



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1510-04

Ox Engineered Products One and Two
Hour Fire Rated Wall Assemblies

Ox Engineered Products, LLC

Products:

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

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April 1, 2022

For the most recent version or a sealed copy of this Technical Evaluation Report (TER), visit drjcertification.org.



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 PRODUCTS EVALUATED¹

- 1.1 Thermo-Ply® Structural Sheathing, OX-IS® Structural Insulation, SI-Strong Structural Insulation, Strong-R® Structural Insulation, ISO RED ci® Polyiso Sheathing, and 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 (Title 24, Part 2)*
- 2.1.4 *CRC—16, 19: California Residential Code (Title 24, Part 2.5)*

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 Test Conducted in Accordance with ASTM E119*
- 2.2.3 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

¹ For more information, 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. 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.

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, and UL-V306
 - 3.1.1.2 UL-U341
 - 3.1.1.3 UL-U356
 - 3.1.1.4 UL-U425 and UL-V454
 - 3.1.1.5 UL-U301
 - 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 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 *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 sides 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" (51 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)

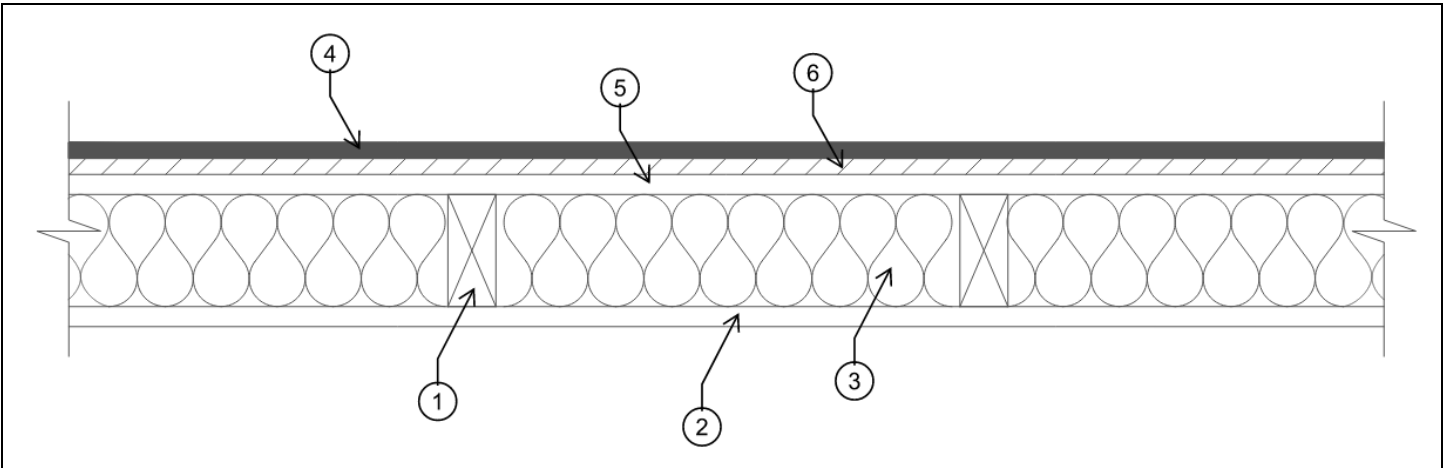
5 APPLICATIONS

5.1 *General*

- 5.1.1 The following assemblies are modified UL designs allowing for the use of the listed insulation and sheathing products. The extension of the listings are based on *ASTM E119* fire testing of the products, *ASTM E2032*, and generally accepted engineering.
- 5.1.2 *Wood – One Hour Fire Rating – Non-Load Bearing*
 - 5.1.2.1 Table 1. One Hour Fire Rating from Interior or Exterior – UL Design No. U364, U397, V306
- 5.1.3 *Wood – One Hour Fire Rating – Load Bearing*
 - 5.1.3.1 Table 2. One Hour Fire Rating from Interior – UL Design No. U341
 - 5.1.3.2 Table 3. One Hour Fire Rating from Interior or Exterior – UL Design No. U354
 - 5.1.3.3 Table 4. One Hour Fire Rating from Interior – Limited Load Bearing, Option 1 – UL Design No. U356
 - 5.1.3.4 Table 5. One Hour Fire Rating from Interior – Limited Load Bearing, Option 2 – UL Design No. U356
 - 5.1.3.5 Table 6. One Hour Fire Rating from Interior or Exterior – UL Design No. U356
- 5.1.4 *Wood – Two Hour Fire Rating – Load Bearing*
 - 5.1.4.1 Table 7. Two Hour Fire Rating from Interior – UL Design No. U364, U397, V306
 - 5.1.4.2 Table 8. Two Hour Fire Rating from Interior or Exterior – UL Design No. U364, U397, V306
 - 5.1.4.3 Table 9. Two Hour Fire Rating from Interior – UL Design No. U356
 - 5.1.4.4 Table 10. Two Hour Fire Rating from Interior or Exterior – UL Design No. U356
 - 5.1.4.5 Table 11. Two Hour Fire Rating from Interior or Exterior – UL Design No. U301
- 5.1.5 *Steel – One Hour Fire Rating – Load Bearing*
 - 5.1.5.1 Table 12. One Hour Fire Rating from Interior or Exterior – UL Design No. U425
 - 5.1.5.2 Table 13. One Hour Fire Rating from Interior or Exterior – UL Design No. V454
- 5.1.6 *Steel – Two Hour Fire Rating – Load Bearing*
 - 5.1.6.1 Table 14. Two Hour Fire Rating from Interior – UL Design No. U425

