Listing and Technical Evaluation Report™

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Attachment of Defend-R CI Ply and Defend-R CI Ply (Class A) to Wood, Steel, Concrete and Masonry

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 12 00 - Structural Panels Section: 06 12 19 - Shear Wall Panels Section: 06 16 00 - Sheathing

1 Innovative Products Evaluated[1]

1.1 Defend-R Wall Products:

1.1.1 Defend-R Panels:

1.1.1.1 Defend-R CI Ply

1.1.1.2 Defend-R CI Ply (Class A)

1.1.1.3 Defend-R CI NB

1.1.2 Defend-R Foam:

1.1.2.1 Defend-R CI Foil

1.1.2.2 Defend-R CI Foil (Class A)

1.1.2.3 Defend-R CI Coated Glass

1.1.2.4 Defend-R CI Coated Glass (Class A)

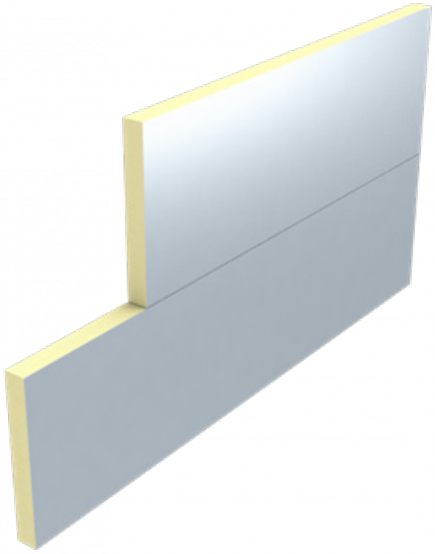
2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1**.

Defend-R CI Ply

Defend-R CI NB

Defend-R CI Coated Glass



Defend-R CI Foil

Figure 1. Defend-R Wall Products

2.2 Defend-R CI Ply and Defend-R CI Ply (Class A) panels are ASTM C1289 Type V, high thermal rigid insulation panels composed of a Type II Class 2 closed cell polyisocyanurate foam core bonded to a premium performance coated glass facer on one side and $^{5}/_{8}$" or $^{3}/_{4}$" Fire-Retardant Treated (FRT) plywood on the other. Both are designed for use in Types I-IV commercial wall applications to provide continuous insulation within the building envelope.

2.3 Defend-R CI NB is an ASTM C1289 Type V, high thermal rigid insulation panel composed of a Type II Class 2 closed cell polyisocyanurate foam core bonded to a premium performance coated glass facer on one side and $^{7}/_{16}$" or $^{5}/_{8}$" OSB or plywood on the other. It is designed for use in Type V commercial wall applications to provide continuous insulation within the building envelope.

2.4 Defend-R CI Coated Glass, Defend-R CI Coated Glass (Class A), Defend-R CI Foil and Defend-R CI Foil (Class A) are proprietary Foam Plastic Insulating Sheathing (FPIS) products.

2.4.1 Defend-R CI Coated Glass and Defend-R CI Coated Glass (Class A) are polyisocyanurate insulation boards adhered to coated glass facers. Insulation boards are available as ASTM C1289 Type II, Class 2, Grade 2 or Grade 3 compliant.

2.4.2 Defend-R CI Foil and Defend-R CI Foil (Class A) are composite boards consisting of a 25-psi closed-cell polyisocyanurate insulation foam core, coated on both sides with a glass-backed aluminum foil facer. Insulation boards are available as ASTM C1289 Type I, Class 1 and Class 2, Grade 2 or Grade 3 compliant.

2.5 *Material Availability*

2.5.1 *Thickness:*

2.5.1.1 *Defend-R CI Ply and Defend-R CI Ply (Class A):*

2.5.1.1.1 1.6" (41 mm) through 4.7" (119 mm)

2.5.1.2 *Defend-R CI Ply NB:*

2.5.1.2.1 1.5" (38 mm) through 4.6" (117 mm)

2.5.1.3 *Defend-R CI Coated Glass and Defend-R CI Coated Glass (Class A):*

2.5.1.3.1 1" (25 mm) through 4" (102 mm)

2.5.1.4 *Defend-R CI Foil and Defend-R CI Foil (Class A):*

2.5.1.4.1 1" (25 mm) through 4" (102 mm)

2.5.2 *Standard Product Width:*

2.5.2.1 48" (1,219 mm)

2.5.3 *Standard Length:*

2.5.3.1 96" (2,438 mm)

2.6 Throughout this report:

2.6.1 The term, “Defend-R Panels”, refers to Defend-R CI Ply, and Defend-R CI Ply (Class A).

2.6.2 The term, “Defend-R Foam”, refers to Defend-R CI Coated Glass, Defend-R CI Coated Glass (Class A), Defend-R CI Foil and Defend-R CI Foil (Class A) products.

2.7 *Fasteners*

2.7.1 Defend-R Panels shall be fastened with one of the proprietary fasteners described in this report, and in accordance with the provisions of this report.

2.7.1.1 Proprietary fastener properties shall be per published manufacturer data.

2.7.1.2 Hunter SIP/WD fasteners (SIPTP fasteners from TRUFAST®) are size No. 14 (shank diameter 0.189") fasteners with a 0.635" diameter pancake head and a T-30 drive. The point is a threaded drill point.

2.7.1.3 Hunter SIP/SD fasteners (SIPLD fasteners from TRUFAST) are size No. 14 (shank diameter 0.189") fasteners with a 0.635" diameter pancake head and a T-30 drive. The point is a two-flute formed drill tip.

