



Listing and Technical Evaluation Report™

Report No: 1207-01



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Rmax® Thermasheath®-SI and Thermasheath®

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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

Section: 06 16 13 - Insulated Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 - Thermal Insulation

Section: 07 21 13 - Foam Board Insulation

Section: 07 25 00 - Water-Resistive Barriers/Weather Barriers

Section: 07 27 00 - Air Barriers

Section: 07 27 23 - Board Product Air Barriers

1 Innovative Products Evaluated¹

1.1 Thermasheath-SI and Thermasheath

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1** and **Figure 2**.

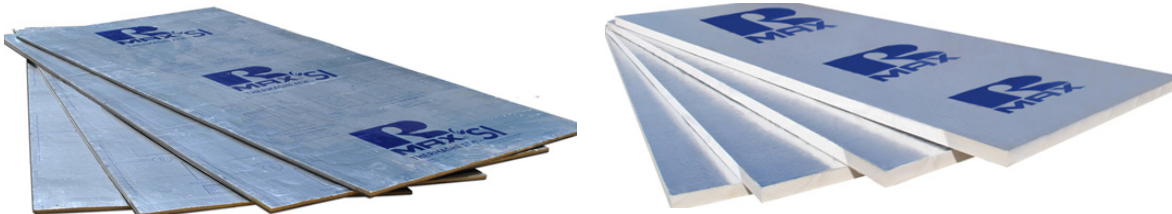


Figure 1. Thermasheath-SI (Left) and Thermasheath (Right)

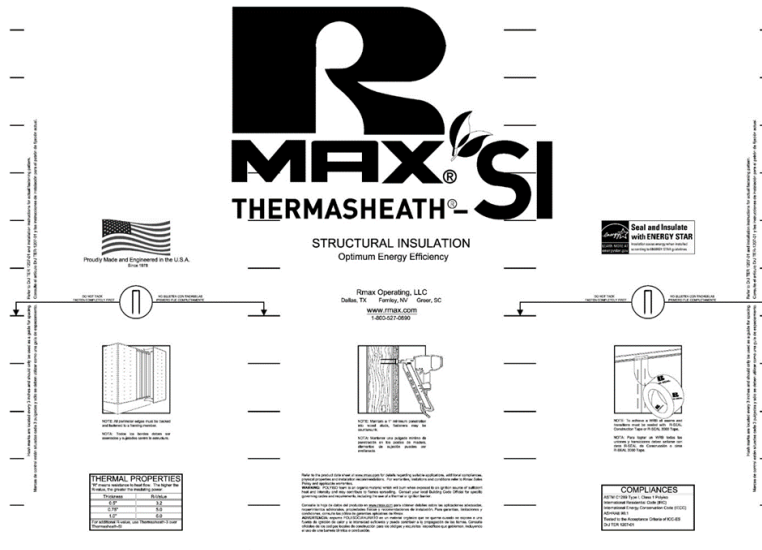


Figure 2. Thermasheath-SI Instructions as Displayed on Board

- 2.1.1 Thermasheath-SI is a structural wall sheathing consisting of a fibrous sheathing board layer adhered to a proprietary Foam Plastic Insulating Sheathing (FPIS). The proprietary fibrous sheathing board is a laminated board made of fibered, specially treated plies that are pressure-laminated with a water-resistant adhesive. The surface finish consists of a facer on one or both sides. The FPIS layer consists of a proprietary insulation board with a closed-cell rigid polyisocyanurate foam core and kraft reinforced aluminum facers on both sides. Both sides have a reflective surface.
 - 2.1.1.1 The FPIS layer complies with ASTM C1289 Type I, Class 1 and Class 2.
- 2.1.2 Thermasheath is a non-structural FPIS panel consisting of a closed cell rigid polyisocyanurate (polyiso) foam core bonded to reinforced aluminum facers on each side. Both sides have a reflective surface.
 - 2.1.2.1 Thermasheath complies with ASTM C1289 Type I, Class 1 and Class 2.
 - 2.1.2.2 For a more comprehensive evaluation of Thermasheath, see Report Number [1309-03](#).
- 2.2 **Material Availability**
 - 2.2.1 **Thickness:**
 - 2.2.1.1 **Thermasheath-SI:**
 - 2.2.1.1.1 1/2" (12.7 mm) through 1 1/4" (32 mm)
 - 2.2.1.2 **Thermasheath:**
 - 2.2.1.2.1 1/2" (12.7 mm) through 4 1/2" (114 mm)
 - 2.2.2 **Standard Product Width:**
 - 2.2.2.1 48" (1,219 mm)
 - 2.2.3 **Standard Lengths:**
 - 2.2.3.1 96" (2,438 mm)
 - 2.2.3.2 108" (2,743 mm)
 - 2.2.3.3 120" (3,048 mm)
- 2.3 As needed, review material properties for design in **Section 6** and to regulatory evaluation in **Section 8**.



3 Definitions

- 3.1 New Materialsⁱⁱ 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.ⁱⁱⁱ The design strengths and permissible stresses shall be established by tests^{iv} and/or engineering analysis.^v
- 3.2 Duly Authenticated Reports^{vi} and Research Reports^{vii} are test reports and related engineering evaluations, which are written by an approved agency^{viii} and/or an approved source.^{ix}
- 3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).^x
- 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.^{xi}
- 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^{xii} ISO/IEC 17025 and ISO/IEC 17020 accredited.
- 3.6 The regulatory authority shall enforce^{xiii} 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^{xiv} 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.^{xv}
- 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.^{xvi} Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.^{xvii}
- 3.9 Approval equity is a fundamental commercial and legal principle.^{xviii}

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation^{xix}

- 4.1 *Standards*
- 4.1.1 *AATCC Test Method 127: Water Resistance: Hydrostatic Pressure Test*
- 4.1.2 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 4.1.3 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*
- 4.1.4 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- 4.1.5 *ASTM C209: Standard Test Methods for Cellulosic Fiber Insulating Board*
- 4.1.6 *ASTM C272: Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions*
- 4.1.7 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 4.1.8 *ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*
- 4.1.9 *ASTM D1037: Standard Test Methods for Evaluation Properties of Wood-Base Fiber and Particle Panel Materials*
- 4.1.10 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*



- 4.1.11 *ASTM E72: Standard Test Methods for Conducting Strength Tests of Panels for Building Construction*
- 4.1.12 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 4.1.13 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*
- 4.1.14 *ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials*
- 4.1.15 *ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specific Pressure Differences Across the Specimen*
- 4.1.16 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
- 4.1.17 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 4.1.18 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*
- 4.1.19 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 4.1.20 *ASTM E2178: Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials*
- 4.1.21 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*
- 4.1.22 *UL 263: Standard for Fire Test of Building Construction and Materials*
- 4.2 Structural performance for shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F, have been tested and evaluated in accordance with the following standards:
 - 4.2.1 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
 - 4.2.2 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*
 - 4.2.3 *ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*
 - 4.2.4 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*
 - 4.2.5 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
 - 4.2.5.1 ASTM D7989 is accepted engineering practice used to establish Seismic Design Coefficients (SDCs). Test data generated by ISO/IEC 17025 approved agencies and/or professional engineers and all associated professional engineering evaluations that use ASTM D7989 as their basis, are defined as intellectual property and/or trade secrets and are also defined as an Independent Design Review (i.e., Listings, certified reports, Duly Authenticated Reports from approved agencies and/or research reports prepared by approved agencies and/or approved sources).
- 4.3 *Regulations*
 - 4.3.1 *IBC – 15, 18, 21: International Building Code®*
 - 4.3.2 *IRC – 15, 18, 21: International Residential Code®*
 - 4.3.3 *IECC – 15, 18, 21: International Energy Conservation Code®*
 - 4.3.4 *CBC—19, 22: California Building Code^{xx} (Title 24, Part 2)*
 - 4.3.5 *CRC—19, 22: California Residential Code^{xx} (Title 24, Part 2.5)*
 - 4.3.6 *CEC —19, 22: California Energy Code (Title 24, Part 6)*
 - 4.3.7 *FBC-B—20, 23: Florida Building Code – Building^{xxi}*
 - 4.3.8 *FBC-R—20, 23: Florida Building Code – Residential^{xxi}*



5 Listed^{xxii}

- 5.1 A nationally recognized testing laboratory such as CBI, states that the materials, designs, methods of construction, and/or equipment have met nationally recognized standards and/or have been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 General

- 6.1.1 Thermasheath-SI and Thermasheath are used as wall sheathing and continuous insulation in buildings constructed in accordance with the IBC and IRC.
- 6.1.1.1 Thermasheath-SI and Thermasheath contain foam plastics complying with IBC Section 2603 and IRC Section R316.
- 6.1.1.2 Thermasheath-SI is used as insulating structural wall sheathing to provide lateral load resistance (wind and seismic) for braced wall panels and shear walls used in wood and light-frame steel construction.
- 6.1.1.3 Thermasheath-SI is used as structural wall sheathing to provide resistance to transverse loads for wall assemblies used in wood and light-frame steel construction.
- 6.1.1.4 Thermasheath-SI is used as structural wall sheathing to provide resistance to uplift loads for wall assemblies used in wood and light-frame steel construction.
- 6.1.2 Thermasheath is a non-structural FPIS panel used as thermal insulation within the building envelope, including, but not limited to, attic, crawlspace, wall, roof, ceiling, floor and foundation assemblies.
- 6.1.2.1 Thermasheath is used as insulating sheathing applied as in-fill to portions of walls that are not designed as braced wall panels or shear walls.
- 6.1.2.2 Thermasheath is used as second layer of insulating sheathing over Thermasheath-SI.
- 6.1.3 Thermasheath-SI and Thermasheath shall not be used as a nail base for other building products.
- 6.1.4 An approved draftstop material when installed in accordance with **Section 6.6**.
- 6.1.5 The Environmental Product Declarations (EPD) for Thermasheath-SI and Thermasheath are available at polyiso.org.