5.2 Wood – One Hour Fire Rating – Non-Load Bearing

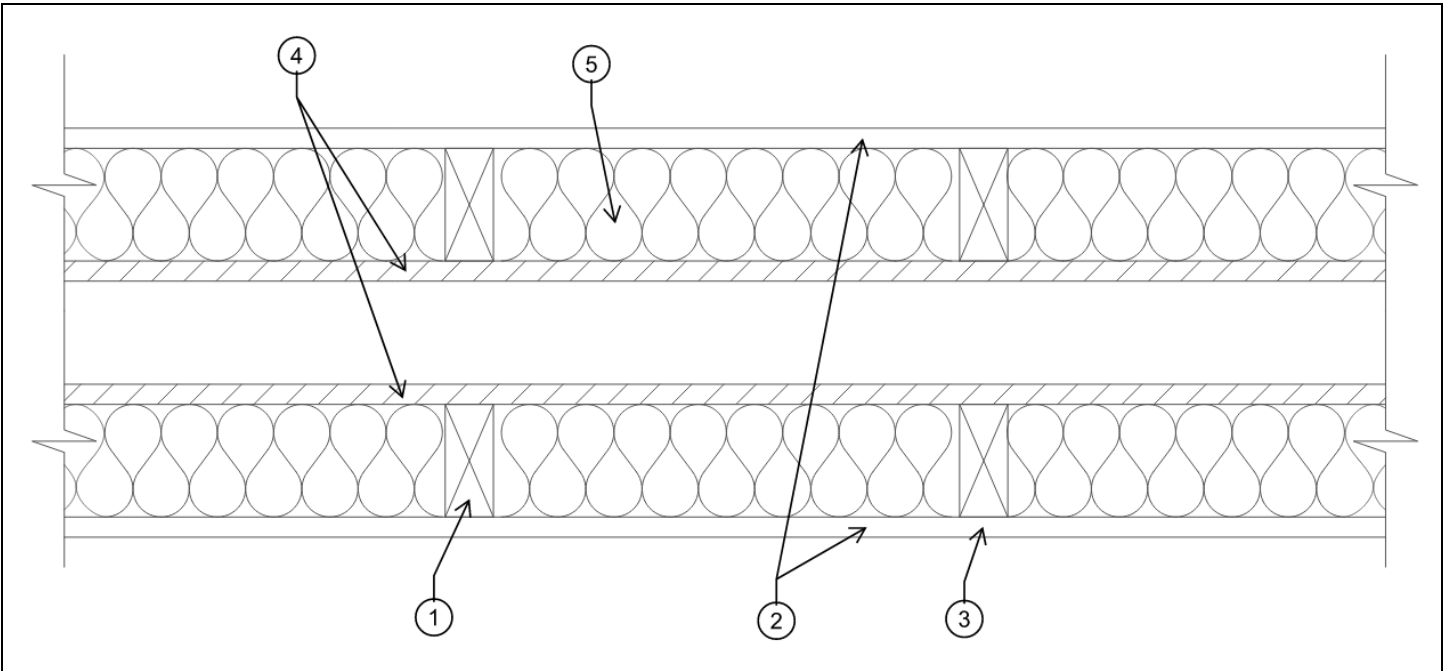
TABLE 1. ONE HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN NO. U364, U397, V306



1. Wood Studs – nominal 2x4, minimum spacing 16" o.c. (406 mm), maximum spacing 24" o.c. (610 mm)
2. Gypsum Board
 - a. Type: X GWB, 5/8" (15.9 mm) thick
 - b. Oriented: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. at perimeter edges and field
3. Cavity Insulation
 - a. Type: Glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Siding including vinyl, fiber cement siding
 - b. Molded Plastic – Particle Board Siding
 - c. Wood Structural Panel or Lap Siding
 - d. Cementitious Stucco
 - e. Brick Veneer
 - f. Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Oriented: vertically on exterior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Spacing: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Sheathing
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

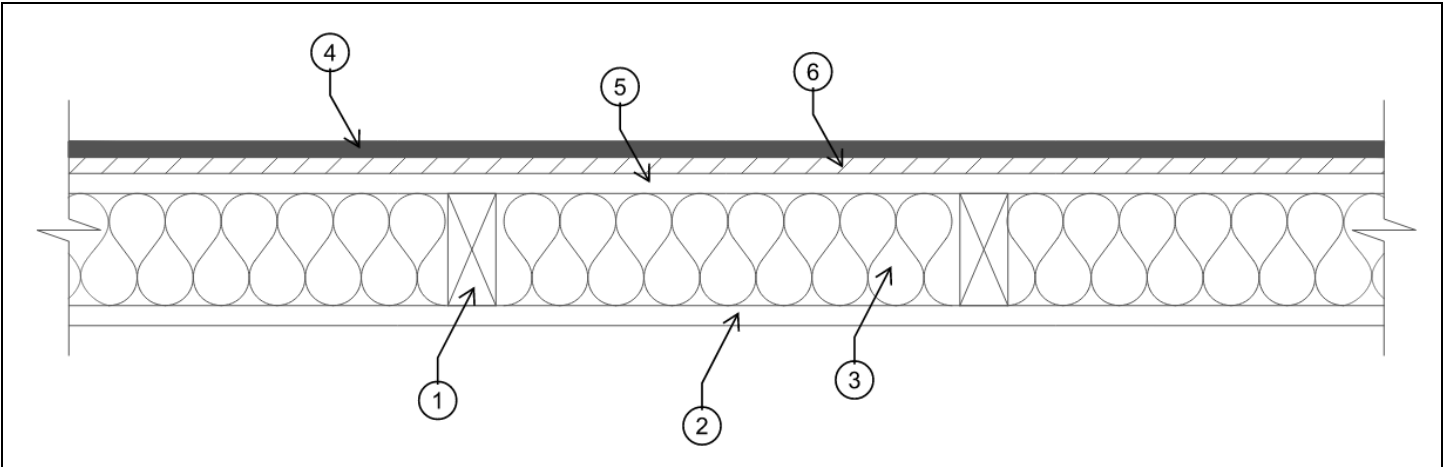
5.3 Wood – One Hour Fire Rating – Load Bearing

TABLE 2. ONE HOUR FIRE RATING FROM INTERIOR – UL DESIGN NO. U341



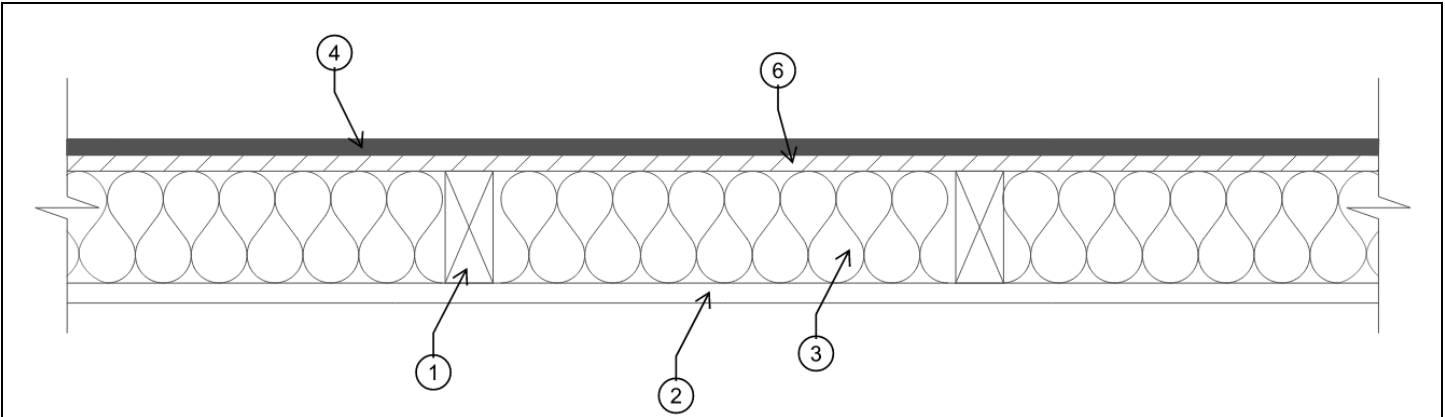
1. Wood Studs – nominal 2x4, maximum spacing 24" o.c. (610 mm), two rows.
2. Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically or horizontally on each side
 - c. Fastener: GWB to studs using 1 7/8" (48 mm) 6d cement coated nails or No. 6 bugle head drywall screws
 - d. Fastener Space: 7" (178 mm) o.c. at perimeter edges and field
3. Joints - Gypsum joints must be finished with joint compound and tape. Fastener heads must be covered with joint compound.
4. Sheathing – (optional) septum may be sheathed 1/2" OX-IS® structural insulation panels, installed per [TER 0804-01](#)
5. Cavity Insulation – cavity insulation is not required where sheathing is used on both halves of wall.
 - a. Type: glass or mineral fiber batt insulation
 - b. Thickness: 3 1/2" (89 mm) max – used in each row of studs.

