



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1004-03

Thermo-Ply® Green & Thermo-Ply®
Green AMG Structural Sheathing

Ox Engineered Products, LLC

Product:

Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing

Issue Date:

November 19, 2013

Revision Date:

April 1, 2022

Subject to Renewal:

April 1, 2023



COMPANY
INFORMATION:

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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
DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION
SECTION: 07 25 00 - Water-Resistive Barriers/Weather Barriers
SECTION: 07 27 00 - Air Barriers

1 PRODUCTS EVALUATED¹

- 1.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing²

2 APPLICABLE CODES AND STANDARDS^{3,4}

2.1 Codes

- 2.1.1 *IBC—15, 18, 21: International Building Code®*
- 2.1.2 *IRC—15, 18, 21: International Residential Code®*
- 2.1.3 *IECC—15, 18, 21: International Energy Conservation Code®*
- 2.1.4 *FBC-B—17, 20: Florida Building Code – Building (FL 16391)⁵*
- 2.1.5 *FBC-R—17, 20: Florida Building Code – Residential (FL 16391)⁵*
- 2.1.6 *CBC—16, 19: California Building Standards Code*
- 2.1.7 *CRC—16, 19: California Residential Code*

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

² Throughout this TER, wherever Thermo-Ply® Green is cited, the provisions are applicable to Thermo-Ply® Green AMG as well.

³ Unless otherwise noted, all references in this TER are from the 2021 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2018 versions of the referenced codes and the standards referenced therein.

⁴ All terms defined in the applicable building codes are italicized.

⁵ All references to the *FBC-B* and *FBC-R* are the same as the 2018 *IBC* and *IRC* unless otherwise noted in the Florida Supplement at the end of this TER.

2.2 Standards and Referenced Documents

- 2.2.1 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*
- 2.2.2 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- 2.2.3 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*
- 2.2.4 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 2.2.5 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*
- 2.2.6 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.2.7 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.2.8 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 2.2.9 *UL 723: Test for Surface Burning Characteristics of Building Materials*

3 PERFORMANCE EVALUATION

3.1 Thermo-Ply® Green Structural Sheathing has been evaluated to determine:

- 3.1.1 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* and the *IRC* Continuous Wall Bracing provisions of *IRC Section R602.10.4* Method CS-WSP (Continuously sheathed wood structural panel) and CS-PF (Continuously sheathed portal frame).
- 3.1.2 Structural performance under lateral load conditions for both wind and seismic loading for use with the performance-based provisions of *IBC Section 2306.1* and *Section 2306.3* for light-frame wood wall assemblies.
 - 3.1.2.1 Table 4 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).
 - 3.1.2.2 The basis for equivalency testing is outlined in Section 12.2.1 of *ASCE 7*:
 - 12.2.1.1 Alternative Structural Systems.** Use of seismic force-resisting systems not contained in Table 12.2-1 shall be permitted contingent on submittal to and approval 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 .
- 3.1.2.3 The basis of the seismic evaluation performed as part of this TER 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.
- 3.1.3 Structural performance under lateral load conditions for use as an alternative to *SDPWS* Section 4.3 Wood-Frame Shear Walls
- 3.1.4 Resistance to transverse loads for wall assemblies used in light-frame wood construction in accordance with *IBC Section 1609.1.1* and *IRC Section R301.2.1*
- 3.1.5 Resistance to uplift loads for wall assemblies used for light-frame wood construction in accordance with *IBC Section 1609* and *IRC Section R301.2.1*

- 3.1.6 Performance for use as a water-resistive barrier (WRB) in accordance with the IBC Section 1403.2⁶ and IRC Section R703.2
- 3.1.7 Performance for use as an air barrier material in accordance with IRC Section N1102.4.1.1 and IECC Section R402.4.1.1 and Section C402.5.1
- 3.1.8 Performance for use as a draftstop in accordance with IBC Section 708.4.2⁷, Section 718.3, and Section 718.4 and IRC Section R302.12
- 3.1.9 Surface burn characteristic performance for use as a Class C interior finish material in accordance with IBC Section 803.1.2⁸ and IRC Section R302.9
- 3.2 Use of Thermo-Ply® Green Structural Sheathing in a portal frame with hold-down (PFH) is outside the scope of this evaluation. For this application, use Thermo-Ply® (Red or Blue) Structural Sheathing and see TER 1101-01.
- 3.3 Use of Thermo-Ply® Green Structural Sheathing in a CS-PF portal frame is outside the scope of this evaluation. For this application, use Thermo-Ply® (Red or Blue) Structural Sheathing and see TER 1004-01 or TER 1004-02.
- 3.4 Use of Thermo-Ply® Green Structural Sheathing in a fire resistance rated assembly is outside the scope of this evaluation. For this application, use Thermo-Ply® (Red or Blue) Structural Sheathing and see TER 1510-04.
- 3.5 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.6 Any engineering evaluation conducted for this TER was performed within DrJ's ANAB accredited ICS code scope and/or the defined professional engineering scope of work on the dates provided herein.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 The product evaluated in this TER is shown in Figure 1.



