WB, CAV-Grip, and Low VOC Travel Adhesives), Fire Resist Barritech VP (or VP LT), Fire Resist Barritech NP 3. GE Momentive SEC 2500 SilShield 4. Vaproshield Wrapshield SA, RevealShield SA 5. Grace Perm-A-Barrier® NPL (AKA: PAB NP20), Perm-A-Barrier® VPL, Perm-A-Barrier® Aluminum Wall Membrane (AWM), Perm-A-Barrier® VPL LT, Perm-A-Barrier® VPS. 6. Henry Air-Bloc 17MR, 21S, 31MR, 33MR and 16MR. 7. Tyvek CommercialWrap. 8. PolyGuard Air Lok Flex VP, FlexGuard, Air Lok Flex (only with claddings 1-6) (Table 3) 9. Prosoco R-Guard Cat 5, R-Guard Cat 5 Rainscreen, R-Guard VB or R-Guard Spray Wrap MVP 10. Sto Gold coat 11. Dryvit Backstop NT 12. Any WRB that has been tested per ASTM E1354 (at a minimum of 20 kW/m² heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than those listed above 13. 3" Aluma-Grip™ 701 or 4" FG-1402 joint tape may be interchanged. (Hardcast AFT is a rebrand of Aluma-Grip™ 701). 14. WR Meadows Air Shield LMP (Gray), Air Shield LMP (Black), Air Shield TMP, Air Shield LSR 15. Cosella-Dörken Products, Inc., Delta-Vent SA, Delta-Vent S, Delta-Fassade S, Delta Maxx. 16. Soprema Sopraseal Stick VP, Soprasolin HD 17. Pecora XL Perm Ultra VP 18. Siga Majvest (for all claddings) or Majvest 500 SA (only with Claddings 1-6) 19. Fortifiber Building Systems Group WeatherSmart Housewrap, WeatherSmart Drainable or WeatherSmart Commercial 20. Dow Corning Dowsil DefendAir 200 21. Hohmann & Barnard Enviro Barrier VP 22. STS FW100A 23. Karnak 321 K-NRG 24. Jumpstart HWW-65A, HWW-65B, HWHP-80A, HWMP-90A, HWD2-72A, HWHPT-92A, HWMPC-105A 25. Master Wall Rollershield 26. Parex WeatherSeal Spray & Roll-On

