Technical Evaluation Report
TER 1004-01
Thermo-Ply® Red & Thermo-Ply® Red AMG Structural Sheathing

Ox Engineered Products, LLC

Product:
Thermo-Ply® Red
and
Thermo-Ply® Red AMG Structural Sheathing

Issue Date:
November 8, 2013
Revision Date:
August 20, 2019
Subject to Renewal:
April 1, 2020
1. Products Evaluated:
   1.1. Thermo-Ply® Red Structural Sheathing
   1.2. Thermo-Ply® Red AMG Structural Sheathing
   1.3. For the most recent version of this Technical Evaluation Report (TER), visit drjcertification.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjcertification.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
   1.4. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found here) and covered by an IAF MLA Evaluation per the Purpose of the MLA (as an example, see letter to ANSI from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other IAF MLA Signatory Countries and have their products readily approved by authorities having jurisdiction using DrJ’s ANSI accreditation.
   1.5. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in IBC Section 1703. Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI’s scope of accreditation. For a list of accredited agencies, visit ANSI’s website. For more information, see drjcertification.org.
   1.6. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
   1.7. DrJ’s code compliance work:

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1 Throughout this TER, wherever Thermo-Ply® Red is cited, the provisions are applicable to Thermo-Ply® Red AMG as well.
1.7.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.

1.7.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer’s seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:
   2.1. 2012, 2015 and 2018 International Residential Code (IRC)
   2.4. 2014 and 2017 Florida Building Code – Building (FBC) (FL 16391)
   2.5. 2016 California Building Standards Code
   2.6. ANSI/AWC SDPWS – Special Design Provisions for Wind and Seismic
   2.7. ASCE 7 – Minimum Design Loads for Buildings and Other Structures
   2.9. ASTM E72 – Standard Test Methods for Conducting Strength Tests of Panels for Building Construction
   2.10. ASTM E564 – Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings
   2.11. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
   2.15. UL 723 – Test for Surface Burning Characteristics of Building Materials

3. Performance Evaluation:
   3.1. Thermo-Ply® Red 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 and CS-PF.
      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 2306.3 for light-frame wood wall assemblies.
         3.1.2.1. Table 5 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 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

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2 Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product also complies with the 2000-2015 versions of the IBC and IRC and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see Section 8.
3.1.2.3. The SDC evaluation uses the approach found in documentation entitled “Equivalency Characteristics and Parameters for Proprietary Shearwalls Used in Wood Framed or Cold-formed Steel Construction”\(^3\) using code defined accepted engineering procedures, experience and good technical judgment.

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 IRC Section R301.2.1 and IBC Section 1609.1.1.

3.1.5. Resistance to uplift loads for wall assemblies used for light-frame wood construction in accordance with IRC Section R301.2.1 and IBC Section 1609.

3.1.6. Performance for use as a water-resistant barrier (WRB) in accordance with IRC Section R703.2 and IBC Section 1403.24.

3.1.7. Performance for use as an air barrier in accordance with IRC Section N1102.4.1.1, and IECC Section R402.4.1.1 and C402.5.1.15.

3.1.8. Performance for use as a draftstop in accordance with IRC Section R302.12, and IBC Section 708.4.26, 718.3 and 718.4.

3.2. Use of Thermo-Ply\(^\circ\) Red Structural Sheathing in a portal frame with hold-down (PFH) is outside the scope of this evaluation.

3.2.1. For this application, see TER No.1101-01: OX-IS\(^\circ\), SI-Strong, ISO RED ci and Thermo-Ply\(^\circ\) “Portal Frame with Hold-Down” (12” to 24” CI PFH).

3.3. Use of Thermo-Ply\(^\circ\) Red Structural Sheathing in a fire resistance rated assembly is outside the scope of this evaluation.

3.3.1. For this application, see TER No. 1510-04: Ox Thermo-Ply\(^\circ\), OX-IS\(^\circ\), SI-Strong, ISO RED ci and ISO RED MAX FPIS – One & Two Hour Fire Rated Wall Assemblies.