TABLE 3. ONE HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN No. U354



1. Wood Studs – nominal 2x4, maximum spacing 16" o.c. (406 mm), nominal 2x6 maximum spacing 24" o.c. (610 mm).
2. Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically or horizontally on interior side
 - c. Joints: centered over studs. Joints must be finished with joint compound and tape. Fastener heads must be covered with joint compound.
 - d. Fastener: GWB to studs using 1 1/8" (48 mm) 6d cement coated nails or No. 6 bugle head drywall screws
 - e. Fastener Space: 7" (178 mm) o.c. at perimeter edges and field
3. Cavity Insulation
 - a. 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
 - a. Aluminum Siding: 0.019" min. thick painted aluminum meeting AAMA 1402.
 - b. Steel Siding: 0.017" min. thick (no. 17 GSG gauge) painted steel.
 - c. Vinyl siding: 0.035" min. thick. UL Classified exterior plastic siding (Molded Plastic).
 - d. Wood siding: 0.313" min. thick lumber, plywood or OSB based siding.
 - e. Hardboard siding: 0.250" min. thick hardboard UL Classified exterior hardboard siding.
 - f. Fiber cement siding: 0.250" min. thick fiber-cement based siding.
 - g. Stone: 2.0" min (natural stone) or 1.5" min (cast artificial) thick stone.
 - h. Brick Veneer: 2.0" min thick brick units. Fastened over foam plastic sheathing to wood studs with metal ties.
 - i. Concrete Masonry Veneer: 2.0" min thick concrete masonry units. Fastened over foam plastic sheathing to wood studs with metal ties.
 - j. Stucco: Portland cement type — 0.750" min thickness. Metal lath or mesh base fastened over foam plastic sheathing to wood studs.
 - k. One-Coat Stucco: 0.375" minimum thickness. Wire fabric lath fastened over foam plastic sheathing to wood studs.
 - l. 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
 - a. Type: X GWB 5/8" (15.9 mm) thick (paper or glass matt facers, square or tapered edges)
 - b. Orientation: vertically or horizontally on exterior side
 - c. Joints: centered over studs staggered from back layer
 - d. Fastener: GWB to studs using 1 1/8" (48 mm) 6d cement coated nails or No. 6 bugle head screws
 - e. Fastener Spacing: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Sheathing
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

TABLE 4. ONE HOUR FIRE RATING FROM INTERIOR – LIMITED LOAD BEARING, OPTION 1 – UL DESIGN No. U356

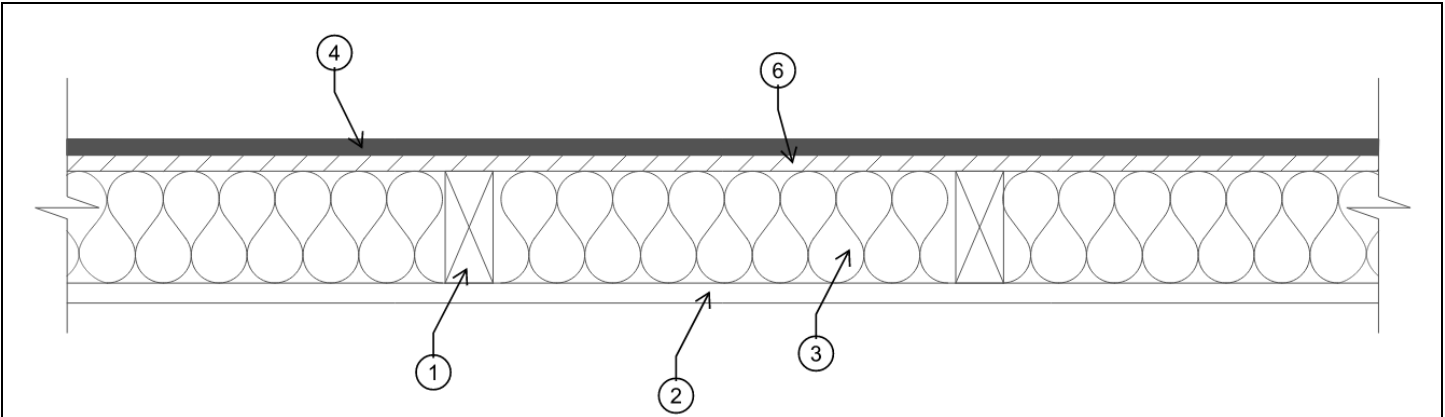


This wall assembly is restricted to 55% of the allowable load. This results in a wall assembly permitted to be built as follows:

- 8' wall heights can be loaded to a maximum of 1,800 lbs. per stud (1,350 plf).
- 9' wall heights can be loaded to a maximum of 1,180 lbs. per stud (885 plf).

1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Siding including vinyl, fiber cement siding
 - b. Molded Plastic – Particle Board Siding
 - c. Wood Structural Panel or Lap Siding
 - d. Cementitious Stucco
 - e. Brick Veneer
 - f. Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing – not used
6. Sheathing – when the following are considered as bracing for the studs, the load is restricted to 55% of the allowable load.
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

