



#1131
ISO/IEC 17065
Product Certification Body

**Ox ISO RED CI, ISO RED MAX, ISO RED MAX WF,
ISO RED MAX LD & ISO RED MAX HD Foam Plastic
Insulating Sheathing**

TER No. 1306-02
Formerly TER No. 1411-01

Ox Engineered Products, LLC

1255 N. 5th St.
Charleston, IL 61920
269-435-2425
oxengineeredproducts.com

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 20 00 – Thermal Protection
Section: 07 21 00 – Building Insulation
Section: 07 22 00 – Roof and Deck Insulation
Section: 07 25 00 – Water-Resistive Barriers
Section: 07 27 00 – Air Barriers

1. Products Evaluated:

- 1.1. ISO RED CI Polyiso Foam Insulated Sheathing
- 1.2. ISO RED MAX Polyiso Foam Insulated Sheathing
- 1.3. ISO RED MAX WF Polyiso Foam Insulated Sheathing
- 1.4. ISO RED MAX LD Polyiso Foam Insulated Sheathing
- 1.5. ISO RED MAX HD Polyiso Foam Insulated Sheathing
- 1.6. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.7. 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](#).
- 1.8. 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

DrJ is a Professional Engineering Approved Source

Learn more about DrJ's Accreditation

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with IBC Section 1703.

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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](#).

- 1.9. 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.
- 1.10. DrJ's code compliance work:
 - 1.10.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
 - 1.10.2. 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:¹

- 2.1. 2012, 2015 and 2018 International Building Code (IBC)
- 2.2. 2012, 2015 and 2018 International Residential Code (IRC)
- 2.3. 2012, 2015 and 2018 International Energy Conservation Code (IECC)
- 2.4. ANSI/FS100 – Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies
- 2.5. ASTM C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation, Method 1, Procedure B
- 2.6. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board (Tensile Strength, and Water Absorption)
- 2.7. ASTM C518 – Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- 2.8. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board
- 2.9. ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging (Dimensional Stability)
- 2.10. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- 2.11. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials, Desiccant Method
- 2.12. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
- 2.13. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- 2.14. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- 2.15. ASTM E1354 – Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- 2.16. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials
- 2.17. NFPA 259 – Standard Test Method for Potential Heat of Building Materials
- 2.18. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies Containing Combustible Components
- 2.19. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

¹ 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](#).

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2.20. AAMA 711-13 – Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products

3. Performance Evaluation:

3.1. ISO RED CI has been evaluated to determine:

- 3.1.1. Wind pressure resistance performance for use as part of an exterior wall covering assembly in accordance with [IRC Section R703.3](#), [IBC Section 1404.8](#), and [ANSI/FS100](#).
- 3.1.2. Performance in accordance with the foam plastic requirements of [IRC Section R316](#) and [IBC Section 2603](#).
- 3.1.3. Performance for use as continuous insulating sheathing in accordance with [IRC Section N1102](#) and [IECC Section C402](#).
- 3.1.4. Performance for use as a water-resistive barrier (WRB) in accordance with [IRC Section R703.2](#) and [IBC Section 1404.2](#).
- 3.1.5. Performance for use as a vapor retarder in accordance with [IRC Section R202](#) and [R702.7](#), and [IBC Section 202](#) and [1405.3](#).
- 3.1.6. Performance for use as an air barrier in accordance with [IECC Section C402](#).
- 3.1.7. Performance of ISO RED CI for vertical and lateral fire propagation is outside the scope of this TER.