3.4. Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
4. **Product Description and Materials:**

4.1. Thermo-Ply® Red 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.

4.1.1. Thermo-Ply® Red Structural Sheathing panels have a nominal thickness of 0.113" and nominal weight of 0.414 lbs. per square foot.

4.2. **Material Availability**

4.2.1. Standard widths include 48" (1219 mm) and 48½" (1238 mm).

4.2.2. Standard lengths include 96" (2438 mm), 108" (2743 mm) and 120" (3048 mm).

4.2.3. Other custom widths and lengths can be manufactured.

5. **Applications:**

5.1. **General**

5.1.1. Thermo-Ply® Red Structural Sheathing panels are used in the following applications as:

5.1.1.1. Wall sheathing in buildings constructed in accordance with the IRC and IBC for light-frame wood construction.

5.1.1.2. Structural wall sheathing to provide lateral load resistance (wind and seismic) for braced wall panels used in light-frame wood construction.

5.1.1.3. Wall sheathing in buildings constructed in accordance with the IBC requirements for Type V light-frame construction.

5.1.1.4. Structural wall sheathing to provide resistance to transverse loads for wall assemblies used in light-frame wood construction.

5.1.1.5. Structural wall sheathing to provide resistance to uplift loads for wall assemblies used in light-frame wood construction.

5.1.1.6. An approved alternative WRB when installed in accordance with Section 5.3 and Section 6.

5.1.1.7. An approved air barrier material when installed in accordance with Section 5.4 and Section 6.

5.1.1.8. An approved draftstop material when installed in accordance with Section 5.5 and Section 6.
5.2. Structural Applications

5.2.1. General Structural Provisions

5.2.1.1. Except as otherwise described in this Technical Evaluation Report (TER), Thermo-Ply® Red 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).

5.2.1.1.1. Thermo-Ply® Red 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 subject to the SDPWS boundary conditions, except as specifically allowed in this TER.

5.2.1.2. Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall. Shear wall anchorage shall be in accordance with the applicable code referenced in Section 2.

5.2.1.3. Except as provided for in Section 5.2.3, the maximum aspect ratio for Thermo-Ply® Red Structural Sheathing shall be 4:1.

5.2.1.4. The minimum full height panel width shall be 24", except as allowed by Section 3.2.1 or Section 5.2.3.

5.2.1.5. Installation is permitted for single top plate or double top plate applications.

5.2.1.6. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.2.2. Simplified IRC Bracing Provisions

Table 1: Thermo-Ply® Red Structural Sheathing Simplified Bracing Table

<table>
<thead>
<tr>
<th>Structural Sheathing Product</th>
<th>Ultimate Design Wind Speed (mph)</th>
<th>Story Level</th>
<th>Eave to Ridge Height (ft)</th>
<th>Minimum Bracing Units Required (long side)</th>
<th>Minimum Bracing Units Required (short side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermo-Ply® Red Structural Sheathing</td>
<td>115</td>
<td>One Story or Top of Two or Three Story</td>
<td>10</td>
<td>1 2 2 2 3 3</td>
<td>1 2 2 2 3 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Two Story or Second of Three Story</td>
<td></td>
<td>2 3 3 4 5 6</td>
<td>2 3 3 4 5 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Three Story</td>
<td></td>
<td>2 3 4 6 7 8</td>
<td>2 3 4 6 7 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One Story or Top of Two or Three Story</td>
<td>15</td>
<td>1 2 3 3 4 4</td>
<td>1 2 3 3 4 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Two Story or Second of Three Story</td>
<td></td>
<td>2 3 4 5 6 7</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Three Story</td>
<td></td>
<td>2 4 5 6 7 9</td>
<td>2 4 5 6 7 9</td>
</tr>
<tr>
<td></td>
<td>130</td>
<td>One Story or Top of Two or Three Story</td>
<td>10</td>
<td>1 2 2 3 3 4</td>
<td>1 2 2 3 3 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Two Story or Second of Three Story</td>
<td></td>
<td>2 3 4 5 6 7</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Three Story</td>
<td></td>
<td>2 4 5 6 7 9</td>
<td>2 4 5 6 7 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One Story or Top of Two or Three Story</td>
<td>15</td>
<td>2 3 3 4 4 6</td>
<td>2 3 3 4 4 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Two Story or Second of Three Story</td>
<td></td>
<td>2 3 4 6 7 8</td>
<td>2 3 4 6 7 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First of Three Story</td>
<td></td>
<td>3 4 6 8 11</td>
<td>3 4 6 8 11</td>
</tr>
</tbody>
</table>

