DrJ CERTIFICATION

#1131
ISO/IEC 17065
Product Certification Body

Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1510-04

Ox Engineered Products One & Two Hour Fire Rated Wall Assemblies

Ox Engineered Products, LLC

Product:

Thermo-Ply® Structural Sheathing, OX-IS® Structural Insulation, SI-Strong Structural Insulation, Strong-R® Structural Insulation, & ISO RED ci® & ISO RED MAX® Polyiso Sheathing

Issue Date:

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Subject to Renewal:

April 1, 2021

ICC MEMBER

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

SECTION: 06 16 13 - Insulated Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 21 00 - Thermal Insulation

1 PRODUCT EVALUATED[1]

1.1 Thermo-Ply® Structural Sheathing, OX-IS® Structural Insulation, SI-Strong Structural Insulation, Strong-R® Structural Insulation, & ISO RED ci® & ISO RED MAX® Polyiso Sheathing

2 APPLICABLE CODES AND STANDARDS[2,3]

2.1 *Codes*

2.1.1 *IBC—12, 15, 18: International Building Code®*

2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.1.3 *CBC— 16, 19: California Building Code*

2.2 *Standards and Referenced Documents*

2.2.1 *ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials*

2.2.2 *ASTM E2032: Standard Guide for Extension of Data From Fire Resistance Tess Conducted in Accordance with ASTM E119*

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[1] Building codes require data from valid research reports be obtained from *approved sources*. 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 ANSI-Accredited Product Certification Body – Accreditation #1131.

Through ANSI 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."

Building official approval of a licensed *registered design professional* (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant *jurisdiction*. Therefore, the work of licensed RDPs is accepted by *building officials*, except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the *building official* responds in writing stating the reasons for disapproval.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

[2] Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., *ASCE 7, NDS, ASTM*). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

[3] All terms defined in the applicable building codes are italicized.

2.2.3 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

3 Performance Evaluation

3.1 Thermo-Ply®, OX-IS®, SI-Strong, Strong-R®, ISO RED ci®, and ISO RED MAX® were evaluated in accordance with *ASTM E119* for the following designs:

3.1.1 Performance of one hour and two hour fire rated wall assemblies using:

3.1.1.1 UL-U364, UL-U397 & UL-V306

3.1.1.2 UL-U356

3.1.1.3 UL-U425 & UL-V454

3.2 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

3.3 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 Product Description and Materials

4.1 Thermo-Ply®

4.1.1 Thermo-Ply® is a proprietary foam plastic insulated sheathing (FPIS) product, 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.

4.1.2 Polymer facings are applied on both sides of the sheathing panels. Facings may be aluminum foil or Kraft/polymer/Kraft facing on both sides.

4.2 OX-IS® and SI-Strong

4.2.1 OX-IS® and SI-Strong are structural, rigid FPIS products consisting of a proprietary fibrous sheathing board laminated to one side of a proprietary rigid foam plastic insulation. The sheathing is made of specially treated plies that are pressure-laminated with a water resistant adhesive. The surface finish consists of a facer on one or both sides.

4.3 Strong-R®

4.3.1 Strong-R® Structural Insulation is a structural, rigid insulation sheathing product consisting of a proprietary fibrous sheathing board laminated to one side of a proprietary rigid foam plastic insulation.

4.3.1.1 The proprietary fibrous sheathing is made of specially treated plies that are pressure-laminated with a water-resistant adhesive. The surface finish consists of a facer on one or both side using a fibrous sheathing board.

4.3.1.2 The rigid foam plastic insulation is a Class A proprietary polyisocyanurate, which can have facings on one or both sides. The facers are designed with a base foil layer.

4.4 ISO RED ci®

4.4.1 ISO RED ci® is a Type 1, Class 1 Dual Faced Rigid Cellular Polyisocyanurate Insulation Board product as defined in *ASTM C1289*.

4.4.2 ISO RED ci® consists of a proprietary Polyisocyanurate rigid board, with facers on both sides. The facers are designed with a base foil layer which is then combined with layers of other material(s).

4.5 ISO RED MAX®

4.5.1 ISO RED MAX® is a Type 1, Class 2 Dual Faced Rigid Cellular Polyisocyanurate Insulation Board product as defined in *ASTM C1289*.

4.5.2 ISO RED MAX® consists of a proprietary Polyisocyanurate rigid board with facers on both sides. The facers are designed with a base foil layer.

4.6 *Material Availability*

4.6.1 *Thicknesses:*

4.6.1.1 Thermo-Ply® – standard structural grade (Red), 0.113" (2.9 mm); and high structural grade (Blue), 0.135" (3.4 mm).