FIGURE 1. THERMO-PLY® GREEN STRUCTURAL SHEATHING

- 4.2 Thermo-Ply® Green Structural Sheathing is composed of pressure-laminated plies consisting of high strength cellulosic fibers. These fibers are specially treated to be water resistant and are bonded with a proprietary water-resistive adhesive. A protective polymer layer is applied on both sides of the panel, and foil facings may be additionally applied on one or both faces.
 - 4.2.1 Thermo-Ply® Green Structural Sheathing panels have a nominal thickness of 0.078" and nominal weight of 0.290 lbs. per square foot.
- 4.3 *Material Availability*
 - 4.3.1 Standard widths include 48" (1219 mm) and 48¾" (1238 mm).
 - 4.3.2 Standard lengths include 96" (2438 mm), 108" (2743 mm), and 120" (3048 mm).
 - 4.3.3 Other custom widths and lengths can be manufactured.

⁶ 2015 IBC Section 1404.2

⁷ 2015 IBC Section 708.4

⁸ 2015 IBC Section 803.1.1

5 APPLICATIONS

5.1 Thermo-Ply® Green Structural Sheathing panels are used in the following applications:

- 5.1.1 Wall sheathing in buildings constructed in accordance with the *IRC* and *IBC* for light-frame wood construction.
- 5.1.2 Structural wall sheathing to provide lateral load resistance (wind and seismic) for braced wall panels used in light-frame wood construction.
- 5.1.3 Wall sheathing in buildings constructed in accordance with the *IBC* requirements for Type V light-frame construction.
- 5.1.4 Structural wall sheathing to provide resistance to transverse loads for wall assemblies used in light-frame wood construction.
- 5.1.5 Structural wall sheathing to provide resistance to uplift loads for wall assemblies used in light-frame wood construction.
- 5.1.6 An approved alternative WRB when installed in accordance with Section 5.3 and Section 6.
- 5.1.7 An approved air barrier material when installed in accordance with Section 5.4 and Section 6.
- 5.1.8 An approved draftstop material when installed in accordance with Section 5.5 and Section 6.

5.2 *Structural Applications*

- 5.2.1 Except as otherwise described in this TER, Thermo-Ply® Green Structural Sheathing shall be installed in accordance with the applicable building codes listed in Section 2 using the provisions set forth therein for the design and installation of wood structural panels (WSP).
 - 5.2.1.1 Thermo-Ply® Green Structural Sheathing 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 is subject to the *SDPWS* boundary conditions except as specifically allowed in this TER.
- 5.2.2 Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall. Shearwall anchorage shall be in accordance with the applicable code referenced in Section 2.
- 5.2.3 The maximum aspect ratio for Thermo-Ply® Green Structural Sheathing shall be 4:1.
- 5.2.4 The minimum full height panel width shall be 24".
- 5.2.5 Installation is permitted for single top plate or double top plate applications.
- 5.2.6 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.
- 5.2.7 *Simplified IRC Bracing Provisions:*
 - 5.2.7.1 Thermo-Ply® Green Structural Sheathing is permitted to be used in accordance with the *IRC* simplified bracing method of *IRC* Section R602.12 and Table 1.



TABLE 1. THERMO-PLY® GREEN STRUCTURAL SHEATHING SIMPLIFIED BRACING TABLE^{1,2,3,4,5,6,7}

Structural Sheathing Product	Ultimate Design Wind Speed (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Bracing Units Required (long side)						Minimum 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
Thermo-Ply® Green Structural Sheathing	115	One Story or Top of Two or Three Story	10	1	2	2	3	3	4	1	2	2	3	3	4
		First of Two Story or Second of Three Story		2	3	4	5	6	7	2	3	4	5	6	7
		First of Three Story		2	4	5	7	8	10	2	4	5	7	8	10
		One Story or Top of Two or Three Story	15	1	2	3	4	4	5	1	2	3	4	4	5
		First of Two Story or Second of Three Story		2	3	4	6	7	8	2	3	4	6	7	8
		First of Three Story		3	4	6	8	9	11	3	4	6	8	9	11
	130	One Story or Top of Two or Three Story	10	1	2	3	3	4	5	1	2	3	3	4	5
		First of Two Story or Second of Three Story		2	4	5	6	7	9	2	4	5	6	7	9
		First of Three Story		3	5	7	9	11	13	3	5	7	9	11	13
		One Story or Top of Two or Three Story	15	2	3	3	4	5	7	2	3	3	4	5	7
		First of Two Story or Second of Three Story		2	4	6	7	8	10	2	4	6	7	8	10
		First of Three Story		3	5	7	10	12	14	3	5	7	10	12	14