Wall Component	Materials
<p>SI: 1 in = 25.4 mm</p> <ol style="list-style-type: none"> 1. The following adhesives may be used for attachment of the polyisocyanurate (polyiso) insulation: <ol style="list-style-type: none"> a. Adhesive applied discontinuously at a rate of $\frac{3}{8}$" x 3" dabs, 16" o.c.: LM 800 XL or BarriBond or BarriBond XL b. Aerosol adhesive at the application rate as per mfg. instructions: CAV-Grip™ or Low VOC Travel-Tack 2. The following may be used as gap filler between insulation panels: FOMO HandiFoam FireBlock and TVM FireBlock. 3. These CCW detailing materials may be used over the base wall assembly. The detailing materials can be used alone or with any approved WRB for the construction. <ol style="list-style-type: none"> a. Board Joint Treatments: <ol style="list-style-type: none"> i. 2" x 40 mil ribbon of BarriBond or BarriBond XL ii. 4" DCH Reinforcing Fabric embedded in Fire-Resist Barritech VP/NP/NP LT or embedded in Fire Resist Barrithane VP iii. 4" Foil-GRIP 1402 (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) iv. 4" AlumaGrip™ 701 (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) b. Termination Mastic for Flashing/Membrane: 1" x 40 mil ribbon or tooled $\frac{3}{8}$" bead of SURE-SEAL Lap Sealant, CCW-704, LM 800 XL, BarriBond, or BarriBond XL c. Detail Flashing, 3" on each side, at Openings, Terminations, Penetrations, Transitions, and Angle Changes. <ol style="list-style-type: none"> i. CCW-705/XLT, CCW-705 TWF/XLT, or Fire Resist 705 FR-A/XLT (all with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) ii. SURE-SEAL P/S Elastoform or SURE-SEAL P/S Cover Strip (both with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) iii. LiquiFiber or DCH Reinforcing Fabric embedded in Barritech VP/NP/NP LT iv. 40 mil application of BarroBond, BarriBond XL, or Barrithane VP 4. These CCW detailing materials may be used over the polyiso insulation and can be use alone or with any approved WRB for the assembly. <ol style="list-style-type: none"> a. Board Joint Treatments: <ol style="list-style-type: none"> i. 2" x 40 mil ribbon of BarriBond or BarriBond XL ii. 4" DCH Reinforcing Fabric embedded in Fire-Resist Barritech VP/NP/NP LT or embedded in Fire Resist Barrithane VP iii. 4" Foil-GRIP 1402 (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) iv. 4" AlumaGrip™ 701 (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) b. Termination Mastic for Flashing/Membrane: 1" x 40 mil ribbon or tooled $\frac{3}{8}$" bead of SURE-SEAL Lap Sealant, LM 800 XL, BarriBond, or BarriBond XL c. Detail Flashing, 3" on each side, at Openings, Terminations, Penetrations, Transitions, and Angle Changes. <ol style="list-style-type: none"> i. Fire Resist 705 FR-A/XLT (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) ii. SURE-SEAL P/S Elastoform or SURE-SEAL P/S Cover Strip (both with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) iii. LiquiFiber or DCH Reinforcing Fabric embedded in Barritech VP/NP/NP LT iv. 40 mil application of BarroBond, BarriBond XL, or Barrithane VP 5. In the NFPA 285 test, flashing for fenestration, including Through-Wall Flashing (TWF), are not considered part of the WRB (ref: 2015 IBC Section 1405.4). TWF is permitted for use in wall assemblies clad with masonry or stone at the base of wall, head of wall, relieving angle, window head, window sill, and at other interruptions in the exterior cavity. TWF shall be applied a maximum of 8" onto the back-up wall and terminate at daylight or onto a drip edge. The following TWF products may be used: <ol style="list-style-type: none"> a. CCW TWF/XLT (with surface preparation as recommended by CCW using CCW-702, CCW-702 LV, CCW-702 WB, CCW-715, Low VOC Travel-Tack, CAV-Grip, HP 250 Primer, or Low VOC EPDM Primer per instructions on Product Data Sheet) b. Pre-Kleened EPDM TWF loose-laid or adhered with SURE-SEAL 90-8-30A bonding Adhesive or SURE-SEAL Low VOC Bonding Adhesive c. Metal TWF by others 6. BRT-801 tape may be used over Fire-Resist 705 RS at membrane splices, terminations, and penetrations. Fire-Resist 705 RS and the substrate may be treated with CCW-702, CCW-702 LV, CCW-702 WB, or Low VOC Travel-Tack to promote adhesion of BRT-801. 7. Fire-Resist 705 RS may be used in the following applications: <ol style="list-style-type: none"> a. Over the exterior insulation, while another approved WRB is used over the base wall assembly. b. Over a WRB on the base wall assembly while no exterior insulation is used. Use only WRBs listed below: <ol style="list-style-type: none"> i. CC Fire Resist 705 FR-A ii. Other WRBs that produce no ignition when tested per ASTM E1354 at a heat flux of 50 kW/m². 8. Insulating coating applied over noncombustible substrate can be used for mitigating thermal bridging at wall assembly terminations and penetrations. Coating applied in these conditions cover a small percentage of the total wall surface area. The following products are allowed: <ol style="list-style-type: none"> a. Aerolon 945 tape with primer by Tnemec b. Aerolon 971 coating with primer by Tnemec. 	