4.6.1.2 OX-IS® and SI-Strong – range from 0.5" (12.7 mm) up to 1.0" (25.4 mm).

4.6.1.3 Strong-R® – thicknesses up to 2.0" (102 mm).

4.6.1.4 ISO RED ci® – range from 0.5" (12.7 mm) up to 2.0" (51 mm).

4.6.1.5 ISO RED MAX® – thicknesses up to 4.0" (102 mm).

4.6.2 The standard widths include 48" (1219 mm) and 48¾" (1238 mm).

4.6.3 The standard lengths include 96" (2438 mm), 108" (2743 mm) and 120" (3048 mm).

5 APPLICATIONS

5.1 *Wood – One Hour Fire Rating – Non-Load Bearing*

5.1.1 *One Hour Fire Rating from Interior or Exterior using Assembly 1 – UL Design No. U364, U397 & V306 (*Figure 1*)*

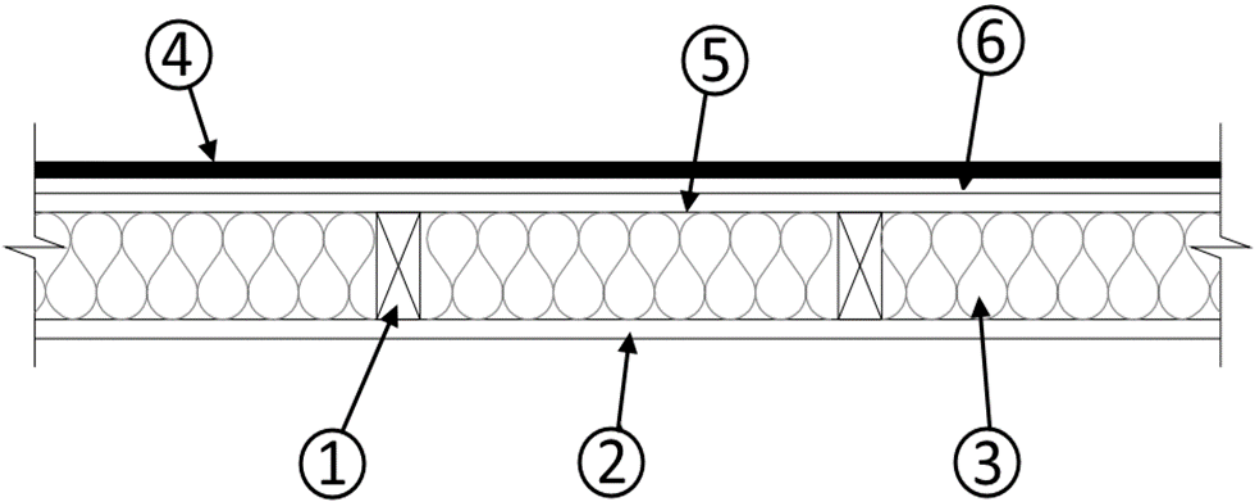

FIGURE 1. ONE HOUR RATED ASSEMBLY 1 USING UL DESIGN NO. U364, U397, & V306

1. Wood Studs – nominal 2x4, minimum spacing 16" o.c. (406 mm), maximum spacing 24" o.c. (6010 mm)
2. Gypsum Board:
   Type: X GWB, ⅝" (15.9 mm) thick
   Oriented: vertically on interior side
   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
   Fastener: GWB to studs using 1⅞" (48 mm) 6d nails or No. 6 Type W screws
   Fastener Space: 7" (178 mm) o.c. at perimeter edges and field
3. Cavity Insulation:
   Type: Glass fiber or mineral wool
   R-value: R-13
   Minimum Thickness: 3½" (89 mm)
4. Exterior Cladding – in accordance with the manufacturer's installation instructions and *U356*:
   Siding including vinyl, fiber cement siding

Molded Plastic – Particle Board Siding
Wood Structural Panel or Lap Siding
Cementitious Stucco
Brick Veneer
Exterior Insulation and Finish System (EIFS)

5. Exterior Gypsum Sheathing:
   Type: X GWB ⅝" (15.9 mm) thick
   Oriented: vertically on exterior side
   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
   Fastener: GWB to studs using 17/8" (48 mm) 6d nails or No. 6 Type W screws
   Fastener Spacing: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Sheathing:
   As installed per TER No. 1004-01: Thermo-Ply®
   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong
   As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®
   As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.2 *Wood – One Hour Fire Rating – Load Bearing*

5.2.1 *One Hour Fire Rating from Interior or Exterior using Assembly 1 – UL Design No. U354 (Figure 2)*