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

1. 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 Thermo-Ply® shall replace the sheathing material.
2. Interpolation shall not be permitted.
3. 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.
4. Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using this table.
5. 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 24" o.c.
6. Thermo-Ply® attached with minimum 15/16" crown x 1 1/4" leg staples fastened 3" o.c. at panel edges and 3" o.c. in the field. Roofing nails (minimum 0.120" x 1 1/4" with a 3/8" head) are a permitted alternate fastener.
7. Minimum 1/2" gypsum wallboard shall be attached to the interior side of the wall in accordance with [IRC Section R702.3.5](#) and [Table R702.3.5](#).

5.2.8 Prescriptive IRC Bracing Applications:

- 5.2.8.1 Thermo-Ply® Green Structural Sheathing may be used on braced wall lines as an equivalent alternative to Method WSP (wood structural panel) and CS-WSP (continuously sheathed wood structural panel) of the *IRC* when installed in accordance with [IRC Section R602.10](#) and this TER.
- 5.2.8.2 Required braced wall panel lengths for Thermo-Ply® Green Structural Sheathing shall be as determined by the equivalency factor shown in Table 2 and [IRC Table R602.10.3\(1-4\)](#) including all footnotes.
 - 5.2.8.2.1 The braced wall line length equivalency factors in Table 2 are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the *IRC*.
 - 5.2.8.2.2 Thermo-Ply® Green Structural Sheathing tested equivalency factors in Table 2 allow the user to determine the length of bracing required, by multiplying the factor from Table 2 by the length shown in the WSP or CS-WSP columns in [IRC Table R602.10.3\(1 and 3\)](#), as modified by all applicable factors in [Table R602.10.3\(2 and 4\)](#), respectively.
- 5.2.8.3 All *IRC* prescriptive bracing minimums, spacing requirements, and rules must still be met.
- 5.2.8.4 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. *IRC* BRACED WALL PANEL EQUIVALENCY FOR THERMO-PLY® GREEN STRUCTURAL SHEATHING^{3,5}

Product	Maximum Stud Spacing (in)	Fastener ²	Maximum Fastener Spacing (edge:field)	Gypsum Wallboard Fastening Schedule ^{4,6} (blocked or unblocked) (edge:field)	Wind
					SPF Framing
					Equivalency Factors to <i>IRC</i> WSP or CS-WSP
Thermo-Ply® Green Structural Sheathing	16 o.c.	Minimum ¹⁵ / ₁₆ " Crown x ¹ / ₄ " Leg Staples ¹	3:3	16:16	1.15
				8:8	0.91
	24 o.c.			16:16	1.29
				8:8	1.00

- SI: 1 in = 25.4 mm
1. Staples shall be a minimum 16 gauge.
 2. Roofing nails (minimum 0.120" x 1 1/4" with a 3/8" head) are a permitted alternate fastener.
 3. Thermo-Ply® Green Structural Sheathing tested equivalency factors allow the user to determine the length of bracing required, by multiplying the factor by the length of bracing shown in the WSP or CS-WSP columns in *IRC* Table R602.10.3(1 and 3), as modified by all applicable factors in Table R602.10.3(2 and 4) respectively.
 4. Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths in *IRC* Table R602.10.3(1 and 3), as modified by all applicable factors in Table R602.10.3(2 and 4), shall be used, except the factor for omitting the gypsum wallboard shall be 1.8 for gypsum fastened 16:16, and 2.3 for gypsum fastened 8:8.
 5. Valid for single top plate (advanced framing method) wall installations or double top plate wall installations.
 6. Gypsum wallboard shall be installed according to the provisions listed in *IRC* Table R702.3.5.

5.2.9 *Prescriptive IBC Conventional Light-Frame Wood Construction:*

5.2.9.1 Thermo-Ply® Green Structural Sheathing may be used to brace exterior walls of buildings as an equivalent alternative to Method 3 of the *IBC* when installed with blocked or unblocked 1/2" gypsum fastened with a minimum 5d cooler nail or #6 type W or S screw spaced a maximum of 16" o.c. at panel edges and 16" o.c. in the field. Bracing shall be in accordance with the conventional light-frame construction method of *IBC* Section 2308.6 and this TER.