3.2. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD have been evaluated to determine:

- 3.2.1. Performance in accordance with the foam plastic requirements of [IRC Section R316](#) and [IBC Section 2603](#).
- 3.2.2. Performance for use as continuous insulating sheathing in accordance with [IRC Section N1102](#) and [IECC Section C402](#).
- 3.2.3. Performance for use as a vapor retarder in accordance with [IRC Section R202](#) and [R702.7](#), and [IBC Section 202](#) and [1405.3](#).
- 3.2.4. Performance for use as an air barrier in accordance with [IECC Section C402](#).
- 3.2.5. Performance for use without a thermal barrier in accordance with [NFPA 286](#) and the acceptance criteria of [IBC Section 803.1.2](#).
- 3.2.6. Performance for vertical and lateral fire propagation in accordance with [NFPA 285](#) and [IBC Section 2603.5.5](#).
- 3.2.7. Performance of ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD for wind pressure resistance and for use as a WRB is outside the scope of this TER.

- 3.3. When used as over-sheathing² on light-frame, masonry, or concrete exterior walls, ISO RED is not required to meet the wind pressure resistance requirements of this TER.
- 3.4. This TER does not address wind pressure resistance requirements for ISO RED CI used as part of an Exterior Insulation Finish System (EIFS). Refer to the EIFS manufacturer's installation instructions for building code compliance.
- 3.5. These products shall comply with the material standards listed in [Section 4](#) and shall be applied to exterior wall construction in accordance with the general requirements of [Section 6](#). ISO RED CI shall also comply with the prescriptive wind pressure resistance requirements of [Section 5.2](#).
- 3.6. ISO RED CI used in accordance with this TER that is required to resist wind pressure in exterior wall covering assemblies shall also comply with the product marking requirements of [Section 9](#), and the conditions of use listed in [Section 8](#).

² As used in this TER, *over-sheathing* refers to the application of foam sheathing over and directly on the surface of wall sheathing material or solid wall construction, such as masonry or concrete, whereby the substrate is capable of resisting the full design transverse wind load required by the applicable building code or latest edition of the ASCE 7 standard. In addition, cladding is separately installed over foam sheathing in accordance with [Section 5.2](#). An over-sheathing application of foam sheathing does not require that the foam sheathing resist wind pressure in accordance with this TER.

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

4. Product Description and Materials:

4.1. ISO RED CI

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

4.1.2. ISO RED CI consists of a proprietary polyisocyanurate rigid board, with facers on both sides. The facers are designed with a base foil layer, with which layers of other material(s) are combined.

4.2. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD, ISO RED MAX HD

4.2.1. These products are Type 1, Class 2 Dual Faced Rigid Cellular Polyisocyanurate Insulation Board products as defined in *ASTM C1289*.

4.2.2. These products consist of a proprietary polyisocyanurate rigid board, with facers on both sides. The facers are designed with a base foil layer. Facer material thicknesses vary by product.



Figure 1: ISO RED CI & ISO RED MAX

4.3. Material Availability

4.3.1.1. Thickness:

4.3.1.1.1. ISO RED CI –range from 0.5" (12.7 mm) up to 2.0" (50.8 mm)

4.3.1.1.2. ISO RED MAX (including WF, LD and HD) – up to 4.0" (102 mm)

4.3.1.2. Standard product width: 48" (1219 mm)

4.3.1.3. Standard lengths: 96", 108" and 120" (2438, 2743 and 3048 mm)

5. Applications:

5.1. General

5.1.1. ISO RED CI is foam plastic insulating sheathing (FPIS) used as wall sheathing in accordance with [IRC Section R316](#) and [IBC Section 2603](#) for Type V construction.

5.1.2. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are foam plastic insulating sheathing (FPIS) used as wall sheathing in accordance with [IBC Section 2603](#) for Types I, II, III, IV, and V construction.

5.1.3. Except as provided for in [Section 5.6](#), ISO RED CI must be used with full protection from the interior of the building by an approved thermal barrier in accordance with [IRC Section R316.4](#) and [IBC Section 2603.4](#).

5.1.4. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are approved for use without the protection of a thermal barrier in accordance with [IBC Section 2603.10](#) and [IRC Section R316.6](#), when applied to walls or ceilings.