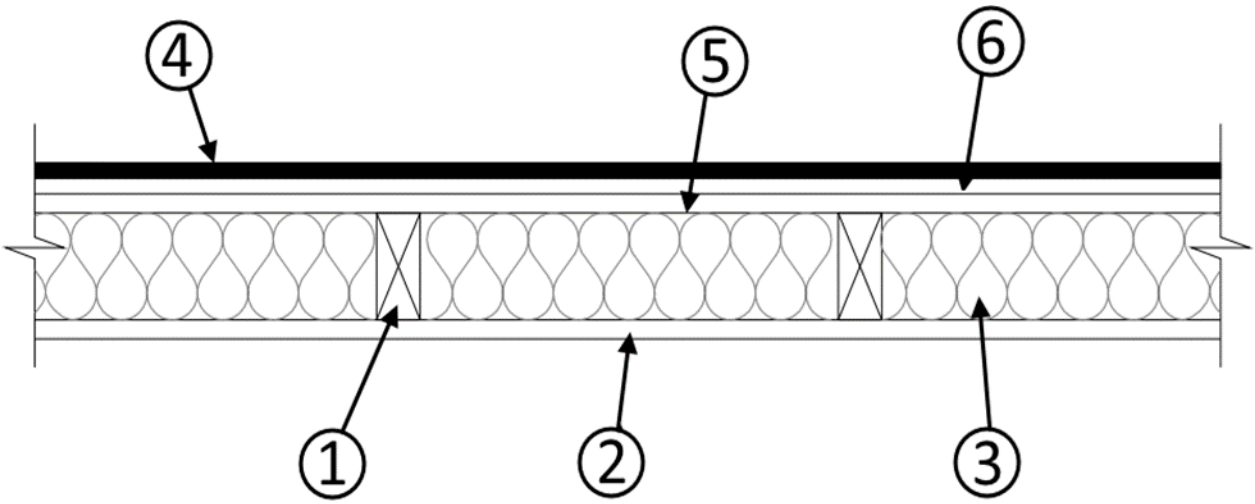

FIGURE 2. ONE HOUR RATED ASSEMBLY 1 USING UL DESIGN NO. U354

1. Wood Studs – nominal 2x4, maximum spacing 16" o.c. (406 mm), nominal 2x6 maximum spacing 24" o.c. (6010 mm).
2. Gypsum Board:
   Type: X GWB ⅝" (15.9 mm) thick
   Oriented: vertically or horizontally on interior side
   Joints: centered over studs. Joints must be finished with joint compound and tape. Fastener heads must be covered with joint compound.
   Fastener: GWB to studs using 1⅞" (48 mm) 6d cement coated nails or No. 6 bugle head drywall screws
   Fastener Space: 7" (178 mm) o.c. at perimeter edges and field
3. Cavity Insulation:
   Type: any UL classified glass fiber batt, mineral wool or sprayed cellulosic fiber. Cavity insulation is required.

4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U356*

   Aluminum Siding: 0.019 in min. thick painted aluminum meeting *AAMA 1402*.

   Steel Siding: 0.017 in min. thick (no. 17 GSG gauge) painted steel.

   Vinyl siding: 0.035 in min. thick. UL Classified exterior plastic siding (Molded Plastic).

   Wood siding: 0.313 in min. thick lumber, plywood or OSB based siding.

   Hardboard siding: 0.250 in. min. thick hardboard UL Classified exterior hardboard siding.

   Fiber cement siding: 0.250 in. min. thick fiber-cement based siding.

   Stone: 2.0 in. min (natural stone) or 1.5 min (cast artificial) thick stone.

   Brick Veneer: 2.0 in. min thick brick units. Fastened over foam plastic sheathing to wood studs with metal ties.

   Concrete Masonry Veneer: 2.0 in. min thick concrete masonry units. Fastened over foam plastic sheathing to wood studs with metal ties.

   Stucco: Portland cement type — 0.750 in. min thickness. Metal lath or mesh base fastened over foam plastic sheathing to wood studs.

   One-Coat Stucco: 0.375 in. minimum thickness. Wire fabric lath fastened over foam plastic sheathing to wood studs.

   Exterior Insulation and Finish System (EIFS): Base coat with reinforcing mesh applied over foam plastic sheathing (Quik-R Wall Insulation) followed by finish coat. Type Quik-R Sheathing (Item 6) must be used for this exterior wall covering.

5. Exterior Gypsum Sheathing

   Type: X GWB ⅝" (15.9 mm) thick (paper or glass matt facers, square or tapered edges)

   Oriented: vertically or horizontally on exterior side

   Joints: centered over studs staggered from back layer

   Fastener: GWB to studs using 1⅞" (48 mm) 6d cement coated nails or No. 6 bugle head screws

   Fastener Spacing: 7" (178 mm) o.c. on perimeter edges and field

6. Exterior Sheathing

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

   As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®

   As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.2.2 *One Hour Fire Rating from Interior using Assembly 2 – UL Design No. U356 (*Figure 3*)*