6.2 Structural Applications

6.2.1 General Provisions:

- 6.2.1.1 Except as otherwise described in this report, Thermasheath-SI shall be installed in accordance with the applicable building codes listed in **Section 4** using the provisions set forth therein for the design and installation of Wood Structural Panels (WSP).
- 6.2.1.1.1 Thermasheath-SI is permitted to be designed in accordance with SDPWS for the design of shear walls using the methods set forth therein, including the perforated shear wall methodology, and subject to the SDPWS boundary conditions, except as specifically allowed in this report.
- 6.2.1.2 Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall.
- 6.2.1.2.1 For wind design, anchor bolt spacing shall not exceed 6' (1,829 mm) o.c.
- 6.2.1.2.2 For seismic design, anchor bolt spacing shall not exceed 4' (1,219 mm) o.c.
- 6.2.1.3 The maximum aspect ratio for Thermasheath-SI shall be 4:1 (height:width).
- 6.2.1.4 The minimum full height panel width shall be 24" (51 mm).
- 6.2.1.5 When used in light-frame wood construction, all panel edges shall be blocked with a minimum 2x nominal lumber.



- 6.2.1.6 Thermasheath-SI on wood studs shall be installed with one of the following:
 - 6.2.1.6.1 Staples shall be a minimum 16-gauge, $\frac{7}{16}$ " crown and penetrate a minimum of 1" into the stud.
 - 6.2.1.6.2 Nails shall be minimum 0.113" x $2\frac{3}{8}$ " and penetrate a minimum of $1\frac{1}{4}$ " into the stud.
- 6.2.1.7 Thermasheath-SI on steel studs shall be installed with #8 pan head screw with a minimum of three thread lengths extending beyond the stud.
- 6.2.1.8 Staples must be countersunk beneath the surface of the foam plastic sheathing. Nails and screws may be countersunk beneath the surface of the foam plastic sheathing.
- 6.2.1.9 Installation is permitted for single top plate (advanced framing method) or double top plate applications.
- 6.2.1.10 Where Thermasheath-SI is installed with $\frac{1}{2}$ " gypsum wallboard on the interior side of the wall, the gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or $1\frac{1}{4}$ " #6 types W or S screws.



6.2.2 Simplified IRC Bracing Provisions:

- 6.2.2.1 Thermasheath-SI is permitted to be used in accordance with the IRC simplified bracing method of IRC Section R602.12 as modified by **Table 1**.
- 6.2.2.2 All other provisions of the IRC simplified bracing method shall be met.

Table 1. Thermasheath-SI IRC Simplified Bracing Table, Wood Framing^{1,2,3,4,5,6,7,8}

Structural Sheathing Product	Ultimate Design Wind Speed, V_{ult} (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units Required (Long Side)						Minimum Number of Bracing Units Required (Short Side)					
				Length of Short Side (ft)						Length of Long Side (ft)					
				10	20	30	40	50	60	10	20	30	40	50	60
Thermasheath-SI	115	One Story or Top of Two or Three Stories	10	1	1	2	2	3	3	1	1	2	2	3	3
		First of Two Story or Second of Three Stories		1	2	3	4	4	5	1	2	3	4	4	5
		First of Three Stories		2	3	4	5	6	7	2	3	4	5	6	7
		One Story or Top of Two or Three Stories	15	1	1	3	3	4	4	1	1	3	3	4	4
		First of Two Story or Second of Three Stories		1	2	3	5	5	6	1	2	3	5	5	6
		First of Three Stories		2	3	4	6	7	8	2	3	4	6	7	8
	130	One Story or Top of Two or Three Stories	10	1	2	2	3	3	3	1	2	2	3	3	3
		First of Two Story or Second of Three Stories		2	3	4	4	5	6	2	3	4	4	5	6
		First of Three Stories		2	4	5	6	8	9	2	4	5	6	8	9
		One Story or Top of Two or Three Stories	15	1	3	3	4	4	4	1	3	3	4	4	4
		First of Two Story or Second of Three Stories		2	3	5	5	6	7	2	3	5	5	6	7
		First of Three Stories		2	4	6	7	9	10	2	4	6	7	9	10

SI: 1 in = 25.4 mm

- This simplified bracing table is based on the provisions of IRC Section R602.12. All provisions therein shall be observed, except that this table shall replace IRC Table R602.12.4 and Thermasheath-SI shall replace the sheathing material.
- Thermasheath-SI shall be installed on 2x4 or 2x6 studs spaced 16" o.c. and fastened with minimum 1/2" crown staples spaced 3":6" (edge:field) per **Section 9**. Fastener edge distance shall be a minimum of 3/8". Nails with a head diameter and length greater than the 1 3/4" x 0.120" nails are also permissible. Increase the required units by 1 where 7/16" crown staples are used.
- Minimum 1/2" gypsum wallboard attached to the interior side of the wall in accordance with IRC Section R702.3.5 and IRC Table R702.3.5.
- Interpolation shall not be permitted.
- Cripple walls or wood-framed basement walls in a walk-out condition shall be designated as the first story and the stories above shall be re-designated as the second and third stories, respectively, and shall be prohibited in a three-story structure.
- Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using this table.
- For Exposure Category C, multiply bracing units by a factor of 1.20 for a one-story building, 1.30 for a two-story building, and 1.40 for a three-story building.
- Maximum stud spacing is 16" o.c.



6.2.3 Prescriptive IRC Bracing Applications:

- 6.2.3.1 Thermasheath-SI may be used on braced wall lines as an equivalent alternative to Method WSP of the IRC, when installed in accordance with IRC Section R602.10 and this report.
- 6.2.3.2 For wind design, required braced wall panel lengths for Thermasheath-SI shall be as shown in **Table 2** and shall be used in conjunction with IRC Table R602.10.3(2), which provides the required adjustments.
- 6.2.3.3 For seismic design, required braced wall panel lengths for Thermasheath-SI shall be as shown in **Table 3** and shall be used in conjunction with IRC Table R602.10.3(4), which provides the required adjustments.
- 6.2.3.4 Thermasheath-SI may be used to brace walls of buildings as an alternative to the IRC Continuous Wall Bracing provisions, IRC Section R602.10.4 (CS-WSP), in accordance with the bracing amounts shown in **Table 2** of this report, as adjusted in accordance with IRC Table R602.10.3(2).
- 6.2.3.5 Use of Thermasheath-SI with Method CS-PF is also permitted, in lieu of WSP specified in accordance with IRC Section R602.10.6.4.
- 6.2.3.6 Where a building or portion thereof, does not comply with one or more of the bracing requirements within the prescriptive section of the IRC, those portions shall be designed and constructed in accordance with IRC Section R301.1.

Table 2. Required Bracing Lengths for Thermasheath-SI – Wood Framing, Wind^{1,2,3,4,5,6}

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed, Vult (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140
One Story OR the Top of Two or Three Stories	10	1.3	1.8	1.8	2.2	2.2	2.7	1.3	1.3	1.8	1.8	2.2	2.2
	20	2.2	3.1	3.1	3.6	4.5	4.9	2.2	2.7	3.1	3.1	3.6	4.5
	30	3.6	4.5	4.9	5.3	6.2	7.1	3.1	4.0	4.0	4.5	5.3	6.2
	40	4.5	5.8	6.2	7.1	8.0	9.3	3.6	4.9	5.3	5.8	6.7	8.0
	50	5.3	7.1	8.0	8.5	9.8	11.6	4.5	6.2	6.7	7.1	8.5	9.8
	60	6.2	8.5	9.3	10.2	11.6	13.4	5.3	7.1	8.0	8.5	9.8	11.6
First Story of Two Stories OR Second Story of Three Stories	10	2.7	3.1	3.6	4.0	4.5	5.3	2.2	2.7	3.1	3.1	4.0	4.5
	20	4.5	5.8	6.7	7.1	8.5	9.8	4.0	4.9	5.8	6.2	7.1	8.0
	30	6.2	8.5	9.3	10.2	12.0	13.8	5.3	7.1	8.0	8.5	10.2	11.6
	40	8.5	11.1	12.0	13.4	15.6	17.8	7.1	9.3	10.2	11.1	13.4	15.1
	50	10.2	13.8	14.7	16.0	19.1	21.8	8.9	11.6	12.5	13.8	16.0	18.7
	60	12.0	16.0	17.8	19.1	22.3	25.8	10.2	13.8	15.1	16.5	19.1	22.3
	10	3.6	4.9	5.3	5.8	6.7	7.6	3.1	4.0	4.5	4.9	5.8	6.7



Table 2. Required Bracing Lengths for Thermasheath-SI – Wood Framing, Wind^{1,2,3,4,5,6}

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed, Vult (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140
First Story of Three Stories	20	6.7	8.9	9.8	10.2	12.0	14.2	5.8	7.6	8.0	8.9	10.2	12.0
	30	9.3	12.5	13.8	15.1	17.4	20.5	8.0	10.7	11.6	12.9	15.1	17.4
	40	12.0	16.5	17.8	19.6	22.7	26.3	10.2	13.8	15.1	16.5	19.6	22.3
	50	15.1	20.0	21.8	24.0	28.0	32.5	12.9	16.9	18.7	20.5	23.6	27.6
	60	17.8	23.6	25.8	28.5	33.4	38.3	15.1	20.5	22.3	24.0	28.0	32.5

SI: 1 ft = 0.3048 m, 1 mph = 1.61 km/h

- Thermasheath-SI shall be installed on 2x4 or 2x6 studs spaced 16" o.c. and fastened with minimum 1/2" staples spaced 3":6" (edge:field) per **Section 9**. If 7/16" staples are used, increase length of bracing by a factor of 1.1.
- Demonstrates equivalency to **IRC Table R602.10.3(1)**. All adjustment factors from **IRC Table R602.10.3(2)** shall be applied, except when used with method CS-PF, a minimum of 1/2" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1 1/4" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels
- Minimum 1/2" gypsum wallboard must be installed as part of the wall assembly. Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.8.
- Where studs are spaced 24" o.c., bracing lengths shall be multiplied by a factor of 1.1.
- The addition of gypsum wallboard to Thermasheath-SI wall assemblies provides a benefit greater than the SDPWS additive method for wood structural panels.
- Bracing lengths are the results of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.