1. This simplified bracing table is based on the provisions of IRC Section 602.12. 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. Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using this table.
6. Maximum stud spacing is 24" o.c.
7. Thermo-Ply® attached with minimum 1/8" 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" with a 3/8" head) are permitted alternate fastener.
8. Minimum 1/2" gypsum wallboard attached to the interior side of the wall in accordance with IRC Section R702.3.5 and Table R702.3.5.
5.2.2.1. Thermo-Ply® Red Structural Sheathing is permitted to be used in accordance with the IRC simplified bracing method of IRC Section R602.12 and Table 1.

5.2.3. Prescriptive IRC Bracing Applications

5.2.3.1. Thermo-Ply® Red Structural Sheathing may be used on braced wall lines as an equivalent alternative to Method WSP and CS-WSP of the IRC, when installed in accordance with IRC Section R602.10 and this TER.

5.2.3.2. Required braced wall panel lengths for Thermo-Ply® Red Structural Sheathing shall be as determined by the equivalency factor shown in Table 2 and IRC Table R602.10.3(1-4)\(^7\) including all footnotes.

5.2.3.2.1. 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.

5.2.3.2.2. Thermo-Ply® Red 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 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.

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

5.2.3.4. 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: Thermo-Ply® Red Structural Sheathing Braced Wall Line Length Equivalency Factors Based on Equivalency Testing for Use with the IRC

<table>
<thead>
<tr>
<th>Thermo-Ply® Red Structural Sheathing Wall Bracing Factors</th>
<th>Maximum Stud Spacing (in)</th>
<th>Fastener</th>
<th>Thermo-Ply® Fastener Spacing (edge/field)</th>
<th>Gypsum Wallboard Fastening Schedule</th>
<th>Wind SPF Framing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermo-Ply® Red Structural Sheathing</td>
<td>16 o.c.</td>
<td>Minimum 15(\frac{1}{16})” Crown x 1(\frac{3}{4})” Leg Staples</td>
<td>3:3</td>
<td>16:16</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8:8</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>24 o.c.</td>
<td></td>
<td></td>
<td>16:16</td>
<td>1.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8:8</td>
<td>0.83</td>
</tr>
</tbody>
</table>

1. Staples shall be a minimum 16 gauge.
2. Roofing nails (minimum 0.120” x 1\(\frac{3}{4}\)” with a \(\frac{3}{8}\)” head) are a permitted alternate fastener.
3. Thermo-Ply® Red 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 columns in IRC Table R602.10.3(1 and 3), as modified by all applicable factors in Table R602.10.3(2 and 4).
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 1.5 for gypsum fastened 16:16, and 1.8 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 provision listed in IRC Table R702.3.5.

5.2.4. Thermo-Ply® Red Structural Sheathing CS-PF Portal Frame

5.2.4.1. A “Thermo-Ply® Red Structural Sheathing CS-PF” was tested and evaluated for equivalency to the IRC Method CS-PF (Continuous Sheathed Portal Frame) in accordance with IRC Section R602.10.6.4 and Table R602.10.5.

5.2.4.2. Table R602.10.5 establishes the contributing length of bracing of the CS-PF as equivalent to its actual length and that it contributes this length of bracing to that required by method CS-WSP.