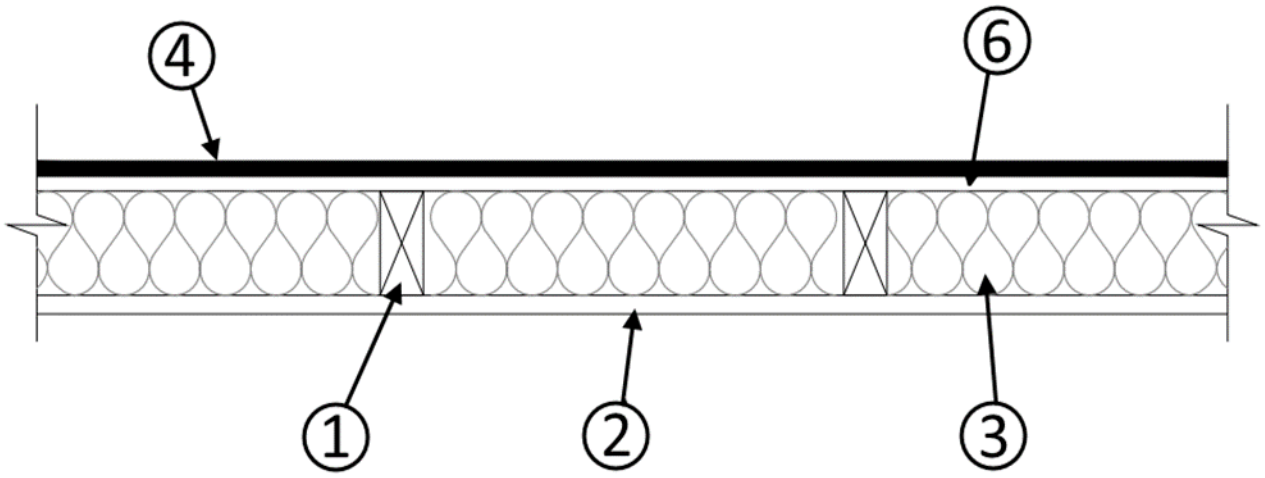

FIGURE 3. ONE HOUR FIRE RATED ASSEMBLY 2 USING UL DESIGN U356

1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud

   Fastener: GWB to studs using 1⅞" (48 mm) 6d nails or No. 6 Type W screws

   Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation

   Type: glass fiber or mineral wool

   R-value: R-13

   Minimum Thickness: 3½" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U356*

   Siding including vinyl, fiber cement siding

   Molded Plastic – Particle Board Siding

   Wood Structural Panel or Lap Siding

   Cementitious Stucco

   Brick Veneer

   Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing – not used
6. Sheathing – when nominal ½" (12.7 mm) wood structural panels are fastened directly to studs, the axial load is not restricted.

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

   As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®

   As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.2.3 *One Hour Fire Rating from Interior or Exterior using Assembly 2 – UL Design No. U356*

5.2.3.1 Assembled as shown in Figure 3 using brick veneer as exterior cladding.

5.3 *Wood – One Hour Fire Rating – Limited Load Bearing:*

5.3.1 One Hour Fire Rating from Interior using Assembly 2 – UL Design No. U356[4]

5.3.1.1 Assembled as shown in Figure 3. The wall assembly was loaded to 55% of the allowable load. A superimposed load of 1,800 lbs. per stud was applied to the assembly at the start of the test and was maintained throughout the test. This superimposed load imposed a stress of 342.9 psi, compression parallel to grain.

5.3.1.2 This results in a wall assembly permitted to be built as follows:

5.3.1.2.1 8' wall heights can be loaded to a maximum of 1,800 lbs. per stud (1,350 plf).

5.3.1.2.2 9' wall heights can be loaded to a maximum of 1,180 lbs. per stud (885 plf).

5.3.1.2.3 The test was unsymmetrical with the fire side of the wall being external to the ⅝" Type X GWB.

1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board

   Type: Georgia-Pacific Firestop Type X GWB ⅝" (15.9 mm) thick OR Gold Bond® Fire-Shield® Type X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs

   Fastener: GWB to studs using 2"-long 12½ ga annular ringed GWB nails with 19/64"-diameter heads and long diamond points

   Fastener Space: 6" (152 mm) o.c. on perimeter edges and 12" (305 mm) o.c. on intermediate studs
3. Cavity Insulation

   Type: glass fiber

   R-value: R-13

   Minimum thickness: 3⅝" (92 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U356*

   19/32"-thick by 4'-wide by 8'-long plywood panel siding OR

   0.024"-thick unbacked aluminum lap siding
5. Exterior Gypsum Sheathing – not used
6. Sheathing

   Proprietary laminated fibrous board sheathing, the same structural sheathing component of OX-IS® and SI-Strong, fiber-based board faced on both sides

   Thickness: minimum of 0.113" thick

   Oriented: vertically with butt joints over studs

   Fastener: attached to unexposed side of the studs and plates with 1¼"-long 11 ga galvanized roofing nails with 7/16"-diameter heads and diamond points

   Fastener Space: 3" (76 mm) o.c. around the perimeter of each sheet and 6" (152 mm) o.c. on the intermediate studs

5.4 *Wood – Two Hour Fire Rating:*

5.4.1 *Two Hour Fire Rating from Interior using Assembly 1 – UL Design No. U364, U397 & V306 (*Figure 4*)*

[4] Testing conducted by the Building Research Laboratory at Ohio State University by Dr. Richard Bletzacker of Richard W. Bletzacker & Associates, Inc. in accordance with *ASTM E119.*