- 5.6 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

6 Installation

- 6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this TER and the applicable building code.
- 6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.
- 6.3 *Installation Procedure*
- 6.3.1 This section provides general guidelines for the installation of R2+ SHEATHE only. Refer to the manufacturer installation instructions in addition to this TER, for complete details and requirements.
- 6.3.1.1 Protect surrounding areas and surfaces from damage.
- 6.3.1.2 For installation of R2+ SHEATHE on exterior, over WRB on base wall: Ensure that WRB is installed correctly and is in good condition before covering with R2+ SHEATHE.
- 6.3.1.2.1 When used in a NFPA 285 approved assembly, WRB must be one of those identified in Table 5.
- 6.3.1.3 For installation of R2+ SHEATHE on interior, over air/water resistive barrier on base wall: Ensure that air/water resistive barrier is one of those identified in Table 6 and air/water resistive barrier is installed correctly and is in good condition before covering with R2+ SHEATHE.
- 6.3.1.3.1 When used in a NFPA 285 approved assembly, the air/water resistive barrier must be one of those identified in Table 6.
- 6.3.1.4 R2+ SHEATHE shall not be applied over walls while they are vulnerable to water intrusion from above or behind.
- 6.3.1.5 Do not block flashing, weeps or other drainage paths with R2+ SHEATHE.
- 6.3.1.6 Do not span expansion joints with R2+ SHEATHE.
- 6.3.1.7 During installation, take precautions to minimize moisture intrusion behind insulation.
- 6.3.1.8 Beginning at the base of the wall, apply horizontally using maximum board lengths to minimize the number of joints.
- 6.3.1.9 Offset R2+ SHEATHE board joints in neighboring rows a minimum of 6". Do not form four-corner intersections.
- 6.3.1.10 R2+ SHEATHE may be applied vertically, as required.
- 6.3.1.11 Pre-cut to fit openings and penetrations.
- 6.3.1.12 Cut with a knife, using a square to guide the cut, or use a table saw.
- 6.3.1.13 Abut all joints tightly and ensure an overall flush, level surface.
- 6.3.1.14 Mechanically fasten using the fastening pattern as indicated.
- 6.3.1.14.1 Space fasteners 12" o.c. at the perimeter and 16" o.c. in the field.
- 6.3.1.14.2 Set back perimeter fasteners $\frac{3}{8}$ " from board edges.

- 6.3.1.14.3 **Note for exterior application:** Where R2+ SHEATHE is installed by the same trade as the cladding, or in close cooperation with that trade, cladding attachment hardware can supplement or replace the insulation fasteners and insulation adhesive. Cladding fasteners fulfilling the R2+ SHEATHE attachment function shall be designed for this function. If the cladding attachment is 16" o.c. or closer, and it tightly secures the insulation, no additional fastening or adhesive is required.
- 6.3.1.14.4 **Note for interior application:** Where R2+ SHEATHE is installed by the same trade as the interior drywall, or in close cooperation with that trade, drywall attachment hardware can supplement or replace the insulation fasteners and insulation adhesive. Drywall fasteners fulfilling the R2+ SHEATHE attachment function shall be designed for this function. If the drywall attachment is 16" o.c. or closer, and it tightly secures the insulation, no additional fastening or adhesive is required.
- 6.3.1.15 When an approved adhesive is used, periodically verify adhesion. Properly installed adhesively applied R2+ SHEATHE will cohesively break the adhesive while still wet and destroy the substrate when dry.
 - 6.3.1.15.1 Consult the detailed manufacturer installation instructions for the proper adhesive pattern to maintain the drainage plane.
 - 6.3.1.15.2 When used in a NFPA 285 approved assembly, adhesives must be one of those listed in Table 5, Table 6 or Table 7.
- 6.3.1.16 Fill gaps greater than 1/8" between insulation boards with expanding spray foam with approved sealant and strike flush. Expanding spray foam may also be applied onto the insulation board edges during installation.
- 6.3.1.17 Verify all materials are installed in accordance with current Carlisle® Coatings & Waterproofing (CCW) published literature and local code requirements.
- 6.3.1.18 Additional information on the installation and detailing of R2+ SHEATHE can be found at carlisleccw.com.
- 6.3.2 This section provides additional guidelines for the installation of R2+ SHEATHE as an air and water-resistive barrier:
 - 6.3.2.1 When used in a NFPA 285 approved assembly as an air/water resistive barrier, see also Section 5.4 and Table 6.
 - 6.3.2.2 When used in a NFPA 285 approved assembly as a WRB, see also Section 5.5 and Table 7 with all notes.
 - 6.3.2.3 Use minimum 1" thickness R2+ SHEATHE.
 - 6.3.2.4 Install directly over wood or steel studs or over exterior sheathing fastened to wood or steel studs.
 - 6.3.2.5 Fasten R2+ SHEATHE boards with corrosion-resistant screws or Heckmann Pos-I-Tie® fitted with Thermal-Grip® ci plastic washers by Rodenhouse. Space fasteners 16" o.c. in the field and 12" o.c. at the perimeter.
 - 6.3.2.5.1 Other fastening used shall be installed 16" o.c. in the field and 12" o.c. at the perimeter. Other fastening shall be verified as air and water tight through ASTM E2357 and ASTM E331 testing, or it shall be sealed with caulk or flashing tape.
 - 6.3.2.6 Tape over board joints with 4" width Aluma-Grip™ 1402 tape by CCW.
 - 6.3.2.7 Cover inside/outside corners with Aluma-Grip™ 701 by CCW. Aluma-Grip™ 701 shall bear 3" minimum onto each side of angle.
 - 6.3.2.8 Wrap window openings with Aluma-Grip™ 701. Aluma-Grip™ 701 shall wrap at least 3" onto wall, and shall return far enough into the window opening to provide continuous air/water seal to window frame.
 - 6.3.2.9 Flash pipe and duct penetrations through R2+ SHEATHE with Aluma-Grip™ 701.
 - 6.3.2.10 Consult CCW details and instructions for complete information about installation of R2+ SHEATHE as an air and water-resistive barrier.