Table 3. Required Bracing Lengths for Thermasheath-SI – Wood Framing, Seismic^{1,2,3,4,5,6,7,8}

Condition	Braced Wall Line Length (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line							
		Intermittent Sheathing				Continuous Sheathing			
		Seismic Design Category (SDC)							
		C	D ₀	D ₁	D ₂	C	D ₀	D ₁	D ₂
One Story OR the Top of Two or Three Stories	10	1.5	1.6	1.8	2.2	1.3	1.5	1.5	1.9
	20	2.8	3.2	3.6	4.5	2.4	2.7	3.0	3.8
	30	4.3	4.8	5.3	6.7	3.7	4.1	4.5	5.7
	40	5.7	6.4	7.1	8.9	4.8	5.5	6.1	7.5
	50	7.1	8.0	8.9	11.1	6.1	6.8	7.5	9.4
First Story of Two Stories OR	10	2.7	3.4	4.0	4.9	2.3	2.8	3.4	4.2
	20	5.3	6.7	8.0	9.7	4.5	5.7	6.8	8.4



Table 3. Required Bracing Lengths for Thermasheath-SI – Wood Framing, Seismic^{1,2,3,4,5,6,7,8}

Condition	Braced Wall Line Length (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line							
		Intermittent Sheathing				Continuous Sheathing			
		Seismic Design Category (SDC)							
		C	D ₀	D ₁	D ₂	C	D ₀	D ₁	D ₂
Second Story of Three Stories	30	8.0	10.1	12.0	14.7	6.8	8.5	10.2	12.5
	40	10.7	13.3	16.0	19.6	9.1	11.4	13.6	16.6
	50	13.3	16.7	20.0	24.5	11.4	14.3	17.0	20.8
First Story of Three Stories	10	4.0	4.7	5.3	NP	3.4	4.0	4.5	NP
	20	8.0	9.3	10.7	NP	6.8	8.0	9.1	NP
	30	12.0	14.0	16.0	NP	10.2	12.0	13.6	NP
	40	16.0	18.7	21.4	NP	13.6	15.9	18.1	NP
	50	20.0	23.4	26.7	NP	17.0	19.8	22.7	NP

SI: 1 ft = 0.3048 m

- Thermasheath-SI shall be installed on 2x4 or 2x6 studs spaced 16" o.c. and fastened with minimum 1/2" staples spaced 3"-6" (edge:field) per **Section 9**. If 7/16" staples are used, increase length of bracing by a factor of 1.1.
- Demonstrates equivalency to [IRC Table R602.10.3\(3\)](#). All adjustment factors from [IRC Table R602.10.3\(4\)](#) shall be applied, except when used with method CS-PF, a minimum of 1/2" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1 1/4" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels.
- Tabulated bracing lengths are based on the following:
 - Soil Class D
 - Wall height = 10'
 - 10 psf floor dead load
 - 15 psf roof/ceiling dead load
 - Braced wall line spacing ≤ 25'
- Linear interpolation is permitted.
- Minimum 1/2" gypsum wallboard must be installed as part of the wall assembly. Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.8.
- The addition of gypsum wallboard to Thermasheath-SI wall assemblies provides a benefit greater than the SDPWS additive method for wood structural panels.
- Where studs are spaced 24" o.c., bracing lengths shall be multiplied by a factor of 1.1.
- Bracing lengths are the results of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.

6.2.4 Thermasheath-SI CS-PF:

- 6.2.4.1 A "Thermasheath-SI CS-PF" was tested and evaluated for equivalency to the IRC Method CS-PF in accordance with IRC Section R602.10.6.4 and IRC Table R602.10.5.
- 6.2.4.2 IRC Table R602.10.5 establishes the contributing length bracing of the CS-PF as equivalent to 1.5 times its actual length and that it contributes this length of bracing to that required by method CS-WSP.
- 6.2.4.3 The capacity of the Thermasheath-SI CS-PF exceeds the capacity of the IRC Method CS-WSP and is therefore permitted to be substituted for an equivalent length of bracing.
- 6.2.4.4 The Thermasheath-SI CS-PF is shown in **Figure 3** through **Figure 6**:

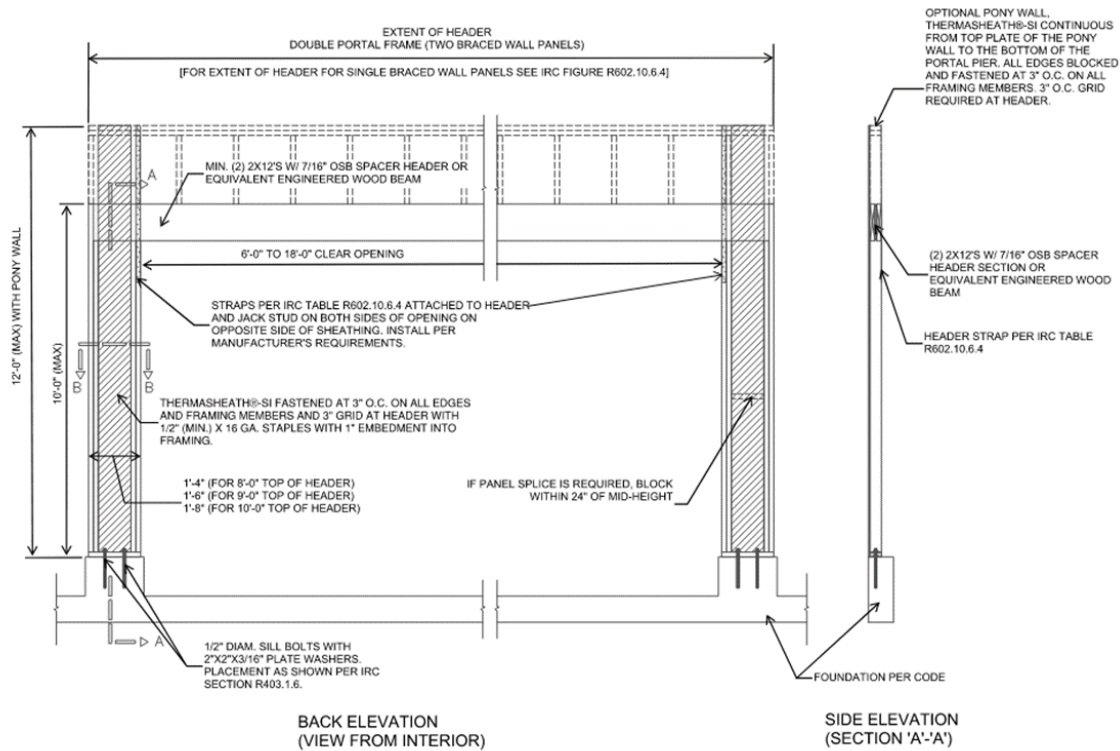


Figure 3. Thermasheath-SI CS-PF Back Elevation

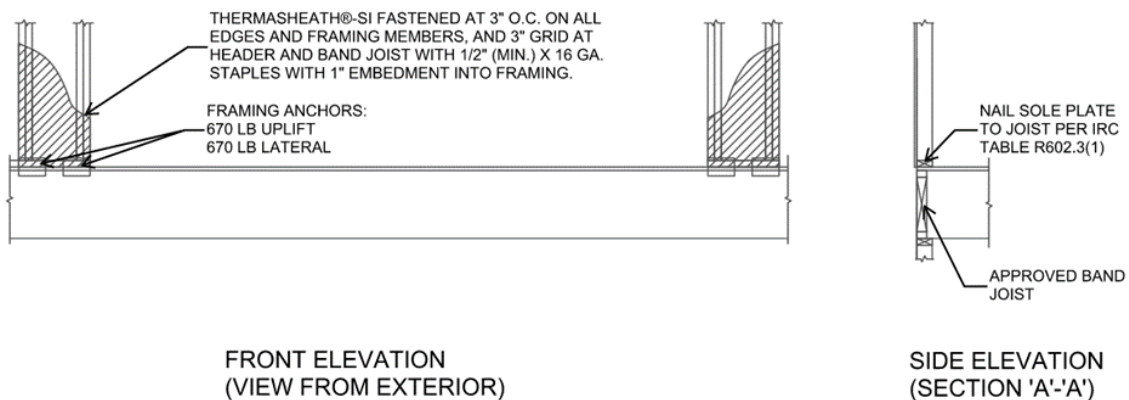


Figure 4. Thermasheath-SI CS-PF Front Elevation 1

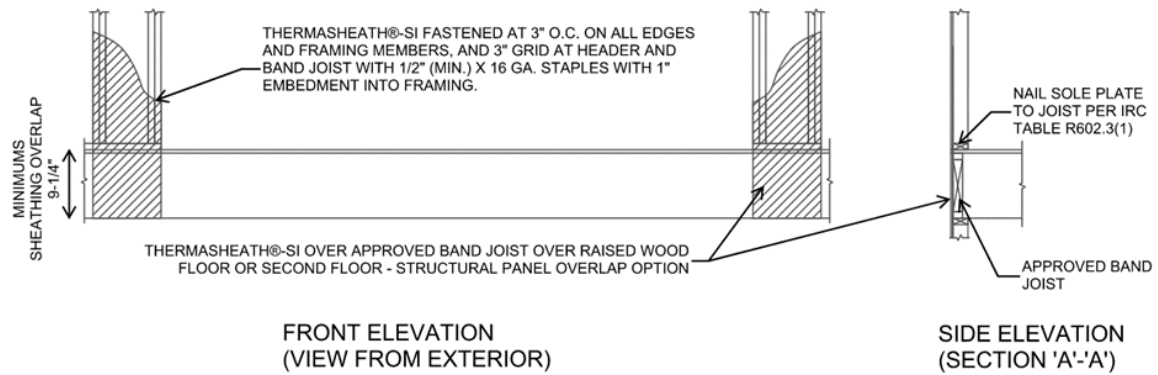


Figure 5. Thermasheath-SI CS-PF Front Elevation 2

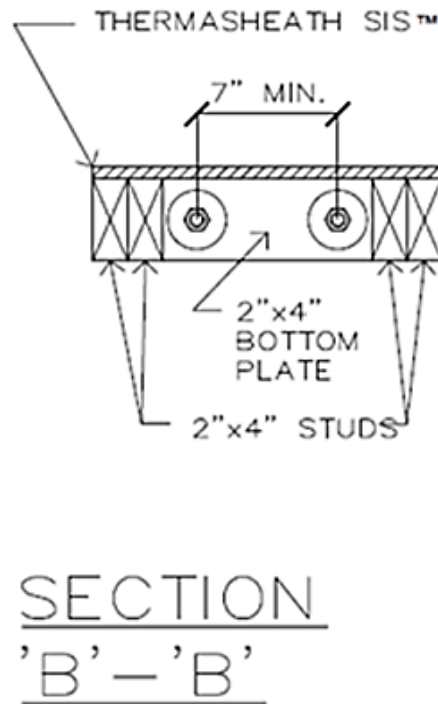


Figure 6. Thermasheath-SI CS-PF Section B-B



6.2.5 Alternative Prescriptive IRC Bracing Applications:

6.2.5.1 As an alternative to **Section 6.3.3**, the following provisions are permitted:

- 6.2.5.1.1 Thermasheath-SI may be used on braced wall lines as an equivalent alternative to Method WSP of the IRC, when installed in accordance with [IRC Section R602.10](#) and this report.
- 6.2.5.1.2 Thermasheath-SI may be used to brace walls of buildings as an alternative to the Continuous Wall Bracing provisions of [IRC Section R602.10.4](#).
- 6.2.5.1.3 Required braced wall panel lengths for Thermasheath-SI shall be as determined by the equivalency factor shown in **Table 4** and [IRC Table R602.10.3\(1\)](#) and [IRC Table R602.10.3\(3\)](#), including all footnotes.

6.2.5.1.3.1 Bracing lengths in these tables for Method WSP or CS-WSP shall be multiplied by the equivalency factor listed in **Table 4**.

Table 4. Braced Wall Line Length Equivalency Factors, Wood Framing

Product	Stud Spacing ⁶ (in)	Fastener	Fastener Spacing (edge:field) (in)	Gypsum ⁵ Wallboard (GWB)	GWB Fastener Spacing (edge:field) (in)	Equivalency Factors ^{1,4,5} to IRC WSP or CS-WSP
Thermasheath-SI	16 o.c.	Minimum 7/16" crown x 1 1/4" leg staples ²	3:6	No GWB	-	1.41
				1/2" GWB	8:8	0.99
		Minimum 1/2" crown x 1 1/4" leg staples ²		No GWB	-	1.30
				1/2" GWB	8:8	0.89
		0.113" dia. Nails ³		No GWB	-	1.63
				1/2" GWB	8:8	1.02
	24 o.c.	Minimum 7/16" crown x 1 1/4" leg staples ²		No GWB	-	1.54
				1/2" GWB	8:8	1.09
		Minimum 1/2" crown x 1 1/4" leg staples ²		No GWB	-	1.43
				1/2" GWB	8:8	0.98
		0.113" dia. Nails ³		No GWB	-	1.77
				1/2" GWB	8:8	1.12

SI: 1 in = 25.4 mm

- Factors based on SPF framing materials.
- Staples shall be a minimum 16-gauge and penetrate a minimum of 1" into the stud. 1" crown x 1 1/4" leg staples are permitted using the equivalency factor for 1/2" staples. Staples must be countersunk beneath the surface of the foam plastic sheathing.
- Nails shall penetrate a minimum of 1 1/4" into the stud. Nails may be countersunk beneath the surface of the foam plastic sheathing.
- Multiply the bracing lengths indicated for the WSP or CS-WSP continuous sheathing methods in [IRC Table R602.10.3\(1\)](#) and [IRC Table R602.10.3\(3\)](#), and as modified by all applicable factors in [IRC Table R602.10.3\(2\)](#) and [IRC Table R602.10.3\(4\)](#), by the factors shown here to establish the required bracing length.
- Valid for single top plate (advanced framing method) wall installations or double top plate wall installations.
- Equivalency factors are the results of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.



6.2.5.1.3.2 These braced wall line length equivalency factors are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the IRC.

6.2.5.1.3.3 Thermasheath-SI tested equivalency factors in **Table 4** allow the user to determine the length of bracing required, by multiplying the factor from **Table 4** by the length shown in the WSP or CS WSP columns in IRC Table R602.10.3(1) and IRC Table R602.10.3(3) as modified by all applicable factors in IRC Table R602.10.3(2) and IRC Table R602.10.3(4), respectively.

6.2.5.1.4 All IRC prescriptive bracing minimums, spacing requirements, and rules must still be met.

6.2.6 Prescriptive IBC Conventional Light-Frame Wood Construction:

6.2.6.1 Thermasheath-SI may be used to brace exterior walls of buildings as an equivalent alternative to the WSP method of the IBC when installed with 1/2" gypsum in accordance with the conventional light frame construction method of IBC Section 2308.6 and this report.

6.2.7 Performance-Based Construction:

6.2.7.1 Thermasheath-SI panels used in wall assemblies designed as shear walls are permitted to be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in **Table 5**, **Table 6**, **Table 7** and **Table 8**.

6.2.7.2 Thermasheath-SI panel shear walls are permitted to resist horizontal wind load forces using the allowable shear loads (in pounds per linear foot) set forth in **Table 5** and **Table 6**.

Table 5. Allowable Stress Design (ASD) Capacity, Wood Framing – Wind

Stud Type	Maximum Stud Spacing (in)	Fastener Type and Size (Minimum) ¹	Fastener Spacing (edge:field) (in)	Gypsum Wallboard (GWB)	GWB Fastener ² Spacing (edge:field) (in)	Allowable Unit Shear Capacity (plf)
Wood	16 o.c.	7/16" crown x 1 1/4" leg staples (16-gauge)	3:6	No GWB	—	260
				1/2" GWB	8:8	380
		1/2" crown x 1 1/4" leg staples (16-gauge)		No GWB	—	280
				1/2" GWB	4:16	485
					8:8	410
					8:16	385
					16:16	345
	24 o.c.	7/16" crown x 1 1/4" leg staples (16-gauge)		No GWB	—	235
				1/2" GWB	8:8	340
		1/2" crown x 1 1/4" leg staples (16-gauge)		No GWB	—	250
				1/2" GWB	8:8	365
	16 o.c.	0.113" x 2 3/8" nails		No GWB	—	225
	24 o.c.			1/2" GWB	8:8	360
				No GWB	—	200
				1/2" GWB	8:8	315

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- Fasteners shall penetrate a minimum of 1" into wood studs. 1" crown x 1 1/4" leg 16-gauge staples are permitted using 1/2" staple capacities. Nails may be countersunk beneath the surface of the foam plastic sheathing. Staples must be countersunk beneath the surface of the foam plastic sheathing. Fasteners must have a minimum edge distance of 3/8".
- Gypsum attached with minimum #6 type W or S screws 1 1/4" long. Use Type W screws for wood stud walls and Type S screws for steel stud walls. Fasteners shall maintain a minimum edge distance of 3/8".



Table 6. Allowable Stress Design (ASD) Capacity, Steel Framing – Wind

Stud Type	Maximum Stud Spacing (in)	Fastener Type & Size (minimum) ¹	SI Fastener ² Spacing (edge:field) (in)	Gypsum Wallboard (GWB)	GWB Fastener ³ Spacing (edge:field) (in)	R-SEAL 2000 LF ⁴	Allowable Unit Shear Capacity (plf)		
							Thermasheath-SI Thickness		
							1/2"	1"	1 1/4"
Steel ⁵	16 o.c.	#8 Pan Head Screw	3:6	No GWB	—	No	290	345	365
						Yes	345	405	420
				1/2" GWB	8:8	No	390	445	465
						Yes	450	510	530
			12:12	No GWB	—	Yes ⁶	345	390	420
				1/2" GWB	8:8	Yes ⁷	450	510	530
	24 o.c.		3:6	No GWB	—	No	230	275	290
						Yes	285	330	345
				1/2" GWB	8:8	No	305	350	365
						Yes	405	440	460
			12:12	No GWB	—	Yes ⁶	285	310	345
				1/2" GWB	8:8	Yes ⁷	405	415	460

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Thermasheath-SI shall be attached with a minimum #8 pan head screw. Fasteners shall be long enough to penetrate through the back of the steel stud a minimum of three (3) thread lengths. Fasteners may be countersunk beneath the surface of the foam plastic sheathing.
2. Fasteners must have a minimum edge distance of 3/8".
3. Gypsum attached with minimum #6 type W or S screws 1 1/4" long. Use Type W screws for wood stud walls and Type S screws for steel stud walls. Fasteners shall maintain a minimum edge distance of 3/8".
4. 3/16" diameter bead of Rmax R-SEAL 2000 LF placed along steel studs and top/bottom plates with 3/8" edge distance.
5. Minimum 20-gauge (33 mil) 3 5/8" x 1 5/8" 33 ksi yield steel studs
6. Where R-SEAL 2000 LF is not applied along the framing members, the tabulated allowable unit shear capacity shall be divided by 4.2.
7. Where R-SEAL 2000 LF is not applied along the framing members, the tabulated allowable unit shear capacity shall be divided by 2.9.



6.2.8 Seismic Design:

6.2.8.1 Thermasheath-SI shear walls that require seismic design in accordance with IBC Section 1613 shall use the seismic allowable unit shear capacities set forth in **Table 7**.