2.7.1.4 Hunter SIP/HD (SIPHD fasteners from TRUFAST) fasteners are size No. 14 (shank diameter 0.189") fasteners with a 0.635" diameter pancake head and a T-30 drive. The point is a two-flute formed drill tip.

2.7.1.5 1/4" Tapcon® Screw Anchors are a 0.192" shank diameter carbon steel concrete anchors with a 0.475" diameter flat head and Star drive. They have an alternating high-low thread form and a pointed tip.

2.7.2 When referred to in this report, Hunter SIP/WD, SIP/SD, and SIP/HD fasteners are equivalent to TRUFAST SIPTP, SIPLD and SIPHD fasteners, respectively.

2.8 *Framing/Substrate Materials*

2.8.1 *Wood:*

2.8.1.1 Solid sawn wood framing members shall consist of lumber species having a specific gravity of at least 0.42.

2.8.2 *Steel:*

2.8.2.1 Steel framing members must comply with one of the material standards provided in Section A3.1 of AISI S100.

2.8.2.2 At a minimum, steel framing members must comply with the requirements set forth in this report.

2.8.3 *Concrete:*

2.8.3.1 Normal weight structural concrete must comply with IBC Section 1901.2.

2.8.3.2 Concrete shall remain uncracked for the service life of the fastener.

2.8.4 *Masonry:*

2.8.4.1 Load-bearing Concrete Masonry Units (CMUs) shall comply with IBC Section 2114.3 and IRC Section R606.2.1.

2.8.4.2 CMUs shall be normal-weight and conform to ASTM C90.

2.9 As needed, review material properties for design in **Section 6** and to regulatory evaluation in **Section 8**.

3 Definitions

3.1 New Materials[2] are defined as building materials, equipment, appliances, systems, or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[3] The design strengths and permissible stresses shall be established by tests[4] and/or engineering analysis.[5]

3.2 Duly Authenticated Reports[6] and Research Reports[7] are test reports and related engineering evaluations, which are written by an approved agency[8] and/or an approved source.[9]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[10]

3.3 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is “approved” when a professional engineer (i.e., Registered Design Professional) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[11]

3.5 Testing and/or inspections conducted for this Duly Authenticated Report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed Registered Design Professional (RDP).

3.5.1 The Center for Building Innovation (CBI) is ANAB[12] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[13] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[14] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept Duly Authenticated Reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[15]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope, shall be approved.[16] Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[17]

3.9 Approval equity is a fundamental commercial and legal principle.[18]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[19]

4.1 *Standards*

4.1.1 *ASCE/SEI 7: Minimum Design Loads for Buildings and Other Structures*

4.1.2 *AISI S100: North American Specification for the Design of Cold-formed Steel Structural Members*

4.1.3 *ASTM A653: Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-coated Galvannealed by the Hot-dip Process*

4.1.4 *ASTM C90: Standard Specification for Loadbearing Concrete Masonry Units*

4.1.5 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*

4.2 *Regulations*

4.2.1 *IBC – 15, 18, 21: International Building Code®*

4.2.2 *IRC – 15, 18, 21: International Residential Code®*

4.2.3 *IECC – 15, 18, 21: International Energy Conservation Code®*

4.2.4 *FBC-B—20, 23: Florida Building Code – Building*[20]

4.2.5 *FBC-R—20, 23: Florida Building Code – Residential*[20]

5 Listed[21]

5.1 Equipment, materials, products or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), approved agency (i.e., CBI and DrJ), and/or approved source (i.e., DrJ) or other organization concerned with product evaluation (i.e., DrJ) that maintains periodic inspection (i.e., CBI) 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.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *Defend-R Panel Attachment to Wood Framing*

6.1.1 Defend-R Panels shall be fastened along each stud.

6.1.2 Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 1** and **Table 2**, when 1x wood furring strips (0.75″ thick) are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener head). The design of the furring is outside the scope of this report and must be checked for the applied loads.

6.1.2.1 **Table 1** lists the largest vertical spacing for the specified fastener(s), while **Table 2** lists maximum wind pressure and the corresponding maximum wind speed for each Exposure Category.

6.1.2.1.1 The fastener spacing to be used shall be governed by the stricter of:

6.1.2.1.1.1 Cladding weight per **Table 1**, or

6.1.2.1.1.2 Wind pressure/wind speed per **Table 2**.

6.1.2.1.1.3 ***Example***: If the cladding weighing 15-psf is installed through a 1.6″ Defend-R CI Ply panel into wood framing spaced 24″ o.c. in a region with wind speeds that can reach up to 150 mph (Exposure Category C), the vertical fastener shall be installed 12″ o.c. (value taken directly from **Table 2** as an example; per note #5 in **Table 2**, interpolation is permitted).

6.1.3 *Connections to Wood Framing to Support Cladding Weight:*

6.1.3.1 Fasteners are required to attach Defend-R Panels to wood framing to support the attached cladding weight. See **Table 1** for the maximum vertical fastener spacing (along the height of the stud) to support specified cladding weights.