TABLE 5. ONE HOUR FIRE RATING FROM INTERIOR – LIMITED LOAD BEARING, OPTION 2 – UL DESIGN No. U356

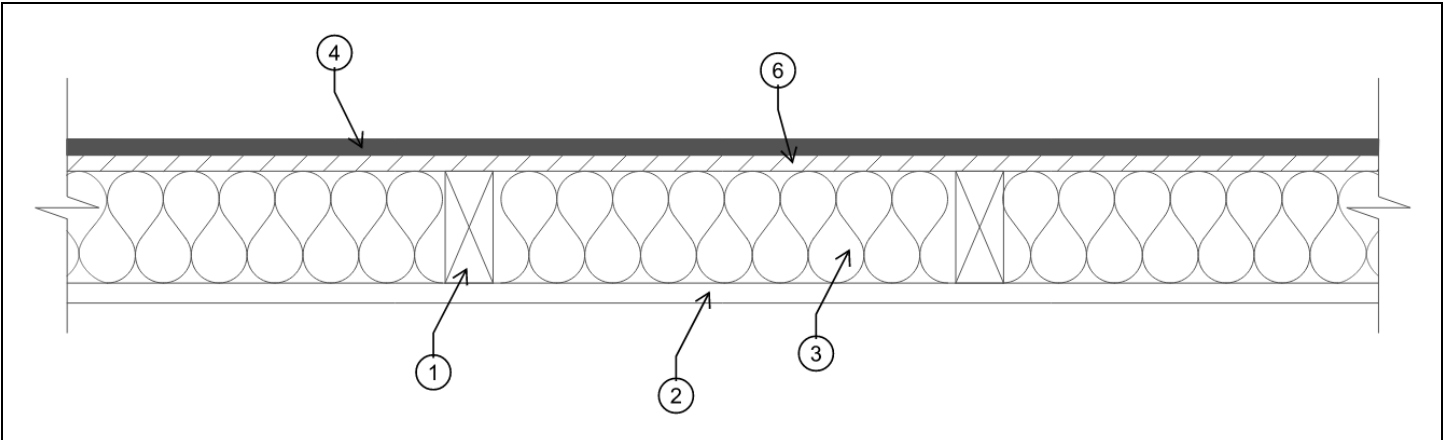


This wall assembly is restricted to 55% of the allowable load. This results in a wall assembly permitted to be built as follows:

- 8' wall heights can be loaded to a maximum of 1,800 lbs. per stud (1,350 plf).
- 9' wall heights can be loaded to a maximum of 1,180 lbs. per stud (885 plf).

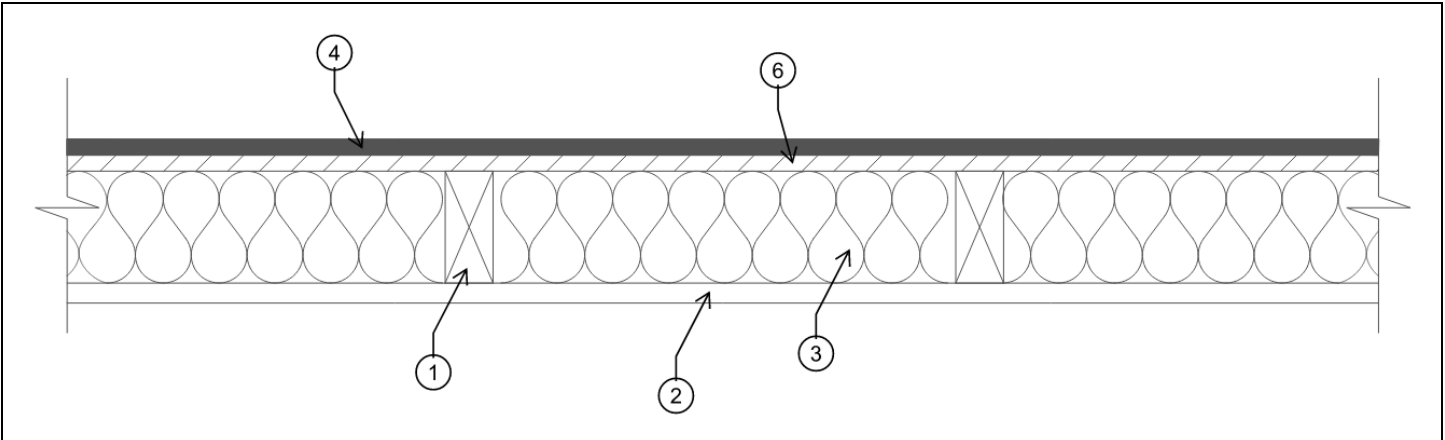
1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board
 - a. Type: Georgia-Pacific Firestop Type X GWB 5/8" (15.9 mm) thick OR Gold Bond® Fire-Shield® Type X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs
 - d. Fastener: GWB to studs using 2"-long 12½ ga annular ringed GWB nails with 19/64"-diameter heads and long diamond points
 - e. Fastener Space: 6" (152 mm) o.c. on perimeter edges and 12" (305 mm) o.c. on intermediate studs
3. Cavity Insulation
 - a. Type: glass fiber
 - b. R-value: R-13
 - c. Minimum thickness: 3½" (92 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. 19/32"-thick by 4'-wide by 8'-long plywood panel siding OR
 - b. 0.024"-thick unbacked aluminum lap siding
5. Exterior Gypsum Sheathing – not used
6. Sheathing – when the following are considered as bracing for the studs, the load is restricted to 55% of the allowable load.
 - a. Proprietary laminated fibrous board sheathing, the same structural sheathing component of OX-IS® and SI-Strong, fiber-based board faced on both sides
 - b. Thickness: minimum of 0.113"-thick
 - c. Oriented: vertically with butt joints over studs
 - d. 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
 - e. Fastener Space: 3" (76 mm) o.c. around the perimeter of each sheet and 6" (152 mm) o.c. on the intermediate studs

TABLE 6. ONE HOUR FIRE RATING FROM INTERIOR – UL DESIGN NO. U356



1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Siding including vinyl, fiber cement siding
 - b. Molded Plastic – Particle Board Siding
 - c. Wood Structural Panel or Lap Siding
 - d. Cementitious Stucco
 - e. Exterior Insulation and Finish System (EIFS)
 - f. Brick Veneer
5. Exterior Gypsum Sheathing – not used
6. Sheathing
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

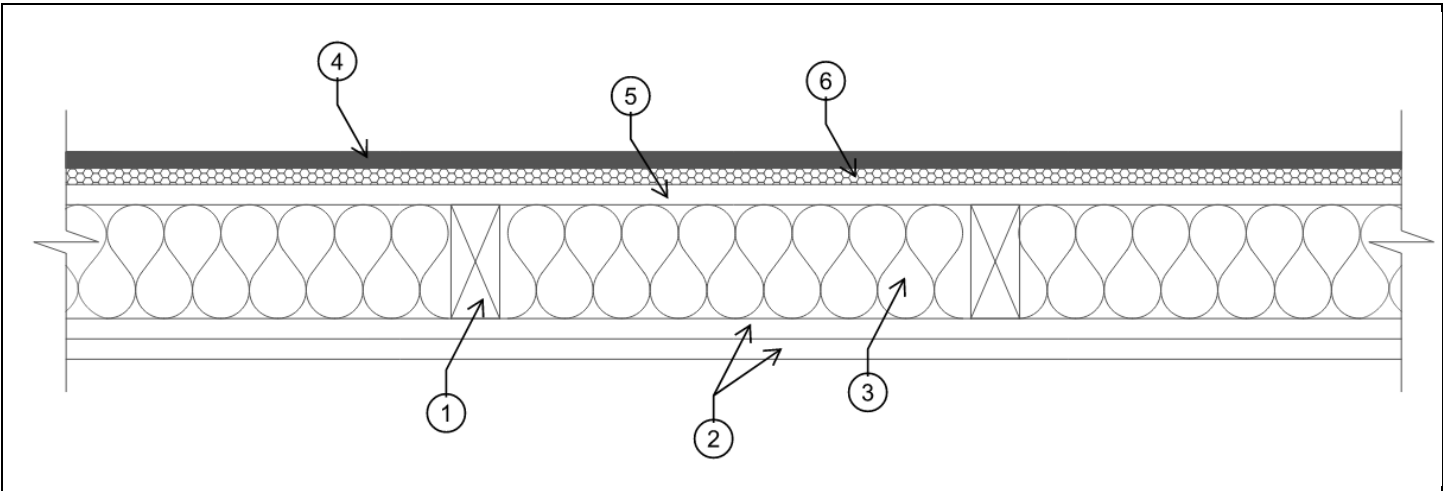
TABLE 7A. ONE HOUR FIRE RATING FROM INTERIOR OR EXTERIOR— UL DESIGN NO. U356



1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Brick Veneer
5. Exterior Gypsum Sheathing – not used
6. Sheathing
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