5.2.4.3. The capacity of the Thermo-Ply® Red Structural Sheathing CS-PF exceeds the capacity of the IRC Method CS-WSP and is, therefore, permitted to be substituted for an equivalent length of bracing.

\(^7\) 2009 IRC Table R602.10.1.2(1) and R602.10.1.2(2)
5.2.4.4. The Thermo-Ply® Red Structural Sheathing CS-PF is described as follows:

Figure 2: Thermo-Ply® Red Structural Sheathing CS-PF Back Elevation

Figure 3: Thermo-Ply® Red Structural Sheathing CS-PF Front Elevation 1
5.2.5. **Prescriptive IBC Conventional Light-Frame Wood Construction**

5.2.5.1. Thermo-Ply® Red 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 ½” 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.

5.2.6. **Performance-Based Wood-Framed Construction**

5.2.6.1. Thermo-Ply® Red 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*.

5.2.6.2. Thermo-Ply® Red 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*.

5.2.6.3. Thermo-Ply® Red 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*.

5.2.6.3.1. The response modification coefficient, R; system overstrength factor, Ω₀; and deflection amplification factor, Cₜ, 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*.

5.2.6.4. Thermo-Ply® Red 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*.

5.2.6.5. Thermo-Ply® Red 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 Strength Design (ASD) Capacity for Thermo-Ply® Red Structural Sheathing – Wind

<table>
<thead>
<tr>
<th>Joint Condition</th>
<th>Maximum Stud Spacing (in)</th>
<th>Gypsum Wallboard (GWB)</th>
<th>Gypsum Wallboard Fastener Spacing (edge/field)</th>
<th>Allowable Unit Shear Capacity (plf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lapped or Butted</td>
<td>16 o.c.</td>
<td>1/4&quot;</td>
<td>4/16</td>
<td>530</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8/8</td>
<td>445</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8/16</td>
<td>425</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16/16</td>
<td>370</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8/8</td>
<td>435</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16/16</td>
<td>365</td>
</tr>
<tr>
<td>Lapped</td>
<td>16 o.c.</td>
<td>No GWB</td>
<td>-</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>24 o.c.</td>
<td></td>
<td></td>
<td>295</td>
</tr>
<tr>
<td>Butted</td>
<td>16 o.c.</td>
<td>No GWB</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>24 o.c.</td>
<td></td>
<td></td>
<td>275</td>
</tr>
</tbody>
</table>

1. Thermo-Ply® Red attached with a minimum 16 gauge, 15/16" crown staples. 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 5/8". 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.

2. All seismic design parameters follow the equivalency as defined in Section 3 of this TER.

3. The allowable unit shear capacity is calculated using a factor of safety of 2.5 per ASCE 7.

4. Response modification coefficient, : "R" reduces forces to a strength level, not an allowable stress level.

5. Deflection amplification coefficient, : "Cd" permits deformation to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.

6. Thermo-Ply® Red may be installed on either the interior or exterior side of the wall.

### Table 4: Seismic Allowable Unit Shear Capacity & Seismic Design Coefficients for Thermo-Ply® Red Structural Sheathing

<table>
<thead>
<tr>
<th>Seismic Force-Resisting System</th>
<th>Joint Condition</th>
<th>Gypsum Wallboard</th>
<th>Maximum Stud Spacing (in)</th>
<th>Seismic Allowable Unit Shear Capacity (plf)</th>
<th>Apparent Shear Stiffness, G_a (kips/in)</th>
<th>Response Modification Factor, R</th>
<th>System Over-strength Factor, Ω_0</th>
<th>Deflection Amplification Coefficient, Cd</th>
<th>Structural System Limitations &amp; Building Height (ft) Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light-Frame (Wood) Walls Sheathed with Thermo-Ply® Red</td>
<td>Lapped or Butted</td>
<td>1/2&quot; Gypsum-Fasteners Spaced 8/8</td>
<td>16 o.c.</td>
<td>355</td>
<td>11.5</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>NL</td>
</tr>
<tr>
<td>Light-Frame (Wood) Walls Sheathed with Thermo-Ply® Red</td>
<td>Lapped or Butted</td>
<td>No GWB</td>
<td>16&quot; o.c.</td>
<td>240</td>
<td>6.7</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>NL</td>
</tr>
<tr>
<td>Light-Frame (Wood) Walls Sheathed with Thermo-Ply® Red</td>
<td>Lapped</td>
<td>1/2&quot; Gypsum-Fasteners Spaced 16/16</td>
<td>24 o.c.</td>
<td>290</td>
<td>11</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>NL</td>
</tr>
</tbody>
</table>