6.1.3.2 See **Figure 2** for a typical installation detail of Defend-R Panels attached to wood studs.

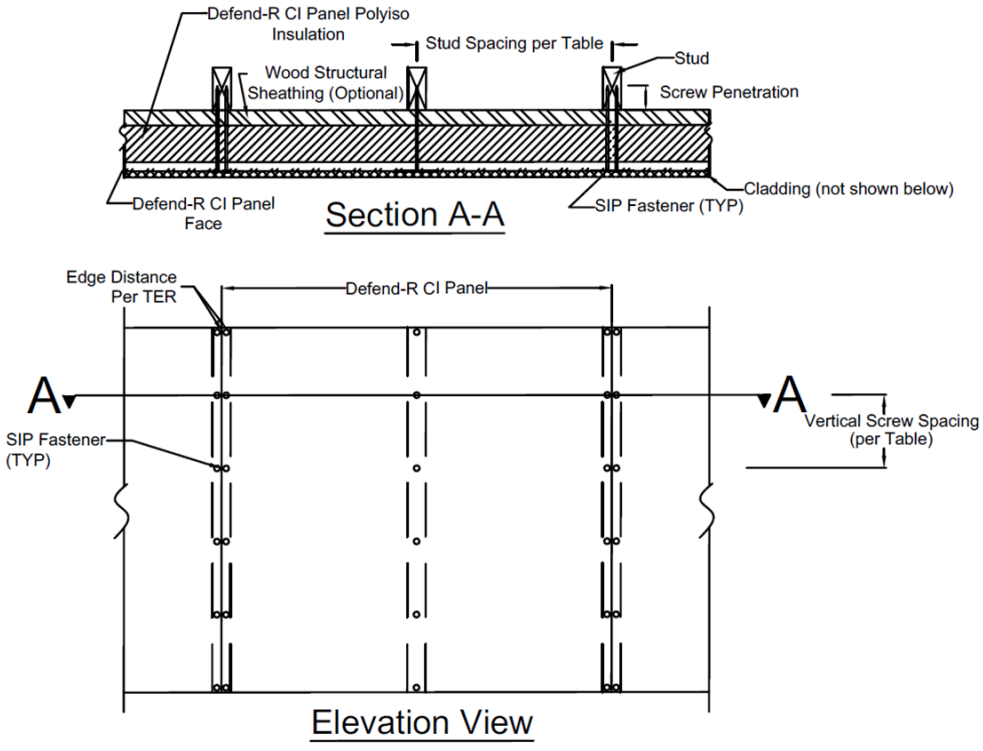


Figure 2. Typical Installation Detail

Table 1. Maximum Fastener Spacing for Defend-R Panels Attached to Wood Framing[5]

Framing Member[4]	Stud Spacing (in) o.c.	Fastener[1,2]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing (in)					
				Specified Cladding Weight[3] (psf)					
				5	10	15	20	25	30
Wood Framing	16"	Hunter SIP/SD	≤ 2 1/2	24	24	24	24	24	24
			3	24	24	24	24	20	16
			3 1/2	24	24	24	16	12	12
			4	24	16	12	8	8	6
		Hunter SIP/WD	≤ 2	24	24	24	24	24	24
			2 1/2	24	24	24	24	24	20
			3	24	24	24	24	20	16
			3 1/2	24	24	24	16	12	12
			4	24	16	12	8	8	6
	24"	Hunter SIP/SD	1	24	24	24	24	24	24
			1 1/2	24	24	24	24	24	20
			2	24	24	24	24	20	16
			2 1/2	24	24	24	20	16	16
			3	24	24	20	16	12	12
			3 1/2	24	20	16	12	8	8
			4	20	12	8	6	4	4
		Hunter SIP/WD	< 1 1/2	24	24	24	24	20	16
			2	24	24	24	20	16	16
			2 1/2	24	24	24	20	16	12
			3	24	24	20	16	12	12
			3 1/2	24	20	16	12	8	8
			4	20	12	8	6	4	4

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud for Hunter SIP/WD is 1 1/2". Minimum fastener penetration into the stud for Hunter SIP/SD is 2" for use with Defend-R Panels 4.2" thick or less, and 1.5" for use with Defend-R Panels 4.6" thick. Fastener penetration length is equal to the threaded portion of the screw in the main member, including the tip.
2. Proprietary fastener properties are per published data or testing. Fastener length shall be chosen so that the fastener fully penetrates the Defend-R Panels and achieves the minimum required fastener penetration into stud.
3. The weight of Defend-R Panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
4. Wood studs shall be a minimum of 2x4 and have a minimum specific gravity of 0.42.
5. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 1** when used with 1x wood furring strips (0.75" thick) that are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener's head).

6.1.4 *Connections to Wood Framing to Resist Out-of-Plane Wind Loading:*

6.1.4.1 Defend-R Panels shall be fastened along each stud with Hunter SIP/WD or Hunter SIP/SD.

6.1.4.2 See **Figure 2** for a typical installation detail of Defend-R Panels attached to wood studs.

Table 2. Allowable Wind Pressures for Defend-R CI Ply and Defend-R CI Ply NB Attached to Wood Framing With SIP/WD and SIP/SD[1,2,3,6]

Stud Spacing (in) o.c.	Vertical Fastener Spacing (in) o.c.	Allowable Wind Pressure[4] (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[4,5]		
			B	C	D
16"	24	54	165	145	135
	16	81	200	180	165
	12	108	200	200	195
	≤ 8	120	200	200	200
24"	24	36	135	115	110
	16	54	165	145	135
	12	72	195	170	155
	≤ 8	95	200	200	185

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud is 1.5". Fastener penetration length is equal to the threaded portion of the screw in the main member, including the tip.
2. Proprietary fastener properties are per published data or testing. Fastener length shall be chosen to such that the fastener fully penetrates the Defend-R Panels and achieves the minimum required fastener penetration into stud.
3. Wood studs shall be a minimum of 2x4 and have a minimum specific gravity of 0.42.
4. Three-second-gust wind speed; based on a building height of 66-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.
5. Interpolation between table values is permitted.
6. Where furring strips are used over foam, their adequacy to span between fasteners shall be checked separately. The design of furring strips is not taken into account in this table.

6.2 *Defend-R Panel Attachment to CFS Framing*

6.2.1 Minimum penetration into CFS framing is the steel framing thickness plus three threads and the tip of the fastener, unless noted otherwise in this report.