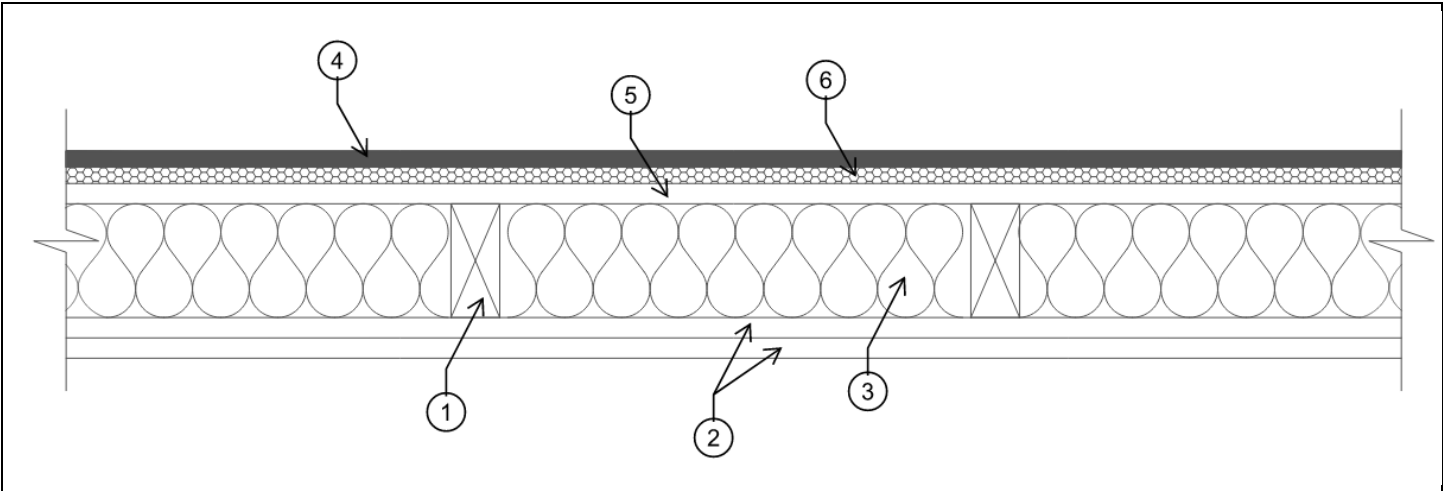
5.4 Wood – Two Hour Fire Rating – Load Bearing

TABLE 8. TWO HOUR FIRE RATING FROM INTERIOR – UL DESIGN NO. U364, U397, V306



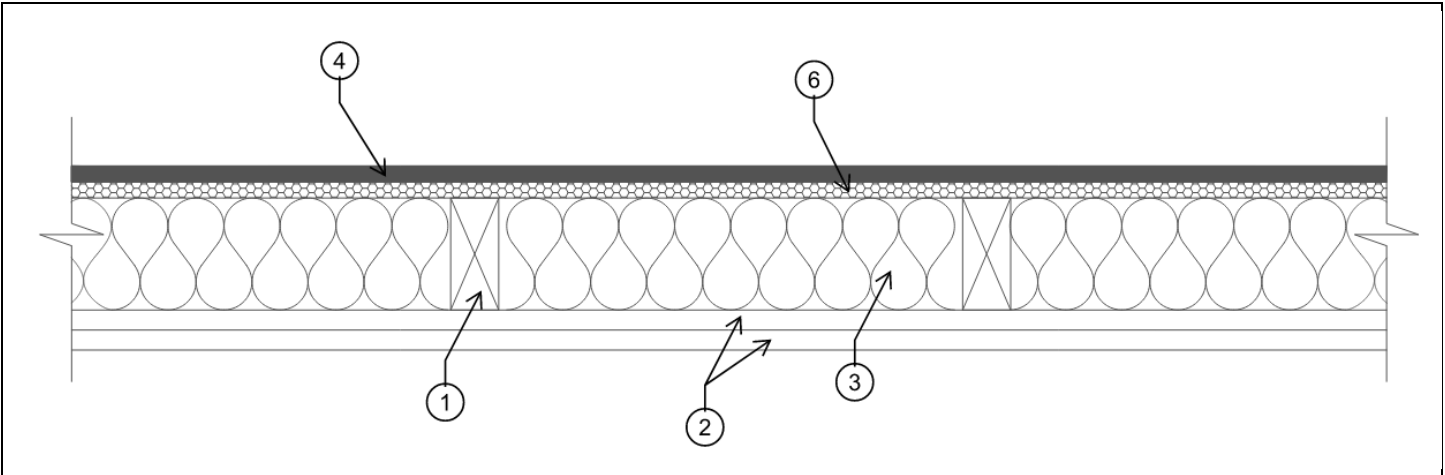
1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c., maximum spaced 24" (610 mm) o.c.
2. Gypsum Board – requires two GWB layers
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener Interior Layer: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field
 - f. Fastener Secondary Layer: using 2 3/8" (61 mm) 8d nails or screws, 8" (203 mm) o.c.
 - g. Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
 - d. Option: BASF spray polyurethane foam insulation is allowed per U397.
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Siding including vinyl, fiber cement siding
 - b. Molded Plastic – Particle Board Siding
 - c. Wood Structural Panel or Lap Siding
 - d. Cementitious Stucco
 - e. Brick Veneer
 - f. Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on exterior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

TABLE 9. TWO HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN NO. U364, U397, V306