1. Thermo-Ply® Red sheathing attached with a minimum 16 gauge, 15/16" crown staples. 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 5/8". 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.

2. Gypsum attached with minimum #6 type W or S screws 1¼" long or 5d cooler nails with a minimum edge distance of 5/8".

3. Where lapped joints are used, the panels shall be overlapped nominally 3/4".

4. Straight line interpolations between fastening patterns are acceptable.

5. Thermo-Ply® Red may be installed on either the interior or exterior side of the wall.
Table 5: Uplift Performance of Thermo-Ply® Red Structural Sheathing

<table>
<thead>
<tr>
<th>Type of Thermo-Ply® Structural Sheathing</th>
<th>Allowable Unit Uplift Capacity (plf)</th>
<th>Maximum Stud Spacing (in)</th>
<th>Fastener Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermo-Ply® Red: Single Bottom Plate</td>
<td>220</td>
<td>16 o.c.</td>
<td>Minimum 15/16” crown, 1 1/4” leg 16 gage galvanized staples¹ OR 0.120” x 1 1/2” roofing nails, 3” o.c. to perimeter/field.</td>
</tr>
</tbody>
</table>

Staple crowns to be installed parallel to framing.

Table 6: Load Capacities (psf) for Thermo-Ply® Red Structural Sheathing Resisting Transverse Wind Loads

<table>
<thead>
<tr>
<th>Thermo-Ply® Grade</th>
<th>Maximum Stud Spacing (in)</th>
<th>Negative Allowable Design Value (psf)</th>
<th>Positive Allowable Design Value (psf)</th>
<th>Fastener Schedule</th>
<th>Basic Wind Speed Vₚₛₚₑₜ per ASCE 7-05 (mph)</th>
<th>Basic Wind Speed Vₚₑₕₚₑₜ per ASCE 7-10 &amp; 7-16 (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermo-Ply® Red (0.113”)</td>
<td>16 o.c.</td>
<td>145</td>
<td>120</td>
<td>Minimum 15/16” crown, 1 1/4” leg 16 gage galvanized staples² OR 0.120” x 1 1/2” roofing nails, 3” o.c. to perimeter/field.</td>
<td>≤ 190</td>
<td>≤ 245</td>
</tr>
<tr>
<td></td>
<td>24 o.c.</td>
<td>95</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Design wind load capacity shall be in accordance with IBC Section 1609.1.1.
2. Capacities assume minimum 1/2” gypsum wallboard installed on the interior side of the wall. Where gypsum wallboard in not installed on the interior side of the wall, a 40% reduction in wind pressure resistance shall be applied (Vₚₛₚₑₜ windspeed less than 150 mph, Vₑₕₚₑₜ less than 190 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, 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

5.3.1. Thermo-Ply® Red Structural Sheathing may be used as a WRB as prescribed in IRC Section R703.2 and IBC Section 1404.2, when installed on exterior walls as described in this section.

5.3.2. Thermo-Ply® Red 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. Approved construction tapes include 17/8” minimum width 3M (8087), Venture White 1585 CW-W Sheathing Tape, or equivalent construction tape.

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 all applicable code sections.