6.2.2 Defend-R Panels shall be fastened along each stud. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 3**, **Table 4**, **Table 5** and **Table 6**, when light-gauge furring channels or hat channels are installed vertically over the Defend-R Foam parallel to the studs (furring is in between insulation and underside of fastener head).

6.2.3 Furring or hat channel thickness must be equal to or greater than CFS framing thickness.

6.2.4 The design of the furring and hat channels is outside the scope of this report, and should be checked for the applied loads.

6.2.4.1 Furring or hat channels shall be oriented so that the raised portion of the furring or channel is snug against the polyiso insulation (i.e., inverted orientation).

6.2.5 **Table 3** through **Table 5** list the largest vertical spacing for the specified fastener(s) and CFS framing member thickness, while **Table 6** lists maximum wind pressure and the corresponding maximum wind speed for each Exposure Category.

6.2.5.1 The fastener spacing to be used shall be governed by the stricter of:

6.2.5.1.1 Cladding weight per **Table 3** through **Table 5**, or

6.2.5.1.2 Wind pressure/wind speed per **Table 6**.

6.2.6 *Defend-R Panel Attachment to CFS Framing to Support Cladding Weight:*

6.2.6.1 Fasteners are required to attach Defend-R Panels to CFS framing to support the attached cladding weight.

6.2.6.1.1 See **Table 3** for maximum vertical fastener spacing (along the height of the stud) for 18-gauge CFS framing to support specified cladding weights.

6.2.6.1.2 See **Table 4** for maximum vertical fastener spacing (along the height of the stud) for 16-gauge CFS framing to support specified cladding weights.

6.2.6.1.3 See **Table 5** for maximum vertical fastener spacing (along the height of the stud) for 12-gauge CFS framing to support specified cladding weights.

Table 3. Maximum Fastener Spacing for Defend-R CI Ply Attached to 18-Gauge CFS Framing[5]

Framing Member[4]	Stud Spacing (in) o.c.	Fastener[1,3]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing (in)					
				Specified Cladding Weight[2] (psf)					
				5	10	15	20	25	30
18-gauge CFS Framing[6,7]	16"	Hunter SIP/SD	1	24	24	24	24	24	24
			1 1/2	24	24	24	24	24	20
			2	24	24	24	24	20	16
			2 1/2 to 4	24	24	24	20	16	12
		Hunter SIP/HD	1	24	24	24	24	24	20
			1 1/2	24	24	24	24	20	16
			2	24	24	24	20	16	12
			2 1/2	24	24	20	16	12	8
			3	24	24	16	12	8	8
			3 1/2	24	20	12	8	8	6
			4	24	16	12	8	6	6
	24"	Hunter SIP/SD	1	24	24	24	24	20	16
			1 1/2	24	24	24	20	16	12
			2	24	24	20	16	12	12
			2 1/2 to 3	24	24	16	12	12	8
			3 1/2 to 4	24	24	16	12	8	8
		Hunter SIP/HD	1	24	24	24	20	16	12
			1 1/2	24	24	20	16	12	12
			2	24	24	16	12	8	8
			2 1/2 to 3	24	20	12	8	8	6
			3 1/2	20	12	8	6	6	4
			4	16	8	8	6	4	4

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud is the steel thickness plus three threads and the tip of the fastener. Required fastener length shall be chosen to fully penetrate Defend-R Panel to achieve minimum fastener penetration into framing.
2. The weight of Defend-R Panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
3. Proprietary fastener properties are per published data or testing.
4. CFS framing shall be a minimum of 45 mils thick and have a minimum ultimate tensile strength of 45 ksi (i.e., ASTM A653, SS Grade 33).
5. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 3**, **Table 4** and **Table 5**, when light-gauge furring channels or hat channels are installed vertically over the Defend-R Foam parallel to the studs (furring is in between insulation and underside of fastener head).
6. Furring or hat channel thickness must be equal to or greater than CFS framing thickness.
7. Furring or hat channels shall be oriented such that the raised portion of the furring or channel is snug against the polyiso insulation (i.e., inverted orientation).

Table 4. Maximum Fastener Spacing for Defend-R CI Ply Attached to 16-Gauge CFS Framing[5]

Framing Member[4]	Stud Spacing (in) o.c.	Fastener[1,3]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing (in)					
				Specified Cladding Weight[2] (psf)					
				5	10	15	20	25	30
16-gauge CFS Framing[6,7]	16"	Hunter SIP/SD	≤ 4	24	24	24	24	24	24
		Hunter SIP/HD	≤ 2	24	24	24	24	24	24
			2 1/2	24	24	24	24	20	16
			3	24	24	24	16	16	12
			3 1/2	24	24	20	16	12	8
			4	24	24	16	12	8	8
	24"	Hunter SIP/SD	≤ 1 1/2	24	24	24	24	24	24
			2	24	24	24	24	24	20
			2 1/2	24	24	24	24	20	16
			3 to 4	24	24	24	20	16	16
		Hunter SIP/HD	1	24	24	24	24	24	24
			1 1/2	24	24	24	24	24	20
			2	24	24	24	24	20	16
			2 1/2	24	24	20	16	12	12
			3	24	20	16	12	8	8
			3 1/2	24	20	12	8	8	6
			4	24	16	12	8	6	6

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud is the steel thickness plus three threads and the tip of the fastener. Required fastener length shall be chosen to fully penetrate the Defend-R CI Ply panel to achieve minimum fastener penetration into framing.
2. The weight of Defend-R CI Ply panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
3. Proprietary fastener properties are per published data or testing.
4. CFS framing shall be a minimum of 53 mils thick and have a minimum ultimate tensile strength of 65 ksi (i.e., ASTM A653, SS Grade 50).
5. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 3**, **Table 4** and **Table 5**, when light-gauge furring channels or hat channels are installed vertically over the Defend-R Foam parallel to the studs (furring is in between insulation and underside of fastener's head).
6. Furring or hat channel thickness must be equal to or greater than CFS framing thickness.
7. Furring or hat channels shall be oriented such that the raised portion of the furring or channel is snug against the polyiso insulation (i.e., inverted orientation).