7 Substantiating Data

- 7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
 - 7.1.1 Flame spread and smoke developed ratings testing in accordance with UL 723
 - 7.1.2 Fire performance criteria testing in accordance with NFPA 285
 - 7.1.3 Fire performance criteria testing in accordance with NFPA 286
 - 7.1.4 Potential heat testing in accordance with NFPA 259
 - 7.1.5 Air barrier material testing in accordance with ASTM E2178
 - 7.1.6 Air barrier assembly testing in accordance with ASTM E2357
 - 7.1.7 Vapor impermeability testing in accordance with ASTM E96 Method A and Method B
 - 7.1.8 Water-resistive barrier testing in accordance with ASTM E331
- 7.2 Engineering analysis comparing the fire resistance properties of R2+ SHEATHE by Priest and Associates
- 7.3 Engineering analysis assessing the substitution of products within the approved NFPA 285 tested wall assemblies by Priest and Associates
- 7.4 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e., ANAB accredited agencies), approved sources (i.e., RDPs), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.
- 7.5 Where pertinent, testing and/or engineering analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes a product as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 7.6 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of products, materials, designs, assemblies and/or methods of construction. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.
- 7.7 Testing and engineering analysis: The strength, rigidity and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.¹⁸
- 7.8 Where additional condition of use and/or code compliance information is required, please search for R2+ SHEATHE on the DrJ Certification website.

¹⁸ See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

8 Findings

- 8.1 As delineated in Section 3, R2+ SHEATHE has performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.
- 8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, R2+ SHEATHE shall be approved for the following applications:
- 8.2.1 Use in exterior walls of buildings of any height of Type I-IV construction in accordance with [IBC Section 2603.5](#)
 - 8.2.2 Use in wall assemblies meeting the requirements of NFPA 285 testing when constructed in accordance with Table 5
 - 8.2.3 Complies with, or is a suitable alternative to, the applicable sections of the codes listed in Section 2
 - 8.2.4 Use in exterior walls of buildings as a WRB in accordance with [IBC Section 1403.2](#)¹⁹
 - 8.2.5 Use in exterior walls of buildings as an air barrier in accordance with [IECC Section C402.5.1](#)
- 8.3 Unless exempt by state statute, when R2+ SHEATHE is to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.
- 8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Carlisle® Coatings & Waterproofing Inc (CCW).
- 8.5 [IBC Section 104.11](#) ([IRC Section R104.11](#) and [IFC Section 104.10](#)²⁰ are similar) in pertinent part states:
- 104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.
- 8.6 **Approved:**²¹ Building codes require that the building official shall accept duly authenticated reports²² or research reports²³ from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies, or methods of construction.
- 8.6.1 Acceptance of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).
 - 8.6.2 Acceptance of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.
 - 8.6.3 Federal law, [Title 18 US Code Section 242](#), requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved, as denial without written reason deprives a protected right to free and fair competition in the marketplace.