5.1.5. 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. Transverse Loads

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- 5.2.1. ISO RED CI may be used to resist wind loads transverse to the face of the wall, as shown in [Table 1](#).
- 5.2.2. Required component and cladding loads to be resisted are found in [/IRC Table R301.2\(2\)](#) and [R301.2\(3\)](#), and [IBC Section 1609.1.1](#).
- 5.2.3. As stated in [Section 3.2.6](#), performance of ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD for wind pressure resistance is outside the scope of this TER.

ISO RED CI Nominal Thickness (in.)	Transverse Wind Load Resistance ¹			
	Negative (-)	Positive (+)	Maximum Allowable Wind Speed	
	Maximum Allowable Design Value (psf)	Maximum Allowable Design Value (psf)	Per ASCE-7-05 (V _{asd}) (mph)	Per ASCE-7-10 (V _{ult}) (mph)
1"	40.1	38.1	125	160

1. Allowable wind speeds are based on the following: components and cladding loads, Exposure B, wall zone 5 (corner), 10 sq. ft. effective wind area, and mean roof height 30'. Loads are considered to be acting perpendicular to the surface of the building.
 2. Any required adjustments to these loads for other site conditions shall be in accordance with the applicable building code.
 3. Allowable design wind pressures are determined in accordance with *ANSI/FS100* with studs spaced a maximum of 16" o.c.

Table 1: Summary of Transverse Load Capacity of ISO RED CI

5.3. Thermal Resistance

- 5.3.1. ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are FPIS panels used as thermal insulation in wall, roof and ceiling assemblies.
- 5.3.2. These products meet the continuous insulating sheathing requirements complying with the provisions of [/IRC Section N1102](#) and [/IECC Section C402](#).
- 5.3.3. These products have the thermal properties shown in [Table 2](#).

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Product	Thickness (in.)	R-Value ¹
ISO RED CI	2.0"	13.0
	1.55"	10.0
	1.0"	6.5
	0.75"	5.0
	0.5"	3.3
ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD, and ISO RED MAX HD	4.0"	25.2
	3.5"	22.1
	3.0"	19.0
	2.5"	16.0
	2.0"	13.0
	1.55"	10.0
	1.0"	6.3
	0.75"	5.0
0.5"	3.2	

1" = 25.4 mm, 1 °F.ft².h/Btu = 0.176 °K.m².h/W
 1. Thermal values are determined using the ASTM C518 test method at 75°F mean temperature on material conditioned according to ASTM C1289 Section 11.1 (Degrees F.ft².h/Btu).

Table 2: Summary of Thermal Resistance of ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD

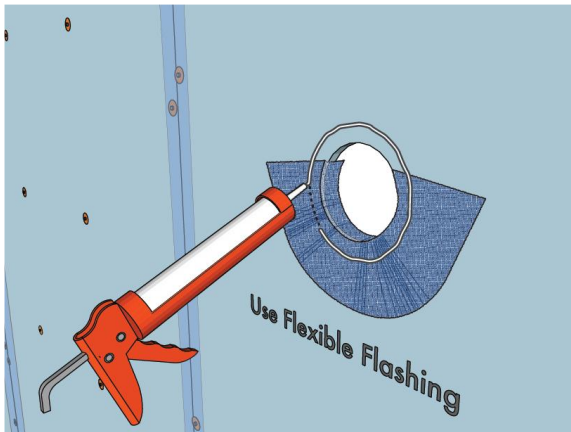
5.4. Air Barrier

- 5.4.1. Wall and ceiling assemblies constructed with ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are used to meet air barrier requirements in accordance with [IECC Section C402](#).
- 5.4.2. All penetrations shall be flashed and sealed in accordance with the flashing manufacturer's installation instructions. Self-adhered flashing tape shall meet AAMA 711 (FortiFlash Butyl or equivalent).
- 5.4.3. These products are defined as air barrier materials having an air permeance of less than 0.02 L/m².ft², in accordance with [IECC Section C402.5](#).