6.2.8.1.1 The response modification coefficient, R , system overstrength factor, Ω_0 , and deflection amplification factor, C_d indicated in **Table 7**, shall be used to determine the base shear, element design forces and design story drift in accordance with ASCE 7 Chapter 12 and Section 14.5.

Table 7. Allowable Stress Design (ASD) Capacity and Seismic Design Coefficients, Wood Framing – Seismic^{1,2}

Seismic Force-Resisting System	Max. Stud Spacing (in)	Gypsum Wallboard ⁷ (GWB)	Seismic Allowable Unit Shear Capacity (plf)	Apparent Shear Stiffness, G_a (kips/in)	Response Modification Factor ³ , R	System Overstrength Factor ⁴ , Ω_0	Deflection Amplification Coefficient ⁵ , C_d	Structural System Limitations and Building Height Limit ⁶ (ft)				
								Seismic Design Category				
								B	C	D	E	F
Light-Frame (Wood) Walls Sheathed with Thermasheath-SI	16 o.c.	1/2" GWB	320	12.5	6.5	3	4	NL	NL	65	65	65
		No GWB	225	6.5	6.5	3	4	NL	NL	65	65	65

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m, 1 psi = 6.895 kPa

1. Thermasheath-SI shall be installed on 2x4 or 2x6 studs spaced 16" o.c. and fastened with minimum 1/2" staples spaced 3":6" (edge:field) per **Section 9**. If 7/16" staples are used, reduce the allowable shear capacity by a factor of 0.93.
2. All seismic design coefficients follow the equivalency procedures as defined in **Section 8** of this report.
3. Response modification coefficient, R , for use throughout ASCE 7. Note R reduces forces to a strength level, not an allowable stress level.
4. The tabulated value of the overstrength factor, Ω_0 , is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.
5. Deflection amplification factor, C_d , for use with ASCE 7 Section 12.8.6, 12.8.7 and 12.9.1.2.
6. NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2.
7. Gypsum attached with minimum #6 type W or S screws 1 1/4" long spaced 8" o.c. at panel edges and in the field. Maximum stud spacing is 16" o.c.



6.2.9 Uplift Resistance:

- 6.2.9.1 Thermasheath-SI panels are permitted to resist uplift wind load forces using the allowable uplift loads (in pounds per linear foot) set forth in **Table 8**.

Table 8. Uplift Performance, Wood and Steel Framing

Product	Stud Type	Maximum Stud Spacing (in)	Fastener Schedule	Fastener Spacing (in)	Gypsum Wallboard (GWB) (in)	Allowable Uplift Capacity ^{1,2} (plf)
Thermasheath-SI	Wood	24 o.c.	Minimum 1/2" crown, 1 1/4" leg 16-gauge galvanized staples ³	3:6	No GWB	150
					1/2" GWB	265
			0.113" x 2 3/8" nails, fastened 3" o.c. to perimeter, 6" o.c. in the field	3:6	1/2" GWB	240
	Steel ⁴	24 o.c.	#8 x 3/4" self-tapping pan head screw ⁵	3:6	No GWB	220

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- The ASD allowable unit uplift capacity is determined by dividing the tabulated uplift capacity by the ASD reduction factor of 2.0 per SDPWS Section 4.3 for determining the ASD allowable capacity for uplift conditions.
- The capacities shown are for the purpose of providing information on the hold-down capacity of the sheathing to the wall plate connection independent of lateral loading. Where combined shear and uplift loading is needed, consult a professional engineer.
- Staple crowns to be installed parallel to grain. Minimum penetration of 1" into the stud
- Minimum 20-gauge (33 mil) 3 5/8" x 1 5/8" 33 ksi yield steel studs
- Fasteners shall be installed with the head in contact with the face of the board. Fastener edge distance shall be a minimum of 3/8" on all sides of the board.

6.2.10 Transverse Wind Loading:

- 6.2.10.1 Thermasheath-SI panels are permitted to resist transverse wind load forces using the allowable transverse loads (in pounds per linear foot) set forth in **Table 9** and **Table 10**.

Table 9. Transverse (Out-Of-Plane) Wind Load Resistance, Wood and Steel Framing

Product	Stud Type	Fastener Schedule	Fastener Spacing (in)	Maximum Stud Spacing (in)	Allowable Design ^{1,2} Value (psf)
Thermasheath-SI	Wood	1/2" crown, 1 1/4" leg 16-gauge galvanized staples ³	3:6	16 o.c.	105
				24 o.c.	75
	Steel ⁴	#8 x 3/4" self-tapping pan head screw ⁵	3:6	24 o.c.	55

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m²

- Applies to both negative and positive wind load.
- Design wind load capacity shall be in accordance with IBC Section 1609.1.1.
- Staple crowns to be installed parallel to grain.
- Minimum 20-gauge (33 mil) 3 5/8" x 1 5/8" 33 ksi yield steel studs
- Fasteners shall be installed with the head in contact with the face of the board. Fastener edge distance shall be a minimum of 3/8" on all sides of the board. The tabulated values also apply where R-SEAL 2000 LF is applied between the framing and Thermasheath-SI.

Table 10. Basic Wind Speed for Use in Exterior Wall Covering Assemblies^{1,2,5}

Product	Stud Type	Maximum Stud Spacing (in)	Allowable Components & Cladding Basic Wind Speed (mph)					
			Allowable Stress Design Wind Speed ⁴ (V _{asd})			Basic Design Wind Speed ³ (V _{ult})		
			Exposure B	Exposure C	Exposure D	Exposure B	Exposure C	Exposure D
Thermasheath-SI	Wood	16 o.c.	155	155	155	200	200	200
		24 o.c.	155	150	135	200	195	175
	Steel	24 o.c.	150	130	115	195	165	150

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

- Wind speed determined in accordance with ASCE 7-22.
- The tabulated wind speeds correspond to the pressures presented in **Table 9**. See **Table 9** for framing and fastening requirements.
- Allowable wind speeds are based on the following:
A building height of 30-feet, GCp= -1.4 for Zone 5 and an Effective Wind Area of 10 ft², Topographic Factor: Kzt=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GCpi=+/-0.18 for an enclosed building, Kd = 0.85 for 'Component and Cladding'.
- IBC Section 1609.3.1: $V_{asd} = V_{ult} \sqrt{0.6}$.
- Reported V_{asd} is capped at 155 mph. Reported V_{ult} is capped at 200 mph.

6.3 Water-Resistive Barrier (WRB)

- 6.3.1 Thermasheath-SI and Thermasheath may be used as a WRB as prescribed in IBC Section 1403.2^{xxiii} and IRC Section R703.2 when installed on exterior walls as described in this section.
- 6.3.2 Thermasheath-SI and Thermasheath shall be installed 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 9**.
- 6.3.3 All joints between boards shall be sealed by R-SEAL 3000, R-SEAL Construction Tape or R-SEAL 2000 LF per the manufacturer installation instructions.
- 6.3.4 A separate WRB may also be provided. If a separate WRB method is used, taping of the sheathing joints is not required.
- 6.3.5 Flashing of corners, windows, doors and other through-wall penetrations is required and shall comply with the applicable code.
- 6.3.6 Where Thermasheath-SI is used intermittently along a braced wall line, Thermasheath may be used as infill between the Thermasheath-SI panels. In this application, the WRB is maintained, provided all seams and joints between boards are covered by R-SEAL 3000, R-SEAL Construction Tape or R-SEAL 2000 LF.
- 6.3.7 Thermasheath-SI and Thermasheath have water resistance properties as shown in **Table 11**.

Table 11. Water Resistance Properties

Property	Test Method	Result
Water Vapor Transmission	ASTM E96	< 0.03 U.S. Perm
Water Absorption	ASTM C209	< 0.2% by Volume
	ASTM C272	< 0.3% by Volume

SI: 1 U.S. Perm [gr/(hr·ft²·inHg)] = 57.2 ng/(Pa·s·m²)



6.4 Thermal Resistance (R-Value)

- 6.4.1 Thermasheath-SI and Thermasheath meet the continuous insulated sheathing requirements complying with the provisions of [IRC Section N1102](#), [IECC Section C402](#), and [IECC Section R402](#).
- 6.4.2 Thermasheath-SI and Thermasheath have the thermal properties as shown in **Table 12**.

Table 12. Thermal Resistance Properties

Product	Thickness (in)	R-Value (°F·ft ² ·hr/Btu)
Thermasheath-SI and Thermasheath	0.50	3.2
	0.75	5.0
	1.00	6.0
	1.25	7.8

SI: 1 in = 25.4 mm; 1 °F·ft²·hr/Btu = 0.176 K·m²/W

6.5 Air Barrier

- 6.5.1 Thermasheath-SI and Thermasheath meet the requirements of [IRC Section N1102](#), [IECC Section C402](#) and [IECC Section R402](#) for use as a component of the air barrier when installed in accordance with the manufacturer installation instructions and this report.
- 6.5.2 The air permeance of an air barrier material is defined by the IECC and the Air Barrier Association of America (ABAA) as being no greater than 0.02 L/(s·m²) at 75 Pa pressure difference when tested in accordance with ASTM E2178.
- 6.5.3 The air barrier properties of Thermasheath-SI and Thermasheath are shown in **Table 13**.

Table 13. Air Barrier Material Properties

Product	Air Permeance ^{1,2} (L/(s·m ²))
Thermasheath-SI and Thermasheath	< 0.02

IP: 1 L/(s·m²) = 0.004 cfm/ft²
 1. Tested in accordance with ASTM E2178.

- 6.5.4 When used as part of an air barrier assembly, all sheathing panel joints shall be sealed with R-SEAL 3000, R SEAL Construction Tape or R-SEAL 2000 LF. The transitions, including top and bottom of walls, and all penetrations shall also be sealed in accordance with the manufacturer installation instructions and this report.

6.6 Draftstop

- 6.6.1 Thermasheath-SI and Thermasheath may be used as a draftstop material in accordance with [IBC Section 708.4.2](#), ^{xxiv} [IBC Section 718.3](#), [IBC Section 718.4](#) and [IRC Section R302.12](#).
- 6.6.2 When installed as a draftstop, Thermasheath-SI and Thermasheath shall be installed in accordance with **Section 9**.