¹⁹ [2015 IBC Section 1404.2](#)

²⁰ [2018 IFC Section 104.9](#)

²¹ Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC [Section 201.4](#) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

²² <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>

²³ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>

- 8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.
- 8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – “*certified once, accepted everywhere.*” IAF specifically says, “*Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.*”²⁴

9 Conditions of Use

- 9.1 Material properties shall not fall outside the boundaries defined in Section 3.
- 9.2 As defined in Section 3, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 9.3 As listed herein, R2+ SHEATHE shall not be used:
- 9.3.1 As a structural nailing base for claddings.
- 9.3.2 To resist lateral loads. Walls shall be braced by other materials in accordance with the applicable code, and the exterior wall covering shall be capable of resisting the full design wind pressure.
- 9.4 This TER and the installation instructions, when required by a code official, shall be submitted at the time of permit application.
- 9.5 When the insulation boards are used on the exterior side of exterior walls of buildings of Type I, II, III, or IV construction must be as described in Table 5.
- 9.6 When the insulation boards are used on the interior side of exterior walls of buildings of Type I, II, III, or IV construction must be as described in Table 6.
- 9.7 When installed in areas where the probability of termite infestation is “very heavy” the installation must meet the requirements of IBC Section 2603.8.
- 9.8 R2+ SHEATHE is manufactured in Smithfield, Pennsylvania; Franklin Park, Illinois; or Puyallup, Washington under a quality control program with quality control inspections in accordance with IBC Section 110.3.10²⁵ and IBC Section 110.3.11.²⁶
- 9.9 The wall assemblies listed in Table 5, Table 6, and Table 7 are based on compliance to the fire provisions of the codes listed in Section 2. Consideration of wall assembly performance with regard to other attributes, such as water vapor control, condensation, energy code requirements, etc. are outside the scope of this TER.
- 9.10 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:
- 9.10.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice, and, when prepared by an approved source, shall be approved when signed and sealed.
- 9.10.2 This TER and the installation instructions shall be submitted at the time of permit application.
- 9.10.3 This innovative product has an internal quality control program and a third-party quality assurance program.
- 9.10.4 At a minimum, this innovative product shall be installed per Section 6 of this TER.
- 9.10.5 The review of this TER, by the AHJ, shall be in compliance with IBC Section 104 and IBC Section 105.4.

²⁴ <https://iaf.nu/en/about-iaf-mla/#:~:text=required%20to%20recognise>

²⁵ 2018 IBC Section 110.3.9, 2015 IBC Section 110.3.8

²⁶ 2018 IBC Section 110.3.10, 2015 IBC Section 110.3.9



- 9.10.6 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4 and IRC Section R109.2.
- 9.10.7 The application of this innovative product in the context of this TER is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2 and any other regulatory requirements that may apply.
- 9.11 The approval of this TER by the AHJ shall comply with IBC Section 1707.1, where legislation states in pertinent part, “*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.11” , all of IBC Section 104, and IBC Section 105.4.*
- 9.12 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 9.13 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner’s authorized agent.

10 Identification

- 10.1 The innovative product listed in Section 1.1 is identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at carlisleccw.com .

11 Review Schedule

- 11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.
- 11.2 For information on the status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

- 12.1 R2+ SHEATHE is included in this TER published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER meets the legislative intent and definition of being acceptable to the AHJ.