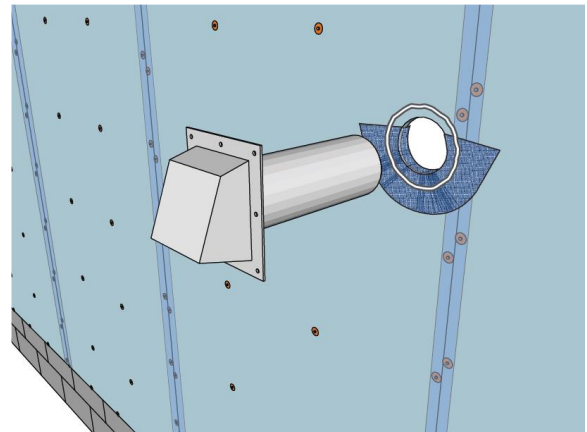
5.5. Water-Resistive Barrier

- 5.5.1. ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are approved WRBs in accordance with [IRC Section R703.2](#) and [IBC Section 1404.2](#) when installed with 2½"-wide 3M (8087), White 3M Venture 1558 HT, Venture 1520 CW Aluminum Foil Sheathing Tape or equivalent on all sheathing seams, 4" wide self-adhered flashing tape meeting AAMA 711 (FortiFlash Butyl or equivalent) with release liner may be required for effective taping of inside and outside corners. See the [manufacturer's product information](#) for further details.
- 5.5.2. ISO RED CI 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](#).
- 5.5.3. A separate WRB may also be provided. If a separate WRB method is used, taping of the sheathing joints is not required.
- 5.5.4. Flashing of penetrations shall comply with the applicable code and must be installed at all sheathing penetrations. Use qualified flashing material such as self-adhered flashing tape meeting AAMA 711 (3M All Weather Flashing Tape 8067 or equivalent). See [Figure 3](#), [Figure 4](#) and [Figure 5](#) for typical penetration flashing details.
- 5.5.5. Flashing Details – Typical Flanged and Unflanged Penetration and Flanged Window

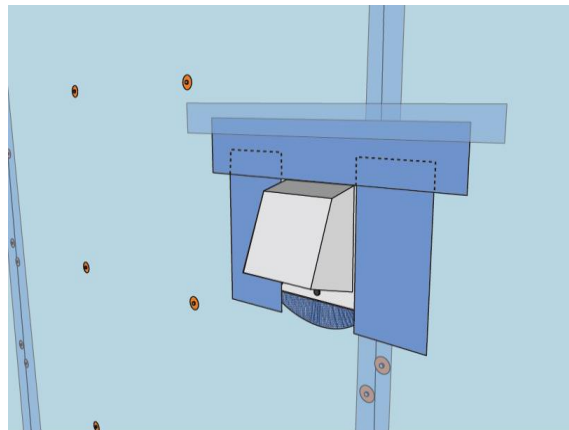
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STEP 1



STEP 2



STEP 3

Figure 3: Typical Penetration Flashing Detail – Flanged

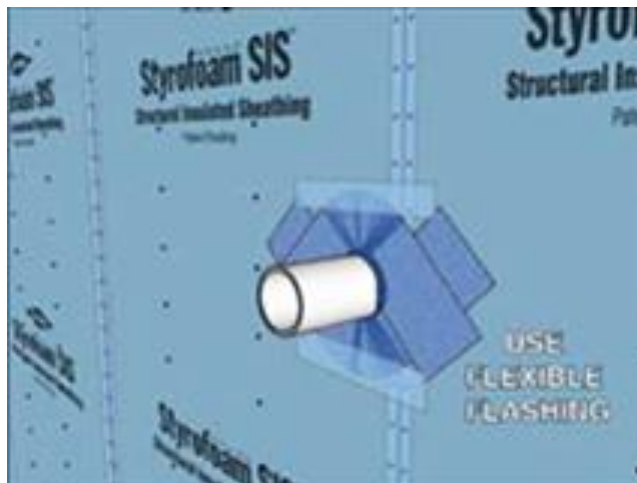


Figure 4: Typical Penetration Flashing Detail – Unflanged

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