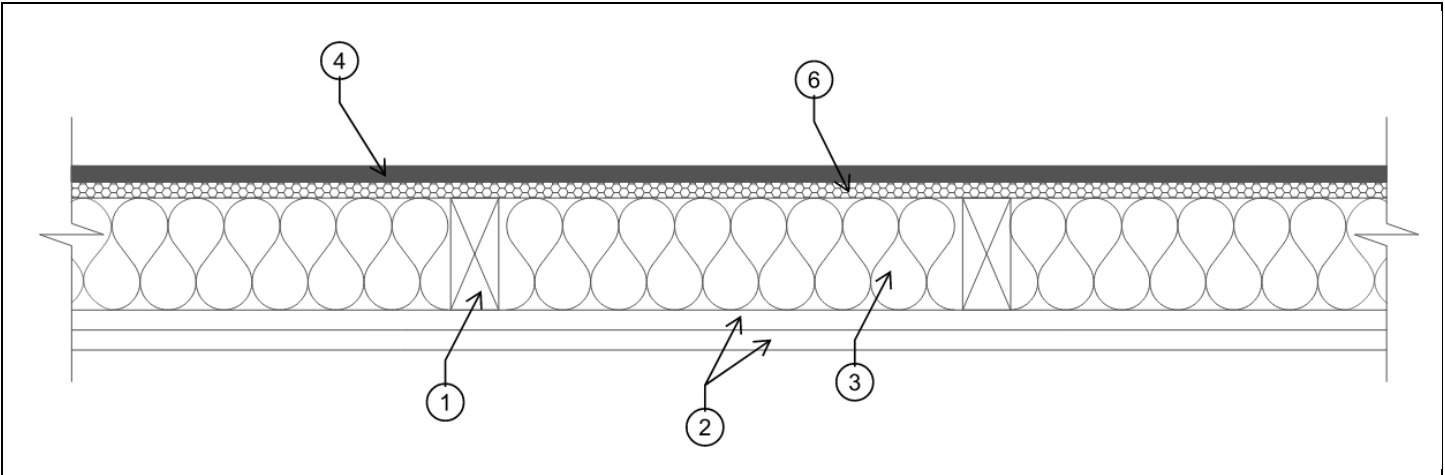
1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c., maximum spaced 24" (610 mm) o.c.
2. Gypsum Board – requires two GWB layers
 - a. Type: X GWB $\frac{5}{8}$ " (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener Interior Layer: GWB to studs using $1\frac{1}{8}$ " (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field
 - f. Fastener Secondary Layer: using $2\frac{3}{8}$ " (61 mm) 8d nails or screws, 8" (203 mm) o.c.
 - g. Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: $3\frac{1}{2}$ " (89 mm)
 - d. Option: BASF spray polyurethane foam insulation is allowed per U397.
4. Exterior Cladding – Brick veneer installed in accordance with the manufacturer's installation instructions and U356
5. Exterior Gypsum Sheathing
 - a. Type: X GWB $\frac{5}{8}$ " (15.9 mm) thick
 - b. Orientation: vertically on exterior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener: GWB to studs using $1\frac{1}{8}$ " (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 7" (178 mm) o.c. on perimeter edges and field
6. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

TABLE 10. TWO HOUR FIRE RATING FROM INTERIOR – UL DESIGN NO. U356



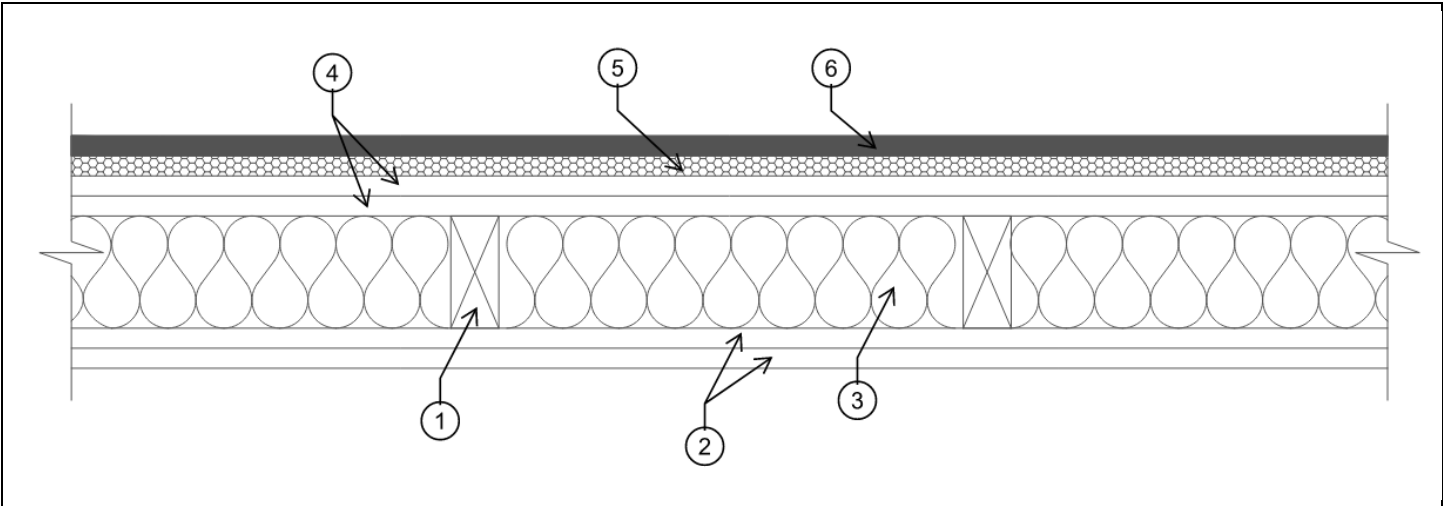
1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board – requires two GWB layers
 - a. Type: X GWB $\frac{5}{8}$ " (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener Interior Layer: GWB to studs using $1\frac{1}{8}$ " (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field
 - f. Fastener Secondary Layer: using $2\frac{3}{8}$ " (61 mm) 8d nails or screws, 8" (203 mm) o.c.
 - g. Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: $3\frac{1}{2}$ " (89 mm)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U356
 - a. Siding including vinyl, fiber cement siding
 - b. Molded Plastic – Particle Board Siding
 - c. Wood Structural Panel or Lap Siding
 - d. Cementitious Stucco
 - e. Brick Veneer
 - f. Exterior Insulation and Finish System (EIFS)
5. Exterior Gypsum Sheathing – not used
6. Exterior Insulation – when the following are considered as bracing for the studs, the load is restricted to 55% of the allowable load.
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

TABLE 11. TWO HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN NO. U356



1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board – requires two GWB layers
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener Interior Layer: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space Interior Layer: 7" (178 mm) o.c. on perimeter edges and field
 - f. Fastener Secondary Layer: using 2 3/8" (61 mm) 8d nails or screws, 8" (203 mm) o.c.
 - g. Fastener Space Secondary Layer: 8" (203 mm) o.c.
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
4. Exterior Cladding – Brick veneer installed in accordance with the manufacturer's installation instructions and U356
5. Exterior Gypsum Sheathing – not used
6. Exterior Insulation – when the following are considered as bracing for the studs, the load is restricted to 55% of the allowable load.
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