Table 5. Maximum Fastener Spacing for Defend-R Panels Attached to 12-Gauge CFS Framing[5]

Framing Member[4]	Stud Spacing (in) o.c.	Fastener[1,3]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing (in)					
				Specified Cladding Weight[2] (psf)					
				5	10	15	20	25	30
12-gauge CFS Framing[6,7]	16"	Hunter SIP/SD	≤ 4	24	24	24	24	24	24
		Hunter SIP/HD	≤ 2 1/2	24	24	24	24	24	24
			3	24	24	24	24	20	16
			3 1/2	24	24	24	16	12	12
			4	24	20	12	8	8	8
	24"	Hunter SIP/SD	≤ 1 1/2	24	24	24	24	24	24
			2	24	24	24	24	24	20
			2 1/2	24	24	24	24	20	16
			3 to 4	24	24	24	24	16	16
		Hunter SIP/HD	1	24	24	24	24	24	24
			1 1/2	24	24	24	24	24	20
			2	24	24	24	24	20	16
			2 1/2	24	24	20	16	12	12
			3	24	20	16	12	8	8
			3 1/2	24	20	12	8	8	6
			4	24	16	12	8	6	6

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud is the steel thickness plus three threads and the tip of the fastener. Required fastener length shall be chosen to fully penetrate the Defend-R Panel to achieve minimum fastener penetration into framing.
2. The weight of Defend-R Panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
3. Proprietary fastener properties are per published data or testing.
4. CFS framing shall be a minimum of 99 mils thick and have a minimum ultimate tensile strength of 65 ksi (i.e., ASTM A653, SS Grade 50).
5. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with **Table 3**, **Table 4** and **Table 5**, when light-gauge furring channels or hat channels are installed vertically over the Defend-R Foam parallel to the studs (furring is in between insulation and underside of fastener head).
6. Furring or hat channel thickness must be equal to or greater than CFS framing thickness.
7. Furring or hat channels shall be oriented such that the raised portion of the furring or channel is snug against the polyiso insulation (i.e., inverted orientation).

6.2.7 *Defend-R Panel Connections to CFS Framing to Resist Out-of-Plane Wind Loading:*

6.2.7.1 Defend-R Panels shall be fastened along each stud with Hunter SIP/SD.

Table 6. Allowable Wind Pressures for Defend-R CI Ply and Defend-R CI Ply NB Attached to Steel Framing with SIP/SD[1,2,5]

Steel Design Thickness (in)	Stud Spacing (in) o.c.	Vertical Fastener Spacing (in) o.c.	Allowable Wind Pressure[3] (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[3,4]		
				B	C	D
0.0346" (20-gauge)	16"	24	43	155	135	125
		20	52	170	150	135
		16	65	190	165	155
		12	86	200	190	175
		≤ 8	120	200	200	200
	24"	24	29	130	110	100
		20	35	140	120	110
		16	43	155	135	125
		12	58	180	155	145
		≤ 8	86	200	190	175
0.0451" (18-gauge)	16"	24	68	195	170	155
		20	81	200	185	170
		16	101	200	200	190
		≤ 12	120	200	200	200
	24"	24	45	160	140	130
		20	54	175	150	140
		16	68	195	170	155
		12	90	200	195	180
		≤ 8	95	200	200	185
0.0552" (16-gauge)	16"	24	102	200	200	190
		≤ 20	120	200	200	200
	24"	24	68	195	170	155
		20	81	200	185	170
		≤ 16	95	200	200	185
0.0979" (12-gauge)	16"	≤ 24	120	200	200	200
	24"	24	81	200	185	170
		≤ 20	95	200	200	185

Table 6. Allowable Wind Pressures for Defend-R CI Ply and Defend-R CI Ply NB Attached to Steel Framing with SIP/SD[1,2,5]

Steel Design Thickness (in)	Stud Spacing (in) o.c.	Vertical Fastener Spacing (in) o.c.	Allowable Wind Pressure[3] (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[3,4]		
				B	C	D

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener penetration into stud is the steel thickness plus three threads and the tip of the fastener. Required fastener length shall be chosen to fully penetrate the Defend-R Panel to achieve minimum fastener penetration into framing.
2. CFS framing shall be a minimum of 33 mils thick and have a minimum tensile strength of 45 ksi.
3. Three-second-gust wind speed; based on a building height of 66-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.
4. Interpolation between table values is permitted.
5. Where furring channels or hat channels are used over foam, their adequacy to span between fasteners shall be checked separately. The design of furring channels and hat channels is not taken into account in this table.

6.3 *Defend-R Panel Attachment to Concrete Substrates*

6.3.1 *Defend-R Panel Attachment to Concrete Substrates to Support Cladding Weight:*

6.3.1.1 Fasteners are required to attach Defend-R Panels to concrete to support the attached cladding weight. See **Table 7** for maximum vertical fastener spacing to support specified cladding weights.

6.3.1.2 Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) is permitted for use in accordance with **Table 7** when used with 1x wood furring strips (0.75″ thick), and are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener head). The design of the furring is outside the scope of this report, and should be checked for the applied loads.