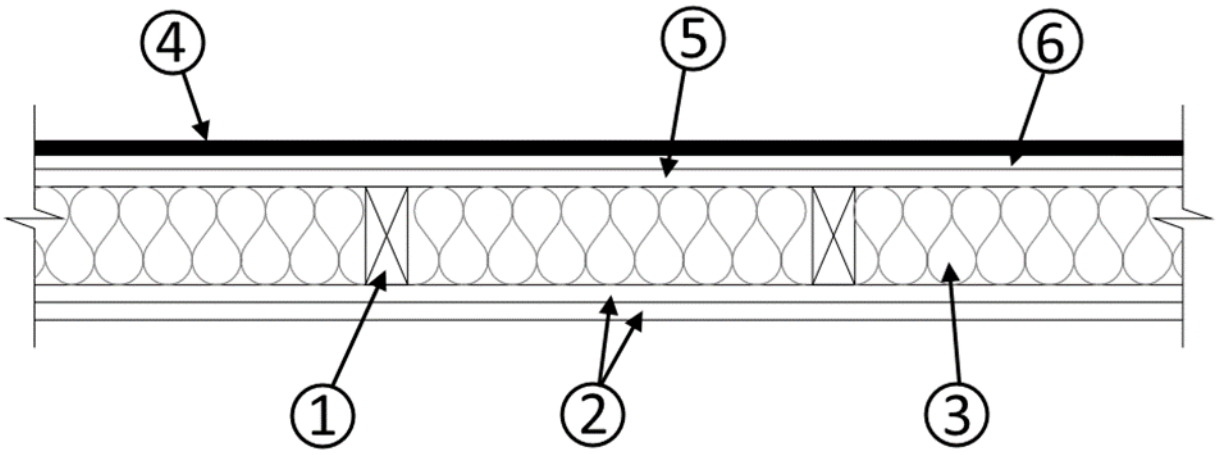

FIGURE 4. TWO HOUR FIRE RATED ASSEMBLY 1 USING UL DESIGN U364, U397 & V306

1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c., maximum spaced 24" (610 mm) o.c.
2. Gypsum Board – requires two GWB layers

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud

   Fastener Interior Layer: GWB to studs using 1⅞" (48 mm) 6d nails or No. 6 Type W screws

   Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field

   Fastener Secondary Layer: using 2⅜" (61 mm) 8d nails or screws, 8" (203 mm) o.c.

   Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation

   Type: glass fiber or mineral wool

   R-value: R-13

   Minimum Thickness: 3½" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U356*

   Siding including vinyl, fiber cement siding

   Molded Plastic – Particle Board Siding

   Wood Structural Panel or Lap Siding

   Cementitious Stucco

   Brick Veneer

   Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on exterior side

   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud

   Fastener: GWB to studs using 1⅞" (48 mm) 6d nails or No. 6 Type W screws

   Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Insulation

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®

As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.4.2 *Two Hour Fire Rating from Interior or Exterior using Assembly 1 – UL Design No. U364, U397 & V306*

5.4.2.1 Assembled as shown in Figure 4 using brick veneer as exterior cladding.

5.4.3 *Two Hour Fire Rating from Interior using Assembly 2 – UL Design No. U356 (*Figure 5*)*

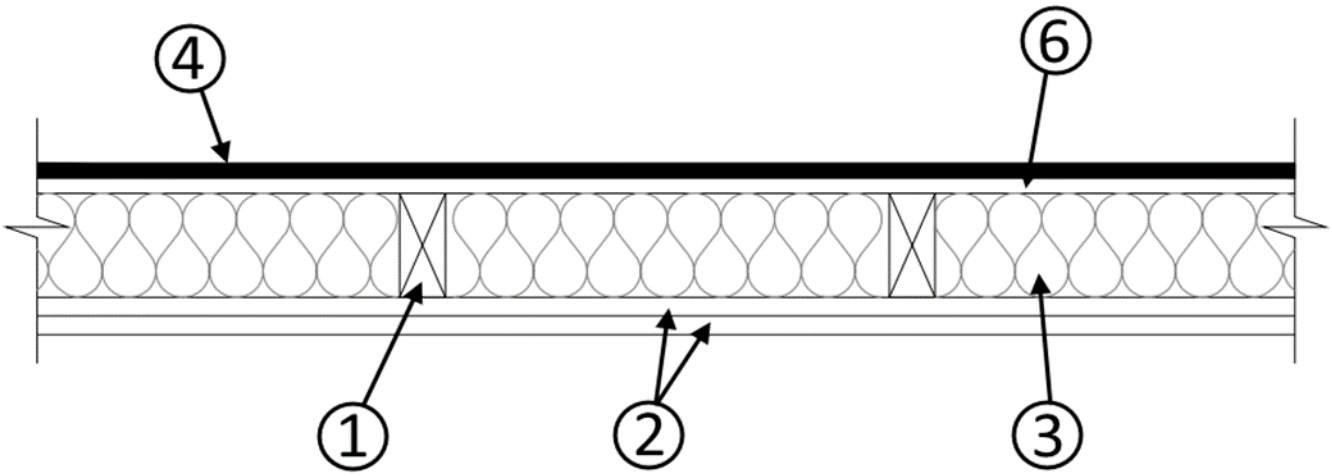

FIGURE 5. TWO HOUR FIRE RATED ASSEMBLY 2 USING UL DESIGN NO. U356

1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board – requires two GWB layers

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs and staggered 1 stud cavity on opposite side of stud

   Fastener Interior Layer: GWB to studs using 1⅞" (48 mm) 6d nails or No. 6 Type W screws

   Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field

   Fastener Secondary Layer: using 2⅜" (61 mm) 8d nails or screws, 8" (203 mm) o.c.

   Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation

   Type: glass fiber or mineral wool

   R-value: R-13

   Minimum Thickness: 3½" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U356*

   Siding including vinyl, fiber cement siding

   Molded Plastic – Particle Board Siding

   Wood Structural Panel or Lap Siding

   Cementitious Stucco

   Brick Veneer

   Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing – not used
6. Exterior Insulation

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®

As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.4.4 *Two Hour Fire Rating from Interior or Exterior using Assembly 2 – UL Design No. U356.*

5.4.4.1 Assembled as shown in Figure 5 using brick veneer for exterior cladding.

5.5 *Steel – One Hour Fire Rating – Load Bearing*

5.5.1 *One Hour Fire Rating from Interior or Exterior using Assembly 1 – UL Design No. U425 (*Figure 6*)*

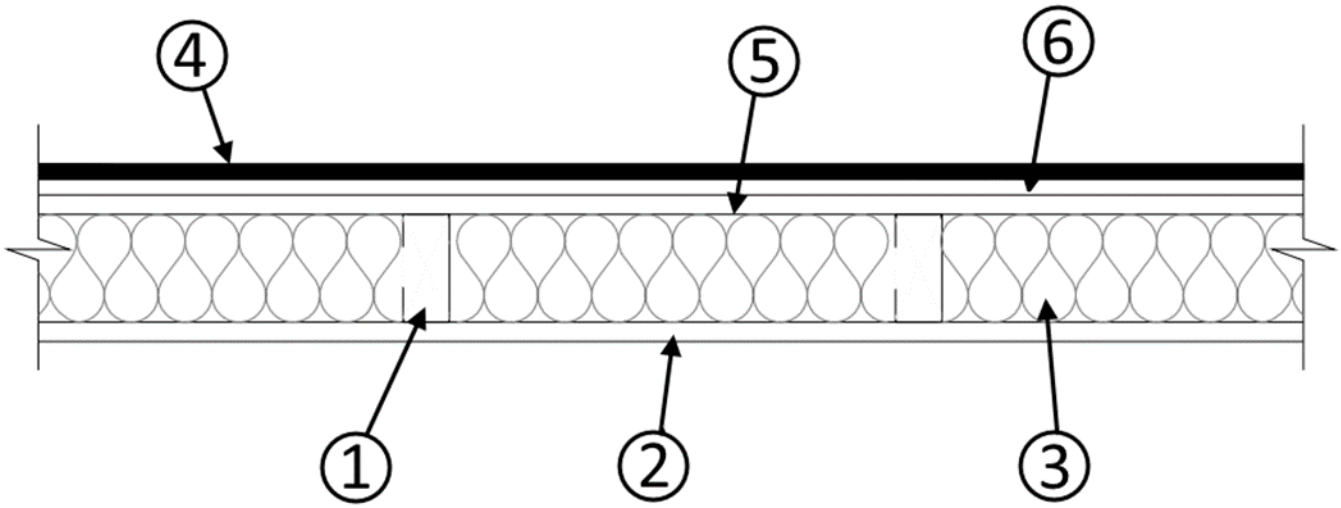

FIGURE 6. ONE HOUR RATED ASSEMBLY 1 USING UL DESIGN NO. U425

1. Steel Studs – minimum 20 ga, maximum spaced 24" (610 mm) o.c.
2. Interior Gypsum Board – 1 Layer – 1 hour (100% of design load)
   Type: X GWB ⅝" (15.9 mm) thick
   Oriented: vertically on interior side
   Joints: centered over studs
   Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws
   Fastener Space: 12" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation
   Type: any UL-classified glass fiber batt, mineral wool or sprayed cellulosic fiber
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *U425*
   Siding including aluminum, steel, brick or stucco
   Cementitious Backer Units
   Fiber-Cement Siding
   Molded Plastic
   Wood Structural Panel or Lap Siding
   Building Units (Cellular Glass Blocks)
5. Exterior Gypsum Sheathing
   Type: X GWB ⅝" (15.9 mm) thick
   Oriented: vertically on exterior side
   Joints: centered over studs staggered from back layer
   Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws

Fastener Space: 12" (178 mm) o.c. along studs and tracks

6. Exterior Insulation

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

   As installed per TER No. 1808-02: up to 2" (51 mm) thickness of Strong-R®

   As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.5.2 *One Hour Fire Rating from Either Side using Assembly 2 – UL Design No. V454 (*Figure 7*)*