5.2.10 *Performance-Based Wood-Framed Construction:*

- 5.2.10.1 Thermo-Ply® Green Structural Sheathing 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 3, Table 4, and Table 5.
- 5.2.10.2 Thermo-Ply® Green Structural Sheathing shear walls are permitted to resist horizontal wind load forces using the allowable shear loads (in pounds per linear foot) set forth in Table 3.
- 5.2.10.3 Thermo-Ply® Green Structural Sheathing shear walls that require seismic design in accordance with *IBC* Section 1613 shall use the seismic allowable unit shear capacities set forth in Table 4.
 - 5.2.10.3.1 The response modification coefficient, R; system overstrength factor, Ω_0 ; and deflection amplification factor, C_d , indicated in Table 4 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.
- 5.2.10.4 Thermo-Ply® Green Structural Sheathing panels are permitted to resist uplift load forces using the allowable uplift loads (in pounds per linear foot) set forth in Table 5.
- 5.2.10.5 Thermo-Ply® Green Structural Sheathing panels are permitted to resist transverse wind load forces using the allowable transverse loads (in pounds per linear foot) set forth in Table 6.

TABLE 3. ALLOWABLE STRESS DESIGN (ASD) CAPACITY FOR THERMO-PLY® GREEN STRUCTURAL SHEATHING – WIND

Product ^{1,5}	Joint Condition ³	Maximum Stud Spacing (in)	Thermo-Ply® Fastener Spacing (edge:field)	Gypsum Wallboard (GWB)	Gypsum Wallboard Fastener ^{2,4} Spacing (edge:field)	Allowable Unit Shear Capacity (plf)
Thermo-Ply® Green Structural Sheathing	Lapped or Butted	16 o.c.	3:3	½" GWB	8:8	390
		24 o.c.			16:16	320
					8:8	360
		16 o.c.	6:12		16:16	290
		16 o.c.	3:3	No GWB	-	220
		24 o.c.	3:3		-	190

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

- Thermo-Ply® Green attached with a minimum 16 gauge, 15/16" crown staples shall penetrate a minimum of 1" into the stud. Fasteners are to be installed with the crown parallel to the framing. Fastener edge distance shall be a minimum of ¾". Fastener head shall be in contact with the Thermo-Ply® surface. Roofing nails (minimum 0.120" x 1¼" with a ¾" head) are a permitted alternate fastener.
- Gypsum shall be attached with minimum #6 type W or S screws 1¼" long or 5d cooler nails with a minimum edge distance of ¾".
- Where lapped joints are used, the panels shall be overlapped nominally ¾".
- Straight line interpolations between fastening patterns is acceptable.
- Thermo-Ply® Green may be installed on either the interior or exterior side of the wall.

TABLE 4. SEISMIC PERFORMANCE OF THERMO-PLY® GREEN STRUCTURAL SHEATHING³

Seismic Force-Resisting System ^{1,8,9}	Gypsum ² Wallboard	Seismic Allowable Unit Shear Capacity (plf)	Apparent Shear Stiffness, G _a (kips/in)	Response Modification Factor, R ⁴	System Overstrength Factor, Ω ₀ ⁵	Deflection Amplification Coefficient, C _d ⁶	Structural System Limitations and Building Height Limit ⁷ (ft)				
							Seismic Design Category				
							B	C	D	E	F
Light-Frame (Wood) Walls Sheathed with Thermo-Ply® Green	½" GWB	230	11	6.5	3	4	NL	NL	65	65	65

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m, 1 psi = 0.00689 MPa

- Thermo-Ply® Green sheathing attached to maximum 24" o.c. framing with a minimum 16 gauge, 15/16" crown staples shall penetrate a minimum of 1" into the stud. Fasteners are to be installed with the crown parallel to the framing and spaced a maximum of 3" o.c. at the panel edges and 3" o.c. in the field. Fastener edge distance shall be a minimum of ¾". Fastener head shall be in contact with the Thermo-Ply® surface. Roofing nails (minimum 0.120" x 1¼" with a 3/8" head) are a permitted alternate fastener.
- Gypsum shall be attached with minimum #6 type W or S screws 1¼" long with a minimum edge distance of ¾".
- All seismic design parameters follow the equivalency as defined in Section 3 of this TER.
- Response modification coefficient, R, for use throughout ASCE 7. Note: R reduces forces to a strength level, not an allowable stress level.
- The tabulated value of the overstrength factor, Ω₀, is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.
- Deflection amplification factor, C_d, for use with ASCE 7 Sections 12.8.6, 12.8.7, and 12.9.2.
- NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2.
- Thermo-Ply® Green sheathing must be installed with lapped joints for seismic applications.
- Thermo-Ply® Green may be installed on either the interior or exterior side of the wall.