5.3.6. Where Thermo-Ply® Red Structural Sheathing is used in the intermittent bracing method along a braced wall line, Thermo-Ply® Green Structural Sheathing may be used as the infill panels between the Thermo-Ply® Red Structural Sheathing braced wall panels. In this application, the WRB, air barrier, and transverse load resistance is maintained, provided all seams and joints between boards are overlapped or sealed by the approved construction tapes listed in Section 5.3.3.
5.4. Air Barrier

5.4.1. Thermo-Ply® Red Structural Sheathing may be used as an air barrier assembly as prescribed in IRC Section N1102.4.1.1 and IECC Section R402.4.1.1 and C402.5.1.1 in accordance with ASTM E283.

5.5. Draftstop

5.5.1. Thermo-Ply® Red Structural Sheathing may be used as a draftstop material in accordance with IRC Section 302.12, and IBC Section 708.4.2, 718.3 and 718.4.

5.5.2. When installed as a draftstop, Thermo-Ply® Red Structural Sheathing shall be installed in accordance with Section 6.

5.6. Fire Resistance Properties

5.6.1. Surface Burn Characteristics

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

Table 7: Flame Spread & Smoke Developed Indexes of Thermo-Ply® Red Structural Sheathing

<table>
<thead>
<tr>
<th>Thermo-Ply® Red Structural Sheathing</th>
<th>Flame Spread</th>
<th>Smoke Developed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 200</td>
<td>&lt; 450</td>
</tr>
</tbody>
</table>

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 1 ¼" galvanized roofing nails or No.16 gage galvanized staples having a 15/16" crown and 1 ¼" 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 3/8" (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® Red 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. General for Structural and WRB Applications

6.1.1. Thermo-Ply® Red 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.

6.1.2. If there are any conflicts between the manufacturer’s instructions and this TER, the more restrictive shall apply.

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9 2012 IECC Section C402.4.1.1
6.1.3. 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. Orientation

6.2.1. Thermo-Ply® Red 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.

6.3. Fastener Type

6.3.1. Thermo-Ply® Red Structural Sheathing

6.3.1.1. Minimum 0.120" x 1¼" galvanized roofing nail.

6.3.1.2. Minimum 15/16" crown by 1¼" leg, 16 ga staples shall be installed per the staple manufacturer's instructions.

6.3.1.3. 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>
<thead>
<tr>
<th>Thermo-Ply® Red Structural Sheathing Application</th>
<th>Maximum Panel Edge Fastener Spacing (in)</th>
<th>Maximum Panel Intermediate Fastener Spacing (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Shear</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Transverse loads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplift loads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water-Resistive Barrier</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Air Barrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draftstop</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.3.2. Gypsum Wallboard

6.3.2.1. Where required, gypsum wallboard shall be a minimum ½" thickness and shall be attached with one of the following.

6.3.2.1.1. #6 x 1¼" type W or S screws

6.3.2.1.2. 5d cooler nails

6.4. Fastener Edge Distance

6.4.1. Fasteners shall be installed with a minimum edge distance of 3/8" (9.5 mm) for Thermo-Ply® Red Structural Sheathing and gypsum.

6.5. Treatment of Joints

6.5.1. Thermo-Ply® Red Structural Sheathing joints may be either butted or overlapped.

6.5.1.1. Lapped joints shall be overlapped by 3/4" (19 mm) nominally and fastened with a single row of fasteners. Always run staples parallel with framing.

6.5.1.2. Butt joints shall be placed over framing members and fastened with a single row of fasteners at each panel edge.

6.6. Window Jamb Adjustments

6.6.1. If windows are made to accommodate traditional 1/2" sheathing materials, order windows with adjustable nailing fins from the supplier. Door brick moldings may be planed or routed 3/8" in order to accommodate the different sheathing thickness, either at the jobsite or by the millwork supplier.
6.6.2. Thermo-Ply® Red 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. The structural installation procedure shall be in accordance with Figure 5.