6.7 Fire Safety Performance

6.7.1 Surface Burning Characteristics:

- 6.7.1.1 Thermasheath-SI and Thermasheath panels have flame spread and smoke developed ratings shown in **Table 14**, when tested in accordance with ASTM E84 per [IBC Section 2603.3](#) and [IRC Section R316.3](#).

Table 14. Surface Burning Characteristics¹

Product	Flame Spread Index	Smoke Developed Index	Classification
Thermasheath-SI and Thermasheath	≤ 75	≤ 450	Class C

SI: 1 in = 25.4 mm
 1. Tested in accordance with ASTM E84, foam core only.

6.7.2 Thermal Barrier and Ignition Barrier (IBC and IRC Buildings):

- 6.7.2.1 Thermasheath-SI and Thermasheath, up to 4¹/₂" in walls only or ceilings only where applicable, is approved for use in attics, crawls spaces or other uninhabited spaces without a thermal barrier or ignition barrier, based on large-scale testing in accordance with NFPA 286 per [IBC Section 2603.9](#) and [IRC Section R316.6](#).
- 6.7.2.2 Thermasheath-SI and Thermasheath, up to 1" in walls only or ceilings only where applicable, is approved for use in attics, crawls spaces or other uninhabited spaces without a thermal barrier or ignition barrier, based on large-scale testing in accordance with NFPA 286 per [IBC Section 2603.9](#) and [IRC Section R316.6](#).
- 6.7.2.3 Thermasheath-SI and Thermasheath, up to 12" (305 mm) in thickness where applicable, may be installed within the building envelope (including, but not limited to, attics, crawlspaces, wall, roof, floor and ceiling assemblies) of all building types when separated from the interior with a thermal barrier consisting of a minimum 1/2" gypsum wallboard or an approved equivalent in accordance with [IBC Section 2603.4](#) and [IRC Section R316.4](#).
- 6.7.2.4 In applications where panels are used in both walls and ceilings, but only one is allowed to be left exposed per **Section 6.7.2.1** or **Section 6.7.2.3**, the other must meet the requirements of **Section 6.7.2.5**.
- 6.7.2.5 Use without an approved thermal barrier or ignition barrier is limited to areas where:
- 6.7.2.5.1 Access to the space is required by [IRC Section R807.1](#) or [IRC Section R408.4](#).
- 6.7.2.5.2 Entry is made only for the purposes of repairs or maintenance.
- 6.7.2.6 Panels may be installed in single or multiple layers.

6.7.3 Fire Resistance Ratings (Fire Rated Assemblies):

- 6.7.3.1 Thermasheath-SI has been tested and meets the requirements of UL 263 (ASTM E119) in accordance with [IBC Section 703.2.1](#) and [IRC Section R302.1](#) for use in the following assembly designs when installed in accordance with the manufacturer installation instructions and this report:
- 6.7.3.1.1 45 minutes: [U424](#), [U425](#), [V321](#), [V499](#), [W456](#)
- 6.7.3.1.2 1 hour: [U026](#), [U326](#), [U330](#), [U354](#), [U355](#), [U364](#), [U424](#), [U425](#), [U460](#), [V302](#), [V303](#), [V454](#), [V499](#), [W307](#), [W417](#), [W456](#)
- 6.7.3.1.3 1.5 hours: [U424](#), [U425](#), [V499](#), [W456](#)
- 6.7.3.1.4 2 hours: [U349](#), [U424](#), [U425](#), [U905](#), [U906](#), [V332](#), [V499](#), [W456](#)
- 6.7.3.1.5 3 hours: [U904](#), [U907](#)
- 6.7.3.1.6 4 hours: [U902](#), [U907](#)



6.7.3.2 Thermasheath has been tested and meets the requirements of UL 263 (ASTM E119) in accordance with IBC Section 703.2.1 and IRC Section R302.1 for use in the following assembly designs when installed in accordance with the manufacturer installation instructions and this report:

6.7.3.2.1 45 minutes: U424, U425, V321, V499, W456

6.7.3.2.2 1 hour: U026, U326, U330, U354, U355, U364, U424, U425, U460, V454, V499, W417, W456

6.7.3.2.3 1.5 hours: U424, U425, V499, W456

6.7.3.2.4 2 hours: U349, U424, U425, U905, U906, V332, V499, W456

6.7.3.2.5 3 hours: U904, U907

6.7.3.2.6 4 hours: U902, U907

6.8 Non-Structural Applications

6.8.1 Where other means of wall bracing are provided or are not required, and an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing, Thermasheath-SI and Thermasheath are permitted to be installed as follows:

6.8.1.1 Fastening shall be sufficient to hold the Thermasheath-SI and Thermasheath in place until the exterior wall covering is installed. Once the wall covering is installed, the wall covering fasteners penetrate through the sheathing and into the wall framing, providing the necessary resistance to transverse loads.

6.8.1.2 Fasteners include, but are not limited to, roofing nails and bugle head screws.

6.8.1.3 Other means of fastening may also be used, such as certain adhesives which are compatible with the sheathing.

6.8.1.4 Consult the manufacturer installation instructions for further details.

6.9 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^{xxv}

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.^{xxvi}

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.^{xxvii}



8 Regulatory Evaluation and Accepted Engineering Practice

8.1 Thermasheath-SI and Thermasheath comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Thermasheath-SI was evaluated to determine:

- 8.1.1.1 Structural performance under lateral load conditions (wind and seismic) for use as an alternative to the IRC Intermittent Wall Bracing provisions of [IRC Section R602.10](#), method WSP (Wood Structural Panel), and the IRC Continuous Wall Bracing provisions of [IRC Section R602.10.4](#), methods CS-WSP (Continuous Sheathed Wood Structural Panel) and CS-PF (Continuous Sheathed Portal Frame).
- 8.1.1.2 Structural performance under lateral load conditions for use as an alternative to the IRC simplified bracing provisions of [IRC Section R602.12](#).
- 8.1.1.3 Structural performance under lateral load conditions for use as an alternative to the IBC Conventional Wall Bracing provisions, [IBC Section 2308.6](#), WSP (Wood Structural Panel) Method 3, for Type V construction.
- 8.1.1.4 Structural performance under lateral load conditions for wind loading for use with the IBC performance based provisions, [IBC Section 2211.1](#) for light-frame steel wall assemblies.
- 8.1.1.5 Structural performance under lateral load conditions for both wind and seismic loading for use with the IBC performance-based provisions, [IBC Section 2306.1](#) and [IBC Section 2306.3](#) for light-frame wood wall assemblies.
- 8.1.1.5.1 **Table 7** provides Seismic Design Coefficients (SDC) that conform to the requirements in ASCE 7 Section 12.2.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design in accordance with ASCE 7 (i.e., all Seismic Design Categories).
- 8.1.1.5.2 The basis for equivalency testing is outlined in Section 12.2.1.1 of ASCE 7:

Alternative Structural Systems. Use of seismic force-resisting systems not contains in Table 12.2-1 shall be permitted contingent on submittal to and approved by the Authority Having Jurisdiction and independent structural design review of an accompanying set of design criteria and substantiating analytical and test data. The design criteria shall specify any limitations on system use, including Seismic Design Category and height; required procedures for designing the system's components and connections; required detailing; and the values of the response modification coefficient, R ; overstrength factor, Ω_o ; and deflection amplification factor, C_d .

- 8.1.1.5.2.1 The basis of the seismic evaluation performed as part of this report is based on ASTM D7989 and testing per ASTM E2126 to establish SDCs that conform to the requirements of ASCE 7 Section 12.2.1.1.
- 8.1.1.6 Resistance to uplift loads for wall assemblies used in light-frame steel and wood construction in accordance with [IBC Section 1604.8.1](#), [IBC Section 2304.10.8](#),^{xxviii} [IBC Section 2308.7.5](#) and [IRC Section R602.3.5](#).
- 8.1.1.7 Resistance to transverse loads for wall assemblies used in light-frame steel and wood construction in accordance with [IBC Section 1609.1.1](#) and [IRC Section R301.2.1](#).
- 8.1.1.8 Structural performance under lateral load conditions for use as an alternative to SDPWS Section 4.3 Wood Frame Shear Walls.



- 8.1.2 Thermasheath-SI and Thermasheath were evaluated to determine:
- 8.1.2.1 Performance in accordance with foam plastic requirements of IBC Section 2603 and IRC Section R316.
 - 8.1.2.2 Performance for use as insulating sheathing (R-Value) in accordance with IRC Section N1102.1, IRC Section N1102.2, IECC Section C402 and IECC Section R402.
 - 8.1.2.3 Performance for use as a WRB in accordance with IBC Section 1403.2^{xxix} and IRC Section R703.2.
 - 8.1.2.4 Performance for use as a vapor retarder in accordance with IBC Section 202, IBC Section 1404.3,^{xxx} IRC Section R202 and IRC Section R702.7.
 - 8.1.2.5 Performance for use as an air barrier material in accordance with IRC Section N1102.4 and IECC Section R402.
 - 8.1.2.6 Performance for use as a draftstop in accordance with IBC Section 708.4.2,^{xxxi} IBC Section 718.3, IBC Section 718.4 and IRC Section R302.12.
 - 8.1.2.7 Performance for use in buildings of Type V construction in accordance with IBC Section 2603 and IRC Section R316.
 - 8.1.2.7.1 Surface burning characteristics in accordance with IBC Section 2603.3 and IRC Section R316.3.
 - 8.1.2.7.2 Special approval for use without a thermal barrier or ignition barrier in accordance with IBC Section 2603.4.1.6, IRC Section R316.5.3 and IRC Section R316.5.4.
 - 8.1.2.8 Performance for use in a fire resistance rated assembly in accordance with IBC Section 703.2.1.
- 8.1.3 Thermasheath was evaluated to determine its performance for use as non-structural in-fill on those portions of a wall assembly not otherwise designed as part of a braced wall panel or shear wall.
- 8.1.4 Use of Thermasheath-SI in a Portal Frame with Hold-Down (PFH) is outside the scope of this report.
- 8.1.5 Use of Thermasheath in applications where the exterior wall covering is unable to resist 100% of the transverse wind load is outside the scope of this report.
- 8.1.6 Performance of Thermasheath-SI used in light-frame steel construction to resist seismic loading is outside the scope of this report.
- 8.2 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^{xxxii} to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.
- 8.3 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which are also its areas of professional engineering competence.
- 8.4 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 General:

- 9.3.1.1 Fastener edge distance is a minimum of $\frac{3}{8}$ " (9.5 mm) for both Thermasheath-SI and gypsum.
- 9.3.1.2 Where used, always fasten staples parallel to the framing member.
- 9.3.1.3 Where hold-down straps are used, install structural sheathing first, remove foam at strap's location, then install the strap over the face of the structural sheathing backer and attach per the manufacturer installation instructions.
- 9.3.1.4 Where required, gypsum wallboard shall be a minimum $\frac{1}{2}$ " and installed with a minimum of #6 x $1\frac{1}{4}$ " Type W or S screws or 5d cooler nails. The fastener spacing shall be a maximum of 8" o.c. (76 mm) along the edge and in the field.