TABLE 5. UPLIFT PERFORMANCE OF THERMO-PLY® GREEN STRUCTURAL SHEATHING

Product	Allowable Unit Uplift Capacity (plf)	Maximum Stud Spacing (in)	Fastener Spacing
Thermo-Ply® Green: Single Bottom Plate	220	16 o.c.	Minimum 15/16" crown, 1¼" leg 16 gage galvanized staples ¹ OR 0.120" x 1¼" roofing nails, 3" o.c. to perimeter/field.

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m
1. Staples crowns to be installed parallel to framing.

TABLE 6. LOAD CAPACITY (PSF) FOR THERMO-PLY® GREEN STRUCTURAL SHEATHING RESISTING TRANSVERSE WIND LOADS^{1,2,4}

Product	Maximum Stud Spacing (in)	Allowable Design Value (psf)	Fastener Schedule	Basic Wind Speed V _{asd} per ASCE 7-05 (mph)	Basic Wind Speed V _{ult} per ASCE 7-10 and 7-16 (mph)
Thermo-Ply® Green (0.078")	16 o.c.	75	Minimum 15/16" crown, 1¼" leg 16 gage galvanized staples ³ OR 0.120" x 1¼" roofing nails, 6" o.c. to perimeter/field.	155	200

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m², 1 mph = 1.61 km/h
1. Design wind load capacity shall be in accordance with IBC Section 1609.1.1.
2. Capacities assume minimum ½" gypsum wallboard installed on the interior side of the wall. Where gypsum wallboard is not installed on the interior side of the wall, a 40% reduction in wind pressure resistance shall be applied (V_{asd} windspeed less than 90 mph, V_{ult} less than 120 mph).
3. Staple crowns shall be installed parallel to framing.
4. Allowable wind speeds are based on the following: Components and Cladding wind loads, Mean roof height 30', Exposure B, Zone 5, 10 sq. ft. effective wind area. See the applicable building code for any adjustment needed for specific building location and configuration.

5.3 Water-Resistive Barrier (WRB)

- 5.3.1 Thermo-Ply® Green Structural Sheathing may be used as a WRB as prescribed in IBC Section 1403.2⁹ and IRC Section R703.2 when installed on exterior walls as described in this section.
- 5.3.2 Thermo-Ply® Green Structural Sheathing 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 6.
- 5.3.3 All seams and joints between boards shall be butt jointed and sealed with an approved construction tape or overlapped in accordance with Section 6. Use approved construction tape, such as 27/8" OX SeamTape®.
- 5.3.4 A separate WRB system may also be provided. If a separate WRB system is used, overlapping or taping of the sheathing joints is not required.
- 5.3.5 Flashing must be installed at all sheathing penetrations and shall comply with the all applicable code sections. Approved flashing tapes include Arctic Flash Synthetic Flashing, Flexible Butyl Flashing, and Home Guard RA-Plus Flashing.

5.4 Air Barrier

- 5.4.1 Thermo-Ply® Green Structural Sheathing may be used as an air barrier material as prescribed in IRC Section N1102.4.1.1 and IECC Section R402.4.1.1 and Section C402.5.1 in accordance with ASTM E2178.

⁹ 2015 IBC Section 1404.2

5.5 *Draftstop*

- 5.5.1 Thermo-Ply® Green Structural Sheathing may be used as a draftstop material in accordance with IBC Section 708.4.2, Section 718.3, and Section 718.4 and IRC Section R302.12.
- 5.5.2 When installed as of a draftstop, Thermo-Ply® Green Structural Sheathing shall be installed in accordance with Section 6.

5.6 *Surface Burn Characteristics*

- 5.6.1 Thermo-Ply® Green Structural Sheathing panels have the flame spread characteristics shown in Table 7.

TABLE 7. FLAME SPREAD AND SMOKE DEVELOPED RATING¹

Product	Flame Spread	Smoke Developed
Thermo-Ply® Green Structural Sheathing	< 200	< 450
1. Tested in accordance with ASTM E84 and UL 723.		