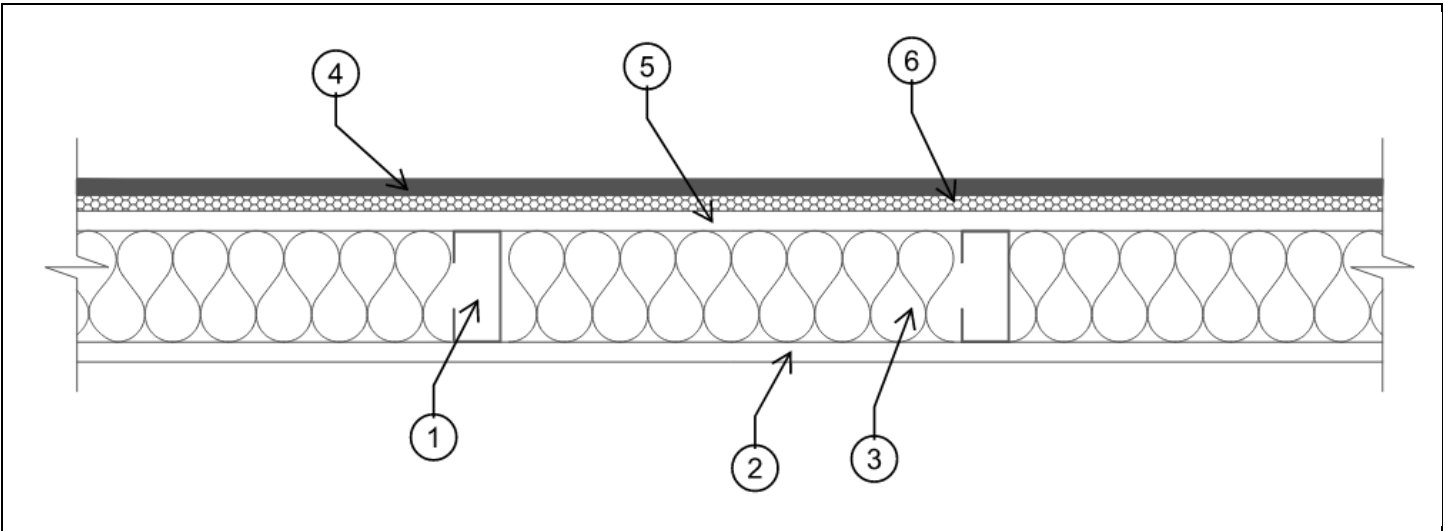
TABLE 12. TWO HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN NO. U301



1. Wood Studs – nominal 2x4, minimum spaced 16" (406 mm) o.c.
2. Gypsum Board – requires two GWB layers
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically or horizontally on interior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud
 - d. Fastener Interior Layer: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space Interior Layer: 6" (152 mm) o.c. on GWB edges and at intermediate studs
 - f. Fastener Face Layer: using 2 3/8" (61 mm) 8d nails or screws
 - g. Fastener Space Face Layer: 8" (203 mm) o.c. on perimeter and field
3. Cavity Insulation
 - a. Type: glass fiber or mineral wool
 - b. R-value: R-13
 - c. Minimum Thickness: 3 1/2" (89 mm)
 - d. Option(s): various SPF's are allowed; SES, or equivalent spray foam, is allowed per U301.
4. Exterior Gypsum Sheathing – 2 layers
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically or horizontally on exterior side
 - c. Joints: centered over studs and staggered 1 stud cavity on opposite side of stud and interior GWB joints
 - d. Fastener Interior Layer: GWB to studs using 1 7/8" (48 mm) 6d nails or No. 6 Type W screws
 - e. Fastener Space: 6" (152 mm) o.c. on GWB edges and at intermediate studs
 - f. Fastener Face Layer: using 2 3/8" (61 mm) 8d nails or screws
 - g. Fastener Space Face Layer: 8" (203 mm) o.c. on perimeter and field
5. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)
6. Exterior Cladding – any code-approved exterior cladding may be used.

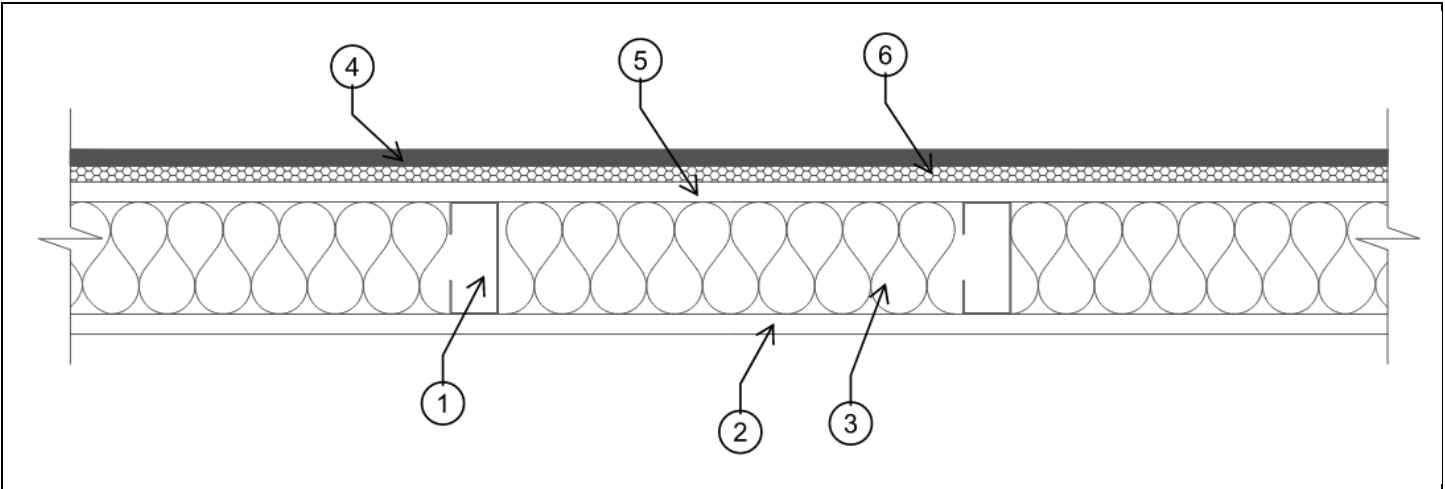
5.5 Steel – One Hour Fire Rating – Load Bearing

TABLE 13. ONE HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – 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)
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Oriented: vertically on interior side
 - c. Joints: centered over studs
 - d. Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws
 - e. Fastener Space: 12" (178 mm) o.c. on perimeter edges and field
3. Cavity Insulation
 - a. Type: any UL-classified glass fiber batt, mineral wool or sprayed cellulosic fiber
 - b. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U425
 - c. Siding including aluminum, steel, brick or stucco
 - d. Cementitious Backer Units
 - e. Fiber-Cement Siding
 - f. Molded Plastic
 - g. Wood Structural Panel or Lap Siding
 - h. Building Units (Cellular Glass Blocks)
4. Exterior Cladding – installed in accordance with the manufacturer's installation instructions and U425
 - a. Siding including aluminum, steel, brick or stucco
 - b. Cementitious Backer Units
 - c. Fiber-Cement Siding
 - d. Molded Plastic
 - e. Wood Structural Panel or Lap Siding
 - f. Building Units (Cellular Glass Blocks)
5. Exterior Gypsum Sheathing
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Oriented: vertically on exterior side
 - c. Joints: centered over studs staggered from back layer
 - d. Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws
 - e. Fastener Space: 12" (178 mm) o.c. along studs and tracks
6. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