Table 7. Maximum Fastener Spacing for Defend-R Panels Attached to Concrete Substrates[7]

Substrate Material[5]	Maximum Horizontal Fastener Spacing (in)	Fastener[1,2,4]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing[6] (in)					
				Specified Cladding Weight[3] (psf)					
				5	10	15	20	25	30
Concrete (f_c' ≥ 2,500 psi)	16"	Hunter SIP/SD	≤ 1 1/2	24	24	24	24	24	24
			2	24	24	24	24	24	20
			2 1/2	24	24	24	24	20	16
			3 to 4	24	24	24	20	16	12
		Hunter SIP/WD	≤ 3	24	24	24	24	24	24
			3 1/2	24	24	24	24	24	20
			4	24	24	24	24	20	16
Concrete (f_c' ≥ 2,500 psi)	16"	1/4" Tapcon	≤ 2	24	24	24	24	24	24
			2 1/2	24	24	24	24	24	20
			3 to 4	24	24	24	24	20	16
	24"		1	24	24	24	24	24	20

Table 7. Maximum Fastener Spacing for Defend-R Panels Attached to Concrete Substrates[7]

Substrate Material[5]	Maximum Horizontal Fastener Spacing (in)	Fastener[1,2,4]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing[6] (in)					
				Specified Cladding Weight[3] (psf)					
				5	10	15	20	25	30
		Hunter SIP/SD	1 1/2	24	24	24	24	20	16
			2	24	24	24	20	16	12
			2 1/2 to 3	24	24	20	16	12	8
			3 1/2 to 4	24	24	16	12	8	8
		Hunter SIP/WD	≤ 1 1/2	24	24	24	24	24	24
			2 to 2 1/2	24	24	24	24	24	20
			3	24	24	24	24	20	16
			3 1/2	24	24	24	20	16	12
			4	24	24	20	16	12	8
		1/4" Tapcon	≤1 1/2	24	24	24	24	24	24
			2	24	24	24	24	20	16
			2 1/2	24	24	24	20	16	12
			3 to 4	24	24	20	16	12	12

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener embedment into substrate is 1.5" for the Hunter SIP/SD and SIP/WD. Minimum fastener embedment into the substrate for Tapcon is 2" for use with Defend-R Panels 4.2" thick or less, and 1.4" for use with Defend-R Panels 4.6" thick or thicker. Required fastener length shall be chosen to fully penetrate the Defend-R Panel to achieve minimum fastener embedment into substrate. Fastener embedment is the threaded length embedded in the substrate, including the tip.
2. Fasteners shall be installed with a minimum end distance of 6" and a minimum edge distance of 2.5".
3. The weight of Defend-R Panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
4. Proprietary fastener properties are per published data or testing.
5. Concrete shall have a minimum compressive strength of 2,500 psi after 28 days.
6. Maximum Fastener Vertical Spacing is based on allowable lateral shear values determined by dividing the strength design value by a conversion factor (α) of 1.48. The conversion factor is based on the load combination: 1.2D + 1.6L, where Dead Load (D) = 30% and Live Load (L) = 70% of the total load, respectively. Adjustments shall be made where other load combinations control.
7. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with this table when used with 1x wood furring strips (0.75" thick) that are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener's head)

6.4 *Defend-R Panel Attachment to CMU Substrates*

6.4.1 Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) is permitted for use in accordance with **Table 8** when used with 1x wood furring strips (0.75″ thick), and are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener head)

6.4.2 *Defend-R Panel Attachment to Masonry Substrates to Support Cladding Weight:*

6.4.2.1 Fasteners are required to attach Defend-R Panels to masonry substrates to support the attached cladding weight. See **Table 8** for maximum vertical fastener spacing to support specified cladding weights.

6.4.2.2 **Table 9** lists maximum wind pressure and the corresponding maximum wind speed for each Exposure Category.

6.4.2.3 The fastener spacing to be used shall be governed by the stricter of:

6.4.2.3.1 Cladding weight per **Table 8**, or

6.4.2.3.2 Wind pressure/wind speed per **Table 9**.

Table 8. Maximum Fastener Spacing for Defend-R Panels Attached to Masonry Substrates[7]

Substrate Material[5]	Maximum Horizontal Fastener Spacing (in)	Fastener[1,2,4]	Maximum Nominal Thickness of the Polyiso Portion of Defend-R Panels (in)	Maximum Fastener Vertical Spacing[6] (in)					
				Specified Cladding Weight[3] (psf)					
				5	10	15	20	25	30
CMU	16"	Hunter SIP/SD	≤ 3 1/2	24	24	24	24	24	24
			4	24	24	24	24	20	16
		Hunter SIP/WD	≤ 4	24	24	24	24	24	24
		1/4" Tapcon	≤ 2	24	24	24	24	24	24
			2 1/2 to 4	24	24	24	24	20	16
	24"	Hunter SIP/SD	≤ 3	24	24	24	24	24	24
			3 1/2	24	24	24	24	24	20
			4	24	24	20	16	12	12
		Hunter SIP/WD	≤ 2 1/2	24	24	24	24	24	24
			3 to 4	24	24	24	24	24	20
		1/4" Tapcon	≤ 1 1/2	24	24	24	24	24	24
			2	24	24	24	24	20	16
			2 1/2 to 4	24	24	20	16	12	12