5.7 *Non-Structural Applications*

- 5.7.1 Where other means of wall bracing are provided, or are not required, any grade of Thermo-Ply® Structural Sheathing may be used to provide other wall functions when installed in accordance with this section.
 - 5.7.1.1 The sheathing panels are applied to wall framing with minimum 0.120" x 1¼" galvanized roofing nails or No.16 gage galvanized staples having a 15/16" crown and 1¼" leg lengths.
 - 5.7.1.2 Fastener spacing shall be a maximum of 6" at the edges and 12" on intermediate members.
 - 5.7.1.3 Stud spacing shall be a maximum of 24" o.c.
 - 5.7.1.4 Minimum fastener penetration into the framing members is 1".
 - 5.7.1.5 Fasten all staples parallel to the framing member with an edge spacing of ⅜" (9.5 mm) minimum.
 - 5.7.1.6 All panels are vertically or horizontally installed with all joints backed by studs, plates, or blocks when water or air barrier functionality is desired.
- 5.7.2 Incidental tears or penetrations of Thermo-Ply® Green Structural Sheathing must be repaired with an approved construction tape. See Section 5.3.3.
- 5.7.3 All joints must be installed in one of the following methods:
 - 5.7.3.1 Joints overlap nominally ¾" (19.1 mm).
 - 5.7.3.2 Butted joints are sealed with approved construction tape. See Section 5.3.3.

6 INSTALLATION

- 6.1 Installation shall comply with the manufacturer’s installation instructions and this TER. In the event of a conflict between the manufacturer’s installation instructions and this TER, the more restrictive shall govern.
- 6.2 *General for Structural and WRB Applications*
 - 6.2.1 Thermo-Ply® Green Structural Sheathing shall be installed in accordance with the manufacturer’s published installation instructions and this TER. Basic instructions are printed on every Thermo-Ply® panel as well.
 - 6.2.2 If there are any conflicts between the manufacturer’s instructions and this TER, the more restrictive shall apply.
 - 6.2.3 Where the Thermo-Ply® Structural Sheathing extends beyond the bottom of a wall and overlaps the band joist below, fasten the bottom edge of the Thermo-Ply® to the wall bottom plate where it meets the band joist. Due to possible shrinkage of the band joist, do not fasten the sheathing to the band joist. Instead, fasten tightly with one fastener every 12" to smooth out if necessary.
 - 6.2.4 Where hold-down straps are used, install Thermo-Ply® Green Structural Sheathing first, then install the strap over the face of the structural sheathing and attach per the manufacturer’s installation instructions.

6.3 Orientation

6.3.1 Thermo-Ply® Green Structural Sheathing may be installed in either the vertical or horizontal orientation. To be recognized for the structural values listed in this report, or as a water or air barrier, all joints must be backed by studs, plates, or blocks and fastened.

6.4 Fastener Type

6.4.1 Thermo-Ply® Green Structural Sheathing:

- 6.4.1.1 Minimum 0.120" x 1¼" galvanized roofing nail.
- 6.4.1.2 Minimum 15/16" crown by 1¼" leg, 16 ga. staples shall be installed per the staple manufacturer's instructions.
- 6.4.1.3 Fasteners shall be driven such that the head of the fastener is in contact with the surface of the Thermo-Ply® Structural Sheathing. Do not overdrive fasteners.

TABLE 8. FASTENER SPACING OF THERMO-PLY® GREEN STRUCTURAL SHEATHING

Thermo-Ply® Green Structural Sheathing Application	Maximum Panel Edge Fastener Spacing (in)	Maximum Panel Intermediate Fastener Spacing (in)
Lateral Shear	3	3
Transverse Loads		
Uplift Loads		
Water-Resistive Barrier	6	12
Air Barrier		
Draftstop		
SI: 1 in = 25.4 mm		

6.5 Fastener Edge Distance

6.5.1 Fasteners shall be installed with a minimum edge distance of ⅜" (9.5 mm) for Thermo-Ply® Green Structural Sheathing and gypsum.

6.6 Treatment of Joints

6.6.1 Thermo-Ply® Green Structural Sheathing joints may be either butted or overlapped.

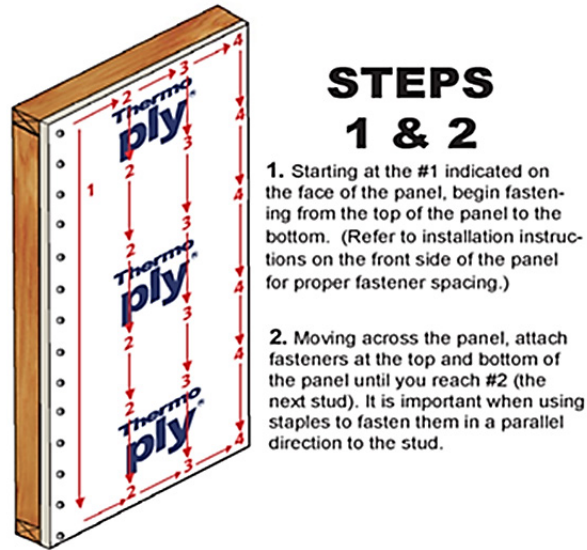
- 6.6.1.1 Lapped joints shall be overlapped by nominally ¾" (19 mm) and fastened with a single row of fasteners. Always run staples parallel with framing.
- 6.6.1.2 Butt joints shall be placed over framing members and fastened with a single row of fasteners at each panel edge.