9.3.2 Orientation:

- 9.3.2.1 Thermasheath-SI and Thermasheath must be installed with the long dimension of the panels parallel to the framing behind and all panel edges supported by framing or blocking.
- 9.3.2.2 Thermasheath-SI and Thermasheath must be installed over studs a nominal thickness of not less than 2" (51 mm) and spaced a maximum of 24" (610 mm) o.c., unless otherwise limited by this report.

9.3.3 Fastener Type:

9.3.3.1 Thermasheath-SI on Wood Studs:

- 9.3.3.1.1 Minimum $\frac{7}{16}$ " crown by $1\frac{1}{4}$ " leg, 16-gauge staples or 0.113" x $2\frac{3}{8}$ " nails with a 1" minimum embedment into stud.

9.3.3.2 Thermasheath-SI on Steel Studs:

- 9.3.3.2.1 Minimum #8 pan head screw, with three thread lengths extending beyond the stud.
- 9.3.3.2.2 $\frac{3}{16}$ " diameter bead of Rmax R-SEAL 2000 LF placed along steel studs and top/bottom plates with $\frac{3}{8}$ " edge distance.

9.3.3.3 Thermasheath:

- 9.3.3.3.1 Refer to the manufacturer installation instructions.

9.3.4 Fastener Spacing:

9.3.4.1 Thermasheath-SI on Wood Stud:

- 9.3.4.1.1 Maximum of 3" o.c. (76 mm) along the edge and 6" o.c. in the field.

9.3.4.2 Thermasheath-SI on Steel Stud:

- 9.3.4.2.1 Maximum of 3" o.c. (76.2 mm) along the edge and 6" o.c. in the field.
- 9.3.4.2.2 With R-SEAL 2000LF, maximum of 12" o.c. (76.2 mm) along the edge and in the field.

9.3.4.3 Thermasheath:

- 9.3.4.3.1 Refer to manufacturer installation instructions.

9.3.5 Treatment of Joints:

- 9.3.5.1 Thermasheath-SI sheathing joints shall be tightly butted at framing members and a single row of fasteners must be applied to both panel edges into the framing behind.
- 9.3.5.2 Do not tack Thermasheath-SI to framing, but fasten each panel completely once fastening begins.



9.3.6 Window Treatments:

- 9.3.6.1 If windows are made to accommodate traditional $\frac{1}{2}$ " sheathing materials, order windows with adjustable nailing fins from the supplier. Door brick moldings may be planed or routed $\frac{3}{8}$ " in order to accommodate the different sheathing thickness, either at the jobsite or by the millwork supplier.
- 9.3.6.2 Thermasheath-SI shall be installed with appropriate flashing and counter flashing in conformance with accepted building standards and in compliance with local building codes and the flashing manufacturer installation instructions.

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 Material properties testing in accordance with ASTM C1289
 - 10.1.2 Lateral load testing in accordance with ASTM E72, ASTM E564, ASTM E2126, and analysis per ASTM D7989
 - 10.1.3 Transverse load testing in accordance with ASTM E330
 - 10.1.4 Uplift load testing in accordance with ASTM E72
 - 10.1.5 Thermal resistance property testing in accordance with ASTM C518
 - 10.1.6 Water vapor permeance testing in accordance with ASTM E96
 - 10.1.7 WRB testing in accordance with AATCC 127, ASTM E283, ASTM E331, and ASTM D1037
 - 10.1.8 Water absorption in accordance with ASTM C209 and ASTM C272
 - 10.1.9 Air permeance testing in accordance with ASTM E2178
 - 10.1.10 Flame spread and smoke developed rating tests in accordance with ASTM E84
 - 10.1.11 Room corner tests in accordance with NFPA 286
 - 10.1.12 Fire resistance ratings in accordance with UL 263
- 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.^{xxxiii}
- 10.6 Where additional condition of use and/or regulatory compliance information is required, please search for Thermasheath-SI and Thermasheath on the DrJ Certification website.



11 Findings

- 11.1 As outlined in **Section 6**, Thermasheath-SI and Thermasheath 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, Thermasheath-SI and Thermasheath shall be approved for the following applications:
 - 11.2.1 Lateral load resistance due to wind and seismic loads carried by shear walls.
 - 11.2.2 Use as an equivalent alternative to the CS-PF as described in IRC Section R602.10.5 and IRC Section R602.10.6.4.
 - 11.2.3 Transverse load resistance due to components and cladding pressures on building surfaces.
 - 11.2.4 Uplift load resistance due to components and cladding pressures on building surfaces.
- 11.3 When installed in accordance with the manufacturer installation instructions and this report, Thermasheath-SI and Thermasheath comply with or are a suitable alternative to, the applicable sections of the codes listed in **Section 4** for the following applications:
 - 11.3.1 Performance of foam plastics in accordance with IBC Section 2603 and IRC Section R316.
 - 11.3.2 Performance for use as insulating sheathing in accordance with IRC Section N1102.1, IRC Section N1102.2, IECC Section R402 and IECC Section C402.
 - 11.3.3 Performance for use as a WRB in accordance with IBC Section 1403.2^{xxxiv} and IRC Section R703.2.
 - 11.3.4 Performance for use as an air barrier in accordance with IRC Section N1102.4 and IECC Section C402.
 - 11.3.5 Performance for use as a draftstop in accordance with IBC Section 708.4.2^{xxxv}, IBC Section 718.3, IBC Section 718.4 and IRC Section R302.12.
 - 11.3.6 Performance for use in a fire resistance rated assembly in accordance with IBC Section 703.2.1.
 - 11.3.7 Flame spread and smoke developed indices in accordance with IBC Section 2603.3 and IRC Section R316.3.
 - 11.3.8 Performance for use without a thermal barrier in accordance with IBC Section 2603.4.1.6, IRC Section R316.5.3 and IRC Section R316.5.4.
 - 11.3.9 Performance for use without a thermal barrier or ignition barrier in accordance with IBC Section 2603.9 and IRC Section R316.6 when installed in accordance with Section 6.7.2.
- 11.4 Unless exempt by state statute, when Thermasheath-SI and Thermasheath 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.
- 11.5 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Rmax.
- 11.6 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10^{xxxvi} 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.



11.7 **Approved:**^{xxxvii} Building regulations require that the building official shall accept Duly Authenticated Reports.^{xxxviii}

11.7.1 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited.

11.7.2 An approved source is “approved” when an RDP is properly licensed to transact engineering commerce.

11.7.3 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.

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

11.9 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.^{xxxix}

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 Except as provided in **Section 6.7.2**, Thermasheath-SI and Thermasheath shall be fully protected from the interior of the building by an approved 15-minute thermal barrier or ignition barrier where required by the applicable code.

12.4 In areas where the probability of termite infestation is “*very heavy*”, in accordance with IBC Section 2603.8 or IRC Section R318.4, the product must not be placed on exterior walls located within 6" (152 mm) of the ground.

12.5 As listed herein, Thermasheath-SI and Thermasheath shall not be used:

12.5.1 As a nailing base, nor

12.5.2 To resist horizontal loads from concrete and masonry walls when used as wall sheathing.

12.6 When not installed for use as wall bracing, as described in this report, the stud walls shall be braced by other materials, in accordance with the applicable code.

12.7 When used as a WRB, Thermasheath-SI and Thermasheath seams shall be sealed with R-SEAL 3000, R-SEAL Construction Tape or R-SEAL 2000 LF.

12.8 When used in accordance with the IBC in Seismic Design Categories C, D, E, or F, special inspections shall comply with IBC Section 1705.13.^{xi}

12.9 When used in accordance with the IBC in high wind areas, special inspections shall comply with IBC Section 1705.12.^{xii}

12.10 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.

12.11 The manufacturer installation instructions shall be shipped to the jobsite with the materials or otherwise be available on the jobsite for inspection.