Figure 5: Installation Instructions – WRB Installation Procedure

6.7.1. Overlapped Joint – Install the first panel per Figure 5.

6.7.1.1. Overlap the next panel ¾” over the first panel, and fasten the joint with a common line of fasteners.

6.7.1.2. For Thermo-Ply® Red 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.

6.7.2. Butted Joint with Flashing – Install panels per Figure 5 with joints butted (no overlap).

6.7.3. 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. Test and Engineering Substantiating Data:

7.1. Transverse load testing, based on ASTM E330.

7.2. Uplift load testing, based on ASTM E72.

7.3. Test reports and data for determining use as a water-resistive barrier material, based on ASTM E331.

7.4. Test reports and data for determining use as an air barrier, based on ASTM E283.

7.5. Lateral load testing and data for determining comparative equivalency for use as an alternative material, based on ASTM E2126.

7.6. Test reports and data for determining comparative equivalency for use as an alternative material in accordance with IRC Section R104.11 and IBC Section 104.11.

7.7. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.
7.8. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

7.9. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.

7.10. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ’s procedure for acceptance of data from approved sources.

7.11. DrJ’s responsibility for data provided by approved sources conforms with IBC Section 1703 and any relevant professional engineering law.

7.12. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., IRC, WFCM, IBC, SDPWS, NDS®, ACI®, AISI, PS-20, PS-2, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

8.1. When installed in accordance with the manufacturer’s installation instructions and this TER, Thermo-Ply® Red Structural Sheathing complies with, or is a suitable alternative to, the applicable sections of the codes listed in Section 2 for the following applications:

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 IRC Section R703.2 and IBC Section 1404.2.

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 IRC Section 302.12, and IBC Section 708.4.2, 718.3 and 718.4.

8.2. IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.9 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, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code. ... Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

8.3. This product has been evaluated evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:

8.3.1. No known variations

8.4. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ’s professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.
9. Conditions of Use:

9.1. Where required by 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.

9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

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

9.4. This report and the installation instructions shall be available to the jurisdiction in which the project is to be constructed.

9.5. Thermo-Ply® Red Structural Sheathing shall not be used as a nailing base for claddings, trim, windows and doors. Fastening through the Thermo-Ply® Red Structural Sheathing into the framing is acceptable.

9.6. Walls sheathed with Thermo-Ply® Red Structural Sheathing shall not be used to resist horizontal loads from concrete and masonry walls.

9.7. When Thermo-Ply® Red 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.

9.7.1. When Thermo-Ply® Structural Sheathing is not installed as a WRB, other means of providing a WRB shall be required, as per the code.

9.8. When used in accordance with the IBC in Seismic Design Categories C, D, E or F, special inspections shall comply with IBC Section 1705.12.10.

9.9. When used in accordance with the IBC in high wind areas, special inspections shall comply with IBC Section 1705.11.11.

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

9.10.1. Allowable shear loads shall not exceed values in Table 3 for wind loads and Table 4 for seismic loads.

9.10.2. Allowable uplift loads shall not exceed values in Table 5.

9.10.3. 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.

9.11. Thermo-Ply® Red Structural Sheathing is manufactured under a quality control program with quality control inspections in accordance with IRC Section R109.2 and IBC Section 110.3.8 and 110.4.

9.12. Design


9.12.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with IRC Section R106 and IBC Section 107.

9.12.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with IRC Section R301 and IBC Section 1603.

9.12.2. Construction Documents

9.12.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.
Technical Evaluation Report (TER)

9.13. Responsibilities

9.13.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.

9.13.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.

9.13.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.

9.13.4. This product is manufactured under a third-party quality control program in accordance with IRC Section R104.4 and R109.2 and IBC Section 104.4 and 110.4.

9.13.5. 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, and the TER shall be reviewed for code compliance by the Building Official.

9.13.6. The use of this TER is dependent on the manufacturer’s in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official’s inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10. Identification:

10.1. Each Thermo-Ply® Red Structural Sheathing panel described in this TER is 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 www.oxengineeredproducts.com.

11. Review Schedule:

11.1. This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjcertification.org.

11.2. For information on the current status of this TER, contact DrJ Certification.

• Mission, Belief and Independence
• Product Evaluation Policies
• Product Approval – Building Code, Administrative Law and P.E. Law