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Minimum fastener embedment into substrate is 2" for the Hunter SIP/SD and 1.5" for the SIP/WD. Minimum fastener embedment into the substrate for Tapcon is 2" for use with Defend-R Panels 4.2" thick or less, and 1.4" for use with Defend-R Panels 4.6" thick or thicker. Required fastener length shall be chosen to fully penetrate the Defend-R Panel to achieve minimum fastener embedment into substrate. Fastener embedment is the threaded length embedded in the substrate, including the tip.
2. Fasteners shall be installed into the face of CMU block with a minimum end distance shall be 6" and a minimum edge distance shall be 2.5".
3. The weight of Defend-R Panels are included in the fastener spacing calculations. The specified cladding weight shall include all other supported materials.
4. Proprietary fastener properties are per published data or testing.
5. Masonry shall be normal-weight CMU conforming to ASTM C90.
6. Maximum Fastener Vertical Spacing is based on allowable lateral shear values determined by dividing the strength design value by a conversion factor (α) of 1.48. The conversion factor is based on the load combination: 1.2D + 1.6L, where Dead Load (D) = 30% and Live Load (L) = 70% of the total load, respectively. Adjustments shall be made where other load combinations control.
7. Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) may be permitted for use in accordance with this table when used with 1x wood furring strips (0.75" thick) that are installed vertically over the Defend-R Foam and parallel to the studs (furring is in between insulation and underside of fastener's head).

6.4.3 *Defend-R Panel Attachment to Masonry Substrates to Resist Out-of-Plane Wind Loading:*

6.4.3.1 Defend-R Panels shall be fastened with Hunter SIP/SD.

Table 9. Allowable Wind Pressures for Defend-R CI Ply and Defend-R CI Ply NB Attached to Masonry Substrates with SIP/SD[1,2]

Horizontal Fastener Spacing (in) o.c.	Vertical Fastener Spacing (in) o.c.	Allowable Wind Pressure[3] (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[4,5]		
			B	C	D
16"	24	34	130	115	105
	16	50	160	140	130
	12	67	190	165	150
	8	101	200	200	185
	≤ 6	120	200	200	200
24"	24	23	105	90	85
	16	34	130	115	105
	12	45	150	130	125
	8	67	190	165	150
	≤ 6	90	200	190	175

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Masonry to have a minimum specified compressive strength of 2,500 psi. Screw shall have sufficient length and be installed so that it penetrates the masonry a minimum of 1.5 inches.
2. Proprietary fastener properties are per published data or testing.
3. Allowable pressure does not consider masonry strength in holding the fastener as a post-installed embedment in accordance with ACI 318, Appendix D.
4. Three-second-gust wind speed; based on a building height of 66-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7-10 and 7-16, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.
5. Interpolation between table values is permitted.

6.5 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.

7 Certified Performance[22]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[23]

7.2 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.[24]

8 Regulatory Evaluation and Accepted Engineering Practice

8.1 Defend-R Wall Products comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Connection of Defend-R Panels was evaluated for use in supporting attached cladding weight.

8.1.1.1 The scope of this report includes connection to light-frame wood construction framing, light-frame Cold Formed Steel (CFS) framing, concrete substrates and Concrete Masonry Units (CMU) to support cladding weight.

8.1.2 Connection of Defend-R CI Ply and Defend-R CI Ply NB panels were evaluated to determine the allowable out-of-plane wind pressure and maximum wind speeds.

8.1.2.1 Allowable out-of-plane wind pressures are provided for wood construction framing, CFS framing and CMU.

8.2 Allowable out-of-plane wind pressures for concrete substrates is outside the scope of this report.

8.3 Attachment of the cladding to the Defend-R Panels is outside the scope of this report.

8.4 Any building code, regulation, 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 RDP/approved sources. DrJ is qualified[25] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.

8.5 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which are also its areas of professional engineering competence.

8.6 Any regulation specific issues not addressed in this section are outside the scope of this report.

9 Installation

9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report and the applicable building code.

9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.

9.3 *Installation Procedure*

9.3.1 All Defend-R Panel edges shall be supported by framing or blocking.

9.3.2 Fasteners shall be installed with a minimum edge distance of $^{3}/_{8}$" on all sides of the Defend-R Panel.

9.3.3 Fasteners shall be installed with the appropriate rotating drill oriented normal to the surface of the Defend-R Panel.

9.3.4 Fastener head shall be installed in contact with the face of the Defend-R Panel.

9.3.5 Fasteners shall be installed with the maximum on-center spacing indicated in **Table 1** through **Table 9**, as applicable.

9.3.6 Fasteners installed in masonry shall be in the face of normal-weight CMU block conforming to ASTM C90.

9.3.7 Fasteners installed in concrete and CMU shall have predrilled holes in accordance with manufacturer installation instructions.

9.3.8 When Defend-R Foam (without the FRT plywood or OSB facer adhered to the polyiso insulation) is noted allowable for use in accordance with **Table 1** through **Table 9**, 1x furring strips or inverted hat/furring channels shall be installed in accordance with the respective table and the sections listed below:

9.3.8.1 See **Section 6.1** for wood framing.

9.3.8.2 See **Section 6.2** for CFS framing.

9.3.8.3 See **Section 6.3** for concrete substrates.

9.3.8.4 See **Section 6.4** for masonry substrates.

10 Substantiating Data

10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

10.1.1 Lateral resistance testing in accordance with ASTM D1761

10.1.2 Fastener spacing, wind pressure and wind speed calculations performed by DrJ Engineering, LLC

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where pertinent, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

10.4 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, or Duly Authenticated Reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this Duly Authenticated Report, may be dependent upon published design properties by others.

10.5 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.[26]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for Defend-R Wall Products on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, Defend-R Wall Products have performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this Duly Authenticated Report and the manufacturer installation instructions, Defend-R Wall Products shall be approved for the following applications:

11.2.1 Use as a nail base for support of cladding materials products.

11.3 Unless exempt by state statute, when Defend-R Wall Products are 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.