12.12 All panel edges shall be supported by wall framing or solid blocking a minimum of 2" nominal in thickness.



- 12.13 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:
- 12.13.1 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.
 - 12.13.2 This report and the installation instructions shall be submitted at the time of permit application.
 - 12.13.3 These innovative products have an internal quality control program and a third-party quality assurance program.
 - 12.13.4 At a minimum, these innovative products shall be installed per **Section 9** of this report.
 - 12.13.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.
 - 12.13.6 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.
 - 12.13.7 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.
- 12.14 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.
- 12.15 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).
- 12.16 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.rmax.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 Thermasheath-SI and Thermasheath 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, 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 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),^{xlii} where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years^{xliii} and/or a \$5,000,000 fine or 3 times the value of^{xliiv} 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^{xliv} 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.^{xlvi}
 - 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.^{xlvii}



- 1.3 **Approved^{xlviii} 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.^{xlix} 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.^l
- 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^{li} 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^{lii} (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](#),^{liii} 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)"*.^{liv} 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](#)^{lv} and [Part 3280](#),^{lvi} 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.^{lvii}
 - 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.^{lviii}
 - 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.^{lix}
 - 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.^{lx}
- 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.^{lxi}
 - 1.11.4 Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.^{lxii}
- 1.12 Approval equity is a fundamental commercial and legal principle.^{lxiii}



Issue Date: June 27, 2022

Subject to Renewal: April 1, 2025

CBC and CRC Supplement to Report Number 1207-01

REPORT HOLDER: Rmax

1 Evaluation Subject

- 1.1 Thermasheath-SI and Thermasheath

2 Purpose and Scope

2.1 Purpose

- 2.1.1 The purpose of this Report Supplement is to show Thermasheath-SI and Thermasheath, recognized in Report Number, 1207-01 have also been evaluated for compliance with the codes listed below.

2.2 Applicable Code Editions

- 2.2.1 *CBC—19, 22: California Building Code (Title 24, Part 2)*
- 2.2.2 *CRC—19, 22: California Residential Code (Title 24, Part 2.5)*
- 2.2.3 *CEC —19, 22: California Energy Code (Title 24, Part 6)*

3 Conclusions

- 3.1 Thermasheath-SI and Thermasheath, described in Report Number 1207-01, comply with the CBC and CRC and are subject to the conditions of use described in this supplement.
- 3.2 Where there are variations between the IBC and IRC and the CBC and CRC applicable to this report, they are listed here:
 - 3.2.1 CBC Section 104.11 replaces IBC Section 104.11.
 - 3.2.2 CBC Section 202 replaces IBC Section 202.
 - 3.2.3 CBC Section 1404.3 replaces IBC Section 1404.3.
 - 3.2.4 CBC Section 1707.1 replaces IBC Section 1707.1.
 - 3.2.5 CBC Section 2306.1 replaces IBC Section 2306.1.
 - 3.2.6 CBC Section 2306.3 replaces IBC Section 2306.3.
 - 3.2.7 CBC Section 2603.3 replaces IBC Section 2603.3.
 - 3.2.8 CRC Section R104.11 replaces IRC Section R104.11.
 - 3.2.9 CRC Section R301.1 replaces IRC Section R301.1.
 - 3.2.10 CRC Section R302.1 replaces IRC Section R302.1.
 - 3.2.11 CRC Section R302.12 replaces IRC Section R302.12.
 - 3.2.12 CRC Section R316.3 replaces IRC Section R316.3.
 - 3.2.13 CRC Section R316.5.3 replaces IRC Section R316.5.3.
 - 3.2.14 CRC Section R316.5.4 replaces IRC Section R316.5.4.



- 3.2.15 CRC Section R408.4 replaces IRC Section R408.4.
- 3.2.16 CRC Section R302.3.5 replaces IRC Section R602.3.5.
- 3.2.17 CRC Section R602.10 replaces IRC Section R602.10.
- 3.2.18 CRC Section R702.3.5 replaces IRC Section R702.3.5.
- 3.2.19 CRC Section R703.2 replaces IRC Section R703.2.
- 3.2.20 CRC Section R807.1 replaces IRC Section R807.1.
- 3.2.21 2022 Building Energy Efficiency Standards for Residential and Nonresidential Buildings replaces IRC Section N1101, IRC Section N1102.1, IRC Section N1102.2, IRC Section N1102.4.

4 Conditions of Use

- 4.1 Thermasheath-SI and Thermasheath, described in Report Number 1207-01, must comply with all of the following conditions:
 - 4.1.1 All applicable sections in Report Number 1207-01.
 - 4.1.2 The design, installation, and inspections are in accordance with additional requirements of CBC and CRC, as applicable.



Issue Date: June 27, 2022

Subject to Renewal: April 1, 2025

FBC Supplement to Report Number 1207-01

REPORT HOLDER: Rmax

1 Evaluation Subject

- 1.1 Thermasheath-SI and Thermasheath

2 Purpose and Scope

- 2.1 Purpose
 - 2.1.1 The purpose of this Report Supplement is to show Thermasheath-SI and Thermasheath, recognized in Report Number 1207-01, have also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.
- 2.2 *Applicable Code Editions*
 - 2.2.1 *FBC-B—20, 23: Florida Building Code – Building*
 - 2.2.2 *FBC-R—20, 23: Florida Building Code – Residential*

3 Conclusions

- 3.1 Thermasheath-SI and Thermasheath, described in Report Number 1207-01, comply with the FBC-B and FBC-R and are subject to the conditions of use described in this supplement.
- 3.2 Where there are variations between the IBC and IRC and the FBC-B and FBC-R applicable to this report, they are listed here:
 - 3.2.1 FBC-B Section 104.4, Section 110.4, Section 1613, Section 1705 and Section 2308 are reserved.
 - 3.2.2 FBC-R Section R104, Section R109, Section R602.3.5, Section R602.10, Table R602.10.3(1), Table R602.10.3(2), Table R602.10.3(3), Table R602.10.3(4), Section R602.10.4, Section R602.10.5, Section R602.10.6.4 and Section R602.12 are reserved.
 - 3.2.3 FBC-B Section 202 replaces IBC Section 202.
 - 3.2.4 FBC-B Section 708.4 replaces IBC Section 708.4.2.
 - 3.2.5 FBC-B Section 718.3 replaces IBC Section 718.3.
 - 3.2.6 FBC-B Section 718.4 replaces IBC Section 718.4.
 - 3.2.7 FBC-B Section 1404.2 replaces IBC Section 1403.2.
 - 3.2.8 FBC-B Section 1405.3 replaces IBC Section 1404.3.
 - 3.2.9 FBC-B Section 1609.1.1 replaces IBC Section 1609.1.1.
 - 3.2.10 FBC-B Section 2304.10.7 replaces IBC Section 2304.10.8.
 - 3.2.11 FBC-B Section 2306.1 replaces IBC Section 2306.1.
 - 3.2.12 FBC-B Section 2306.3 replaces IBC Section 2306.3.



- 3.2.13 FBC-B Section 2603.3 replaces IBC Section 2603.3.
- 3.2.14 FBC-B Section 2603.8 replaces IBC Section 2603.8.
- 3.2.15 FBC-B Section 2603.9 replaces IBC Section 2603.9.
- 3.2.16 FBC-R Section R301.1 replaces IRC Section R301.1.
- 3.2.17 FBC-R Section R301.2.1 replaces IRC Section R301.2.1.
- 3.2.18 FBC-R Section R302.1 replaces IRC Section R302.1.
- 3.2.19 FBC-R Section R302.12 replaces IRC Section R302.12.
- 3.2.20 FBC-R Section R316.3 replaces IRC Section R316.3.
- 3.2.21 FBC-R Section R316.5.3 replaces IRC Section R316.5.3.
- 3.2.22 FBC-R Section R316.5.4 replaces IRC Section R316.5.4.
- 3.2.23 FBC-R Section R318.8 replaces IRC Section R318.4.
- 3.2.24 FBC-R Section R408.4 replaces IRC Section R408.4.
- 3.2.25 FBC-R Section R702.3.5 replaces IRC Section R702.3.5.
- 3.2.26 FBC-R Table R702.3.5 replaces IRC Table R702.3.5.
- 3.2.27 FBC-R Section R703.2 replaces IRC Section R703.2.
- 3.2.28 FBC-R Section R807.1 replaces IRC Section R807.1.
- 3.2.29 FBC-R Section N1101.1 replaces IRC Section N1102.

4 Conditions of Use

- 4.1 Thermasheath-SI and Thermasheath, described in Report Number 1207-01, must comply with all of the following conditions:
 - 4.1.1 All applicable sections in Report Number 1207-01.
 - 4.1.2 The design, installation, and inspections are in accordance with additional requirements of FBC-B Chapter 16 and Chapter 17, as applicable.



Notes

- i For more information, visit djrcertification.org or call us at 608-310-6748.
- ii <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702>
- iii 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>
- iv <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
- v 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
- vi <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
- vii <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>
- viii https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency
- ix https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source
- x <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](#).
- xi <https://www.nsps.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>
- xii <https://www.cbiteest.com/accreditation/>
- xiii <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11>:-:text=to%20enforce%20the%20provisions%20of%20this%20code
- xiv <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
- xv <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
- xvi <https://iaf.eu/en/about-iaf>:-: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
- xvii True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- xviii <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>
- xix 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.
- xx All references to the CBC and CRC are the same as the 2021 IBC and 2021 IRC unless otherwise noted in the Florida Supplement at the end of this report.
- xxi 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.
- xxii <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>
- xxiii 2015 IBC Section 1404.2
- xxiv 2015 IBC Section 708.4
- xxv <https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4>
- xxvi <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
- xxvii <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
- xxviii 2018 IBC Section 2304.10.7
- xxix 2015 IBC Section 1404.2
- xxx 2015 IBC Section 1405.3
- xxxi 2015 IBC Section 708.4



- 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.
- See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.
- 2015 IBC Section 1404.2
- 2015 IBC Section 708.4
- 2018 IFC Section 104.9
- 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.
- <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>
- Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- 2018 IBC Section 1705.12
- 2018 IBC Section 1705.11
- <http://www.drjengineering.org/AppendixC> AND <https://www.drjcertification.org/cornell-2016-protection-trade-secrets>
- <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years>
- <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided>
- <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>
- IBC 2021, Section 1706.1 Conformance to Standards
- IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General
- See Section 11 for the distilled building code definition of **Approved**
- Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES
- <https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1>
- New York City, The Rules of the City of New York, § 101-07 Approved Agencies
- New York City, The Rules of the City of New York, § 101-07 Approved Agencies
- <https://up.codes/viewer/new-jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1>
- <https://www.nj.gov/dca/divisions/codes/codreg/ucc.html>
- <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>
- <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>
- IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.
- IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.
- <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/>
- IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.
- <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>
- True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>