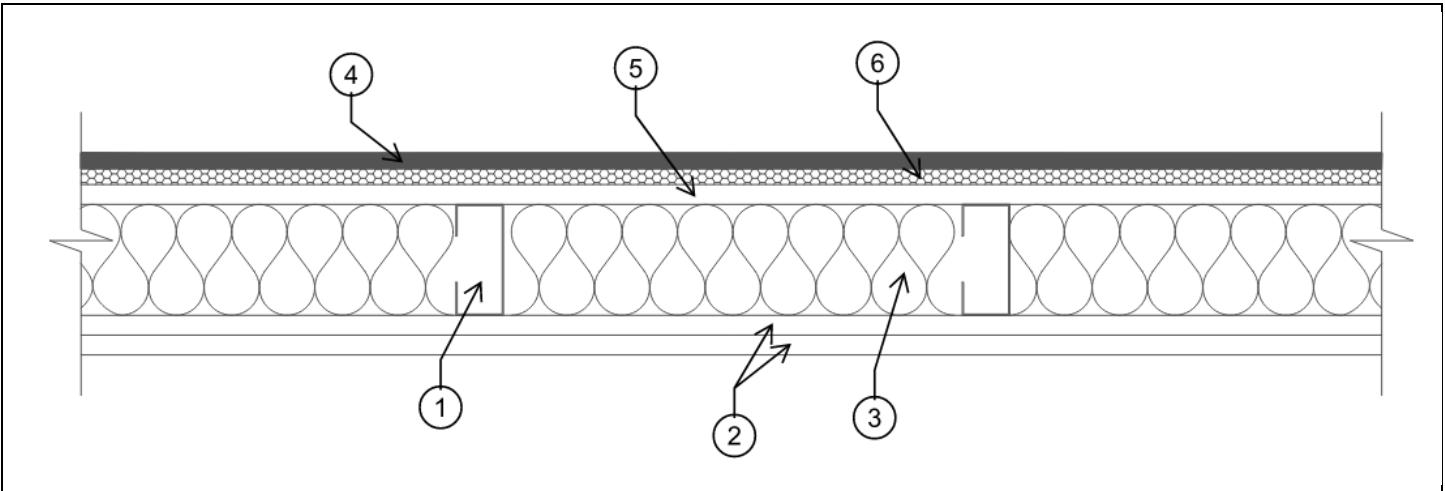
TABLE 14. ONE HOUR FIRE RATING FROM INTERIOR OR EXTERIOR – UL DESIGN NO. V454



1. Steel Studs – minimum 20 ga., spaced maximum 24" (610 mm) o.c.
2. Interior Gypsum Board
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Orientation: vertically on interior side
 - c. Joints: centered over studs staggered from exterior gypsum sheathing joints
 - d. Fastener: GWB to studs using Type S 1" (25.4 mm) self-drilling, self-tapping steel screws
 - e. Fastener Space: 8" (203 mm) o.c. on perimeter edges and 12" (305 mm) o.c. in the field
3. Cavity Insulation
 - a. 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
 - a. 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
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Oriented: vertically on exterior side
 - c. Joints: centered over studs staggered from interior GWB
 - d. Fastener: GWB to studs using Type S 1" (25.4 mm) self-drilling, self-tapping steel screws
 - e. Fastener Space: 8" (203 mm) o.c. on perimeter edges and 12" (305 mm) o.c. in the field
6. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

5.6 Steel – Two Hour Fire Rating – Load Bearing

TABLE 15. TWO HOUR FIRE RATING FROM INTERIOR – UL DESIGN NO. U425



1. Steel Studs – minimum 20 ga., spaced 24" (610 mm) o.c. maximum
2. Interior Gypsum Board
 - a. 2 Layers – 2 hours (80% of design load)
 - b. Type: X GWB 5/8" (15.9 mm) thick
 - c. Oriented: vertically on interior side
 - d. Joints: centered over studs and staggered 1 stud cavity between layers
 - e. 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 1-5/8" self-tapping bugle head sheet steel screws in second layer.
 - f. Fastener Space: 12" (178 mm) o.c. on perimeter edges and field.
3. Cavity Insulation
 - a. 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
 - a. Siding including aluminum, steel, brick or stucco
 - b. Cementitious Backer Units
 - c. Fiber-Cement Siding
 - d. Molded Plastic
 - e. Wood Structural Panel or Lap Siding
 - f. Building Units (Cellular Glass Blocks)
5. Exterior Gypsum Sheathing
 - a. Type: X GWB 5/8" (15.9 mm) thick
 - b. Oriented: vertically on exterior side
 - c. Joints: centered over studs staggered from back layer
 - d. Fastener: GWB to studs using Type S-12 1" (25.4 mm) self-tapping bugle head sheet steel screws
 - e. Fastener Space: 12" (178 mm) o.c. along studs and tracks
6. Exterior Insulation
 - a. Thermo-Ply® – installed per [TER 1004-01](#)
 - b. OX-IS® or SI-Strong up to 1" (25.4 mm) thick – installed per [TER 0804-01](#)
 - c. Strong-R® up to 2" (51 mm) thick – installed per [TER 1808-02](#)
 - d. ISO RED ci® up to 2" (51 mm) thick or ISO RED MAX® up to 4" (102 mm) thick – installed per [TER 1306-02](#)

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 5.2, Section 5.3, and Section 5.5.
- 6.2.3.2 The two hour rated wall assembly shall be constructed as described in Section 5.4 and Section 5.6.
- 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 1004-01.
- 6.2.3.5 OX-IS® and SI-Strong shall be installed per TER 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 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 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 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 Fire rating performance testing in accordance with *ASTM E119*
- 7.1.2 Engineering evaluation of equivalent design for one or two hour fire rated wall assemblies in accordance with *ASTM E2032*
- 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 method of construction 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 As a component element of one and two hour fire rated wall assemblies as described in Section 5.
- 8.2 This method of construction 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 TER, they are listed here.
- 8.2.1 No known variations
- 8.3 Building codes require data from valid research reports be obtained from approved sources (i.e., licensed registered design professionals [RDPs]).
- 8.3.1 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.
- 8.4 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.
- 8.5 Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain method of construction approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – “certified once, accepted everywhere.”
- 8.6 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...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 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 RDP).
- 9.4 At a minimum, this method of construction shall be installed per Section 6 of this TER.
- 9.5 This method of construction 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.
- 9.6 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.
- 9.7 This TER shall be reviewed for code compliance by the AHJ in concert with IBC Section 104.
- 9.8 The implementation of this TER for this method of construction 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](#).