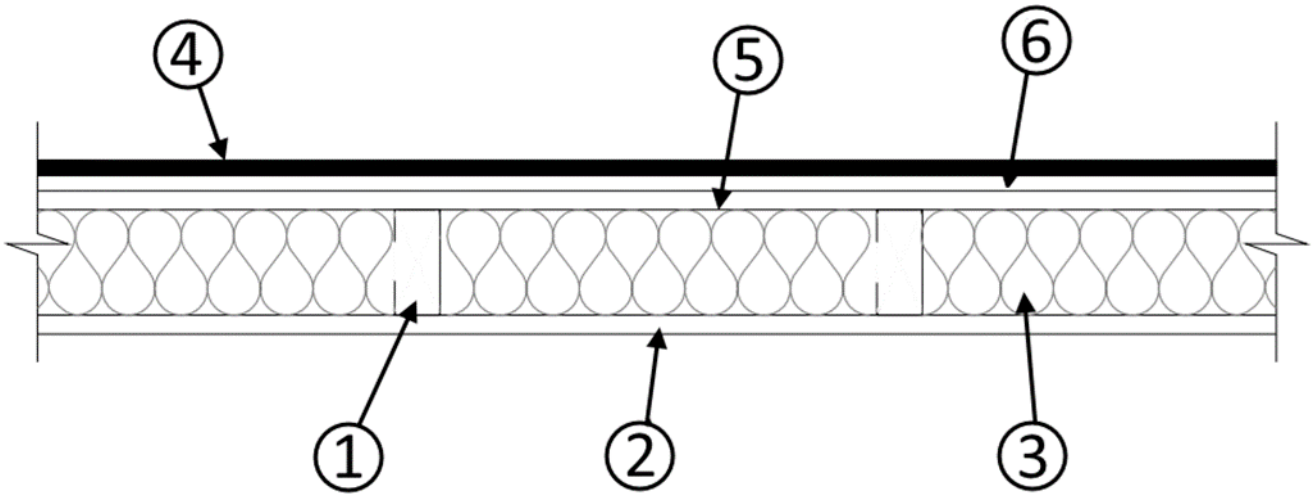

FIGURE 7. ONE HOUR RATED ASSEMBLY 2 USING UL DESIGN NO. V454

1. Steel Studs – minimum 20 ga., spaced maximum 24" (610 mm) o.c.
2. Interior Gypsum Board

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs staggered from exterior gypsum sheathing joints

   Fastener: GWB to studs using Type S 1" (25.4 mm) self-drilling, self-tapping steel screws

   Fastener Space: 8" (203 mm) o.c. on perimeter edges and 12" (305 mm) o.c. in the field

3. Cavity Insulation

   Type: any UL-classified glass fiber batt, mineral wool or sprayed cellulosic fiber or proprietary spray polyurethane foam (SPF) allowed in V454. See listing for full details.

4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *V454*

   Siding including aluminum, steel, vinyl, wood, hard board, fiber-cement, stone, brick veneer, concrete or masonry veneer, stucco, one-coat stucco, Exterior Insulation and Finish System (EIFS), metal panel, or wall and partition facing and accessories.

5. Exterior Gypsum Sheathing – Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on exterior side

   Joints: centered over studs staggered from interior GWB

   Fastener: GWB to studs using Type S 1" (25.4 mm) self-drilling, self-tapping steel screws

   Fastener Space: 8" (203 mm) o.c. on perimeter edges and 12" (305 mm) o.c. in the field

6. Exterior Insulation

   As installed per TER No. 1004-01: Thermo-Ply®

   As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

As installed per TER No. 1808-02: up to 2” (51 mm) thickness of Strong-R®

As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

5.6 *Steel – Two Hour Fire Rating – Load Bearing*

5.6.1 *Two Hour Fire Rating from the Interior using Assembly 1 – UL Design No. U425 (*Figure 8*)*

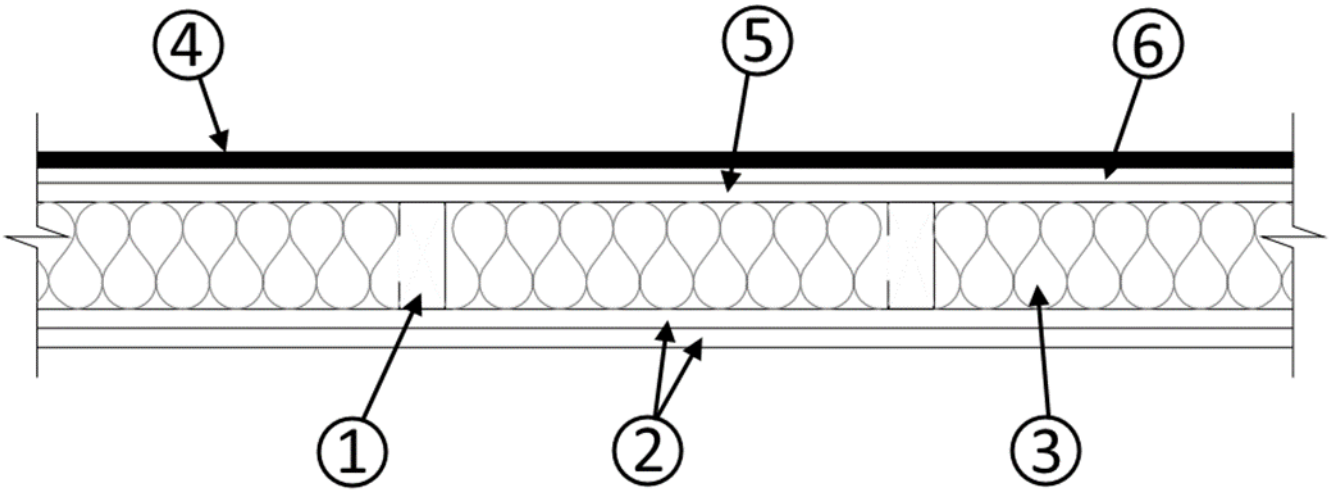

FIGURE 8. TWO HOUR RATED ASSEMBLY 2 USING UL DESIGN NO. U425

1. Steel Studs – minimum 20 ga., spaced 24" (610 mm) o.c. maximum
2. Interior Gypsum Board

   2 Layers – 2 hours (80% of design load)

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on interior side

   Joints: centered over studs and staggered 1 stud cavity between layers

   Fastener: GWB to studs using Type S-12 x 1" (25.4 mm) self-tapping bugle head sheet steel screws in first layer, Type S-12 x 1-⅝" self-tapping bugle head sheet steel screws in second layer.