6.7 Window Jamb Adjustments

6.7.1 If windows are made to accommodate traditional ½" sheathing materials, order windows with adjustable nailing fins from the supplier. Door brick moldings may be planed or routed ⅜" in order to accommodate the different sheathing thickness, either at the jobsite or by the millwork supplier.

6.7.2 Thermo-Ply® Green Structural Sheathing must 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's installation instructions.

6.7.3 The structural installation procedure shall be in accordance with Figure 2.



STEPS 1 & 2

1. Starting at the #1 indicated on the face of the panel, begin fastening from the top of the panel to the bottom. (Refer to installation instructions on the front side of the panel for proper fastener spacing.)

2. Moving across the panel, attach fasteners at the top and bottom of the panel until you reach #2 (the next stud). It is important when using staples to fasten them in a parallel direction to the stud.

FIGURE 2. INSTALLATION INSTRUCTIONS – WRB INSTALLATION PROCEDURE

6.7.4 Overlapped Joint – Install the first panel per Figure 2.

6.7.4.1 Overlap the next panel $\frac{3}{4}$ " over the first panel and fasten the joint with a common line of fasteners.

6.7.4.2 For Thermo-Ply® Green AMG, ensure the panel is properly positioned on the wall prior to removal of the adhesive release liners on vertical edges. Fasten the overlapped joint with a common line of fasteners.

6.7.5 Butted Joint with Flashing – Install panels per Figure 2 with joints butted (no overlap).

6.7.6 Seal butted seams with approved construction tape (see Section 5.3.3), when finished with attaching the wall panels and all fasteners in the wall line

7 SUBSTANTIATING DATA

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

7.1.1 Transverse load testing in accordance with *ASTM E330*

7.1.2 Uplift load testing in accordance with *ASTM E72*

7.1.3 Water-resistive barrier material testing in accordance with *ASTM E331*

7.1.4 Air barrier material testing in accordance with *ASTM E2178*

7.1.5 Lateral load testing for use as an alternative material in accordance with *ASTM E2126* and analysis per *ASTM D7989*

7.1.6 Surface burn characteristics testing in accordance with *ASTM E84*

7.2 Information contained herein is the result of testing and/or data analysis by sources which conform to *IBC Section 1703* and/or *professional engineering regulations*. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through state or local adoption of codes and standards. The providers of the codes and standards are legally responsible for their content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a product as *being equivalent* to that prescribed in this code in quality, *strength*, effectiveness, *fire resistance*, durability, and safety. Where the accuracy of the provisions provided herein is reliant upon the published properties of materials, DrJ relies upon the grade mark, grade stamp, mill certificate, and/or test data provided by material suppliers to be minimum properties. DrJ analysis relies upon these properties to be accurate.

8 FINDINGS

- 8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:
- 8.1.1 Lateral load resistance due to wind and seismic loads carried by shear walls
 - 8.1.2 Transverse load resistance due to components and cladding pressures on building surfaces
 - 8.1.3 Uplift load resistance due to wind uplift loads carried by the walls
 - 8.1.4 Performance for use as a WRB in accordance with IBC Section 1403.2¹⁰ and IRC Section R703.2
 - 8.1.5 Performance for use as an air barrier in accordance with IRC Section N1102.4.1.1 and IECC Section R402.4.1.1
 - 8.1.6 Performance for use as a draftstop in accordance with IBC Section 708.4.2, Section 718.3, and Section 718.4 and IRC Section R302.12.
 - 8.1.7 Performance for use as a Class C interior finish material in accordance with IBC Section 803.1.2¹¹ and IRC Section R302.9
- 8.2 Building codes require data from valid research reports be obtained from approved sources (i.e., licensed registered design professionals [RDPs]).
- 8.2.1 Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.
- 8.3 Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the building official. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131 and employs RDPs.
- 8.4 Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – “certified once, accepted everywhere.”
- 8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10¹² are similar) 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*.

9 CONDITIONS OF USE

- 9.1 This report and the installation instructions shall be available to the jurisdiction in which the project is to be constructed.
- 9.2 Thermo-Ply® Green Structural Sheathing shall not be used as a nailing base for claddings, trim, windows, and doors. Fastening through the Thermo-Ply® Green Structural Sheathing into the framing is acceptable.
- 9.3 Walls sheathed with Thermo-Ply® Green Structural Sheathing shall not be used to resist horizontal loads from concrete and masonry walls.
- 9.4 When Thermo-Ply® Green Structural Sheathing is installed as a wall sheathing but is not installed per structural requirements, light-framed walls shall be braced by other means. When used as a WRB, installation shall be in accordance with Section 5.3.
- 9.4.1 When Thermo-Ply® Structural Sheathing is not installed as a WRB, other means of providing a WRB shall be required, as per the code.