Appendix A

1 Legislation that Authorizes AHJ Approval

- 1.1 **Fair Competition:** State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:
 - 1.1.1 Advance Innovation,
 - 1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and
 - 1.1.3 Benefit consumers through lower prices, better quality, and greater choice.
- 1.2 **Adopted Legislation:** The following local, state, and federal regulations affirmatively authorize R2+ SHEATHE to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:
 - 1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to “protect economic freedom and opportunity by promoting free and fair competition in the marketplace.”
 - 1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation, and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.
 - 1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),²⁷ where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than 10 years²⁸ and/or a \$5,000,000 fine or 3 times the value of²⁹ the Intellectual Property (IP) and Trade Secrets (TS).
 - 1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.
 - 1.2.4 For new materials³⁰ that are not specifically provided for in any building code, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.
 - 1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.³¹
 - 1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence, provided in writing, that specific legislation has been violated by an individual registered PE.
 - 1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.³²

²⁷ <http://www.drjengineering.org/AppendixC> and <https://www.drjcertification.org/cornell-2016-protection-trade-secrets>.

²⁸ <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years>

²⁹ <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided>

³⁰ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>

³¹ [IBC 2021, Section 1706.1 Conformance to Standards](#)

³² [IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General](#)

- 1.3 **Approved³³ by Los Angeles:** The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards, which apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.³⁴ The Superintendent of Building roster of approved testing agencies is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a CBI Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.³⁵
- 1.4 **Approved by Chicago:** The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).
- 1.5 **Approved by New York City:** The NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed³⁶ an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement³⁷ (i.e., ANAB, International Accreditation Forum (IAF), etc.).

³³ See Section 8 for the distilled building code definition of Approved

³⁴ Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

³⁵ https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

³⁶ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

³⁷ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

- 1.6 **Approved by Florida:** Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods; 1) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 3) A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code; 4) A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code; 5) A statewide product approval issued by the Florida Building Commission. The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).
- 1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA]):** A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.
- 1.8 **Approved by New Jersey:** Pursuant to Building Code 2018 of New Jersey in IBC Section 1707.1 General,³⁸ it states: “In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)”.³⁹ Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) Approvals:** Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations. 1. A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. 2. Reports of engineering findings issued by nationally recognized evaluation service programs, such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item 2 given that the listed entities are no longer in existence and/or do not provide “reports of engineering findings”.

³⁸ https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

³⁹ <https://www.nj.gov/dca/divisions/codes/codreg/ucc.html>

- 1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards:** Pursuant to Title 24, Subtitle B, Chapter XX, [Part 3282.14](#)⁴⁰ and [Part 3280](#),⁴¹ the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) “All construction methods shall be in conformance with accepted engineering practices”; 2) “The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.”; and 3) “The design stresses of all materials shall conform to accepted engineering practice.”
- 1.10 **Approval by US, Local, and State Jurisdictions in General:** In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:
- 1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.⁴²
- 1.10.2 For innovative alternative products, materials, designs, services and/or methods of construction, in the absence of approved rules or other approved standards...the building official shall accept duly authenticated reports (i.e., listing and/or research report) from approved agencies with respect to the quality and manner of use of new materials or assemblies.⁴³ A building official approved agency is deemed to be approved via certification from an accreditation body that is listed by the International Accreditation Forum⁴⁴ or equivalent.
- 1.10.3 The design strengths and permissible stresses of any structural material...shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.⁴⁵ An approved source is defined as a PE subject to professional engineering laws, where a research and/or a technical evaluation report certified by a PE, shall be approved.
- 1.11 **Approval by International Jurisdictions:** The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements:
- 1.11.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country,
- 1.11.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.
- 1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

⁴⁰ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>

⁴¹ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>

⁴² [IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials](#). Adopted law pursuant to IBC model code language 1706.2.

⁴³ [IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General](#). Adopted law pursuant to IBC model code language 1707.1.

⁴⁴ Please see the [ANAB directory](#) for building official approved agencies.

⁴⁵ [IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards](#) Adopted law pursuant to IBC model code language 1706.1.



1.11.4 **Approved:** The purpose of the IAF MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA, and subsequently acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.