   Fastener Space: 12" (178 mm) o.c. on perimeter edges and field.
3. Cavity Insulation

   Type: any UL-classified glass fiber batt, mineral wool or sprayed cellulosic fiber
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and *425*

   Siding including aluminum, steel, brick or stucco

   Cementitious Backer Units

   Fiber-Cement Siding

   Molded Plastic

   Wood Structural Panel or Lap Siding

   Building Units (Cellular Glass Blocks)
5. Exterior Gypsum Sheathing

   Type: X GWB ⅝" (15.9 mm) thick

   Oriented: vertically on exterior side

   Joints: centered over studs staggered from back layer

   Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws

   Fastener Space: 12" (178 mm) o.c. along studs and tracks

6. Exterior Insulation

As installed per TER No. 1004-01: Thermo-Ply®

As installed per TER No. 0804-01: up to 1" (25.4 mm) thickness of OX-IS® or SI-Strong

As installed per TER No. 1808-02: up to 2" (51 mm) thickness of Strong-R®

As installed per TER No. 1306-02: up to 2" (51 mm) of ISO RED ci® or up to 4" (102 mm) of ISO RED MAX®

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 *Installation Procedure*

6.2.1 Insulation boards shall be installed horizontally with sheathing edges bearing directly on framing members and edges of abutting panels in moderate contact with each other.

6.2.2 Install cladding materials in accordance with the cladding manufacturer's installation instructions.

6.2.3 One and Two Hour Fire Rated Wall Assemblies:

6.2.3.1 The one hour rated wall assembly shall be constructed as described in Section 5.1.

6.2.3.2 The two hour rated wall assembly shall be constructed as described in Section 5.4.

6.2.3.3 Specifications as defined in the UL Directory (e.g., UL assembly *U356* or *U364*)

6.2.3.4 Thermo-Ply® shall be installed per TER No. 1004-01.

6.2.3.5 OX-IS® and SI-Strong shall be installed per TER No. 0804-01.

6.2.3.5.1 Up to 1" (25.4 mm) thickness.

6.2.3.6 Strong-R® shall be installed per TER No. 1808-02.

6.2.3.6.1 Up to 2" (51 mm) thickness.

6.2.3.7 ISO RED ci® or ISO RED MAX® shall be installed per TER No. 1306-02.

6.2.3.7.1 ISO RED ci® up to 2" (51 mm) thickness.

6.2.3.7.2 ISO RED MAX® up to 4" (102 mm) thickness.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 Evaluation and analysis of *ASTM E119* testing conducted by Architectural Testing, Inc., an Intertek company.

7.2 Evaluation and analysis of *ASTM E119* testing conducted by the Building Research Laboratory at Ohio State University by Dr. Richard Bletzacker of Richard W. Bletzacker & Associates, Inc.

7.3 Engineering evaluation of equivalent design for one or two hour fire rated wall assemblies in accordance of *ASTM E2032* by Priest & Associates Consulting.

7.4 DrJ Technical Evaluation Report, TER No. 1004-01 Thermo-Ply® Red & Thermo-Ply® Red AMG Structural Sheathing.

7.5 DrJ Technical Evaluation Report, TER No. 0804-01 flame spread and smoke developed ratings in accordance with *ASTM E84*.

7.6 DrJ Technical Evaluation Report, TER No. 1808-02 Strong-R® Structural Insulation.

7.7 DrJ Technical Evaluation Report, TER No. 1306-02 Ox ISO RED ci® & ISO RED MAX®.

7.8 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC* Section 1703 and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.

7.9 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC, IRC, NDS®,* and *SDPWS*). 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, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

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 As a component element of one and two hour fire rated wall assemblies as described in Section 6.

8.2 Thermo-Ply®, OX-IS®, SI-Strong, Strong-R®, ISO RED ci® and ISO RED MAX® are approved for use in the wall assemblies listed in Section 5 when installed as described in Section 6.

8.3 *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*.

8.4 This product has been 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 applicable to this evaluation, they are listed here.

8.4.1 No known variations

9 CONDITIONS OF USE

9.1 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.

9.2 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ 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 and/or by the Building Designer (e.g., *owner* or *registered design professional*).

9.4 At a minimum, this product shall be installed per Section 6 of this TER.

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

9.6 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. Therefore, the TER shall be reviewed for code compliance by the *building official* for acceptance.

9.7 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 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 of this TER, visit drjcertification.org.

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