¹⁰ 2015 IBC Section 1404.2

¹¹ 2015 IBC Section 803.1.1

¹² 2018 IFC Section 104.9

- 9.5 When used in accordance with the *IBC* in high wind areas, special inspections shall comply with IBC Section 1705.12¹³.
- 9.6 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.
 - 9.6.1 Allowable shear loads shall not exceed values in Table 3 for wind loads and Table 4 for seismic loads.
 - 9.6.2 Allowable uplift loads shall not exceed values in Table 5.
 - 9.6.3 Transverse design loads shall not exceed those described in Table 6 unless an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing.
- 9.7 Where required by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.8 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.9 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (e.g., owner or RDP).
- 9.10 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.11 This product has an internal quality control program and a third-party quality assurance program in accordance with IBC Section 104.4 and Section 110.4 and IRC Section R104.4 and Section R109.2.
- 9.12 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.
- 9.13 This TER shall be reviewed for code compliance by the AHJ in concert with IBC Section 104.
- 9.14 The implementation of this TER for this product is dependent on the design, quality control, third-party quality assurance, proper implementation of installation instructions, inspections required by IBC Section 110.3, and any other code or regulatory requirements that may apply.

10 IDENTIFICATION

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

11 REVIEW SCHEDULE

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

¹³ 2018 *IBC* Section 1705.11

FBC Supplement to TER 1004-03

REPORT HOLDER: Ox Engineered Products, LLC

1 EVALUATION SUBJECT

- 1.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing

2 PURPOSE AND SCOPE

2.1 Purpose

- 2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, recognized in TER 1004-03, has 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—17, 20: Florida Building Code – Building (FL 16391)*
- 2.2.2 *FBC-R—17, 20: Florida Building Code – Residential (FL 16391)*

3 CONCLUSIONS

- 3.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, described in TER 1004-03, 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 TER, they are listed here.
 - 3.2.1 *FBC-B* Section 104.4 and Section 110.4 are reserved.
 - 3.2.2 *FBC-R* Section R104, Section R109, Section R602.10, Section R602.10.3, Table R602.10.3(1), Table R602.10.3(2), Table R602.10.3(3), Table R602.10.3(4), Section R602.12, and Table R602.12.4 are reserved.
 - 3.2.3 *FBC-R* Section N1101 replaces *IRC* Section N1102.4.1.1.
 - 3.2.4 *FBC-B* Section 708.4 replaces *IBC* Section 708.4.2.
 - 3.2.5 *FBC-B* Section 2308 replaces *IBC* Section 2308.6 and is reserved.
 - 3.2.6 *FBC-B* Section 1404.2 replaces *IBC* Section 1403.2.
 - 3.2.7 *FBC-B* Section 1705 replaces *IBC* Section 1705.11 and is reserved.

4 CONDITIONS OF USE

- 4.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, described in TER 1004-03, must comply with all of the following conditions:
 - 4.1.1 All applicable sections in TER 1004-03
 - 4.1.2 The design, installation, and inspections are in accordance with additional requirements of *FBC-B* Chapter 16 and Chapter 17, as applicable.



Issue Date: December 22, 2020
Subject to Renewal: April 1, 2023

CBC and CRC Supplement to TER 1004-03

REPORT HOLDER: Ox Engineered Products, LLC

1 EVALUATION SUBJECT

- 1.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing

2 PURPOSE AND SCOPE

2.1 Purpose

- 2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, recognized in TER 1004-03, has also been evaluated for compliance with the codes listed below.

2.2 Applicable Code Editions

- 2.2.1 *CBC—16, 19: California Building Code (Title 24, Part 2)*
- 2.2.2 *CRC—16, 19: California Residential Code (Title 24, Part 2.5)*

3 CONCLUSIONS

- 3.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, described in Sections 2.0 through 11.0 of TER 1004-03, complies with *CBC* and *CRC* and is subject to the conditions of use described in this supplement.

4 CONDITIONS OF USE

- 4.1 Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing, described in TER 1004-03, must comply with all of the following conditions:
 - 4.1.1 All applicable sections in TER 1004-03
 - 4.1.2 The design, installation, conditions of use, and identification of Thermo-Ply® Green and Thermo-Ply® Green AMG Structural Sheathing are in accordance with the 2018 *International Building Code (IBC)* provisions noted in TER 1004-03.
 - 4.1.3 The design, installation, and inspections are in accordance with additional requirements of *CBC* and *CRC*, as applicable.