11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Drexel Metals, Inc.

11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[27] 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.

11.6 **Approved**:[28] Building regulations require that the building official shall accept Duly Authenticated Reports.[29]

11.6.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited.

11.6.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce.

11.6.3 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. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB-Accredited Product Certification Body – Accreditation #1131.

11.8 Through the IAF Multilateral Agreements (MLA), this Duly Authenticated Report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 Duly Authenticated Reports are equivalent.[30]

12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

12.2 As defined in **Section 6**, 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.

12.3 As listed herein, Defend-R Wall Products shall be used:

12.3.1 In dry lumber with a moisture content less than or equal to nineteen percent (19%).

12.4 Cladding attachment shall be in accordance with the cladding manufacturer installation instructions or an approved engineered design.

12.5 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:

12.5.1 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.

12.5.2 This report and the installation instructions shall be submitted at the time of permit application.

12.5.3 These innovative products have an internal quality control program and a third-party quality assurance program.

12.5.4 At a minimum, these innovative products shall be installed per **Section 9** of this report.

12.5.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.

12.5.6 These innovative products have 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.

12.5.7 The application of these innovative products in the context of this report 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.

12.6 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, "*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11*," all of IBC Section 104, and IBC Section 105.4.

12.7 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

12.8 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

13.1 The innovative products listed in **Section 1.1** are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.

13.2 Additional technical information can be found at www.drexmet.com.

14 Review Schedule

14.1 This report is subject to periodic review and revision. For the latest version, visit drjcertification.org.

14.2 For information on the status of this report, please contact DrJ Certification.

15 Approved for Use Pursuant to U.S. and International Legislation Defined in Appendix A

15.1 Defend-R Wall Products are included in this report 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. This report states either that the material, product, or service meets recognized standards or has been tested and found suitable for a specified purpose. This report 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

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 these innovative products 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),[31] where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years[32] and/or a $5,000,000 fine or 3 times the value of[33] 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 materials[34] that are not specifically provided for in any regulation, 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.[35]

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 have 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.[36]

1.3 **Approved**[37] **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 that 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.[38] The Superintendent of Building Approved Testing Agency Roster 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 DrJ 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.[39]

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 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed[40] 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 agreement[41] (i.e., ANAB, International Accreditation Forum [IAF], etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation by:

1.6.1 A certification mark or listing of an approved certification agency,

1.6.2 A test report from an approved testing laboratory,

1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity, or

1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed and sealed by a professional engineer or architect, licensed in Florida.

1.6.5 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:

1.6.5.1 A certification mark, listing or label from a commission-approved certification agency indicating that the product complies with the code,

1.6.5.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code,

1.6.5.3 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,

1.6.5.4 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, or

1.6.5.5 A statewide product approval issued by the Florida Building Commission.

1.6.6 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 the 2018 Building Code of New Jersey in IBC Section 1707.1 General,[42] 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)*".[43] Furthermore N.J.A.C 5:23-3.7 states: "*Municipal approvals of alternative materials, equipment, or methods of construction*."

1.8.1 **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.

1.8.1.1 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 the above.

1.8.1.2 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 the above.

1.8.2 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 the previous paragraph, given that the listed entities are no longer in existence and/or do not provide "*reports of engineering findings*."

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[44] and Part 3280,[45] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:

1.9.1 "*All construction methods shall be in conformance with accepted engineering practices*."

1.9.2 "*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*."

1.9.3 "*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.[46]

1.10.2 For innovative alternatives and/or methods of construction, the building official shall accept Duly Authenticated Reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.[47]

1.10.2.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.

1.10.2.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[48]

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.[49]

1.11 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, designs, services, and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 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.

1.11.2 **Approved**: The purpose of the 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, designs, services, and/or methods of construction.

1.11.3 ANAB is an IAF-MLA signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.[50]

1.11.4 Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[51]

1.12 Approval equity is a fundamental commercial and legal principle.[52]

Notes

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

2 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702

3 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11

4 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as

5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice

6 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies

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

8 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency

9 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source

10 https://www.law.cornell.edu/uscode/text/18/1832 (b) 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. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

11 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

12 https://www.cbitest.com/accreditation/

13 https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104:~:text=to%20enforce%20the%20provisions%20of%20this%20code

14 https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11:~:text=Where%20the%20alternative%20material%2C%20design%20or%20method%20of%20construction%20is%20not%20approved%2C%20the%20building%20official%20shall%20respond%20in%20writing%2C%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1:~:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%2C%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%2C%20stating%20the%20reasons%20therefore

15 https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11

16 https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

17 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

18 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

19 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.

20 All references to the FBC-B and FBC-R are the same as the 2021 IBC and 2021 IRC unless otherwise noted in the Florida Supplement at the end of this report.

21 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed AND https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled

22 https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4

23 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

24 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

25 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.

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

27 2018 IFC Section 104.9

28 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.

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

30 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.
31 http://www.drjengineering.org/AppendixC AND https://www.drjcertification.org/cornell-2016-protection-trade-secrets
32 https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years
33 https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided
34 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2
35 IBC 2021, Section 1706.1 Conformance to Standards
36 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General
37 See Section 11 for the distilled building code definition of **Approved**
38 Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES
39 https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1
40 New York City, The Rules of the City of New York, § 101-07 Approved Agencies
41 New York City, The Rules of the City of New York, § 101-07 Approved Agencies
42 https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1
43 https://www.nj.gov/dca/divisions/codes/codreg/ucc.html
44 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14
45 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280
46 IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.
47 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.
48 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/
49 IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.
50 https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope
51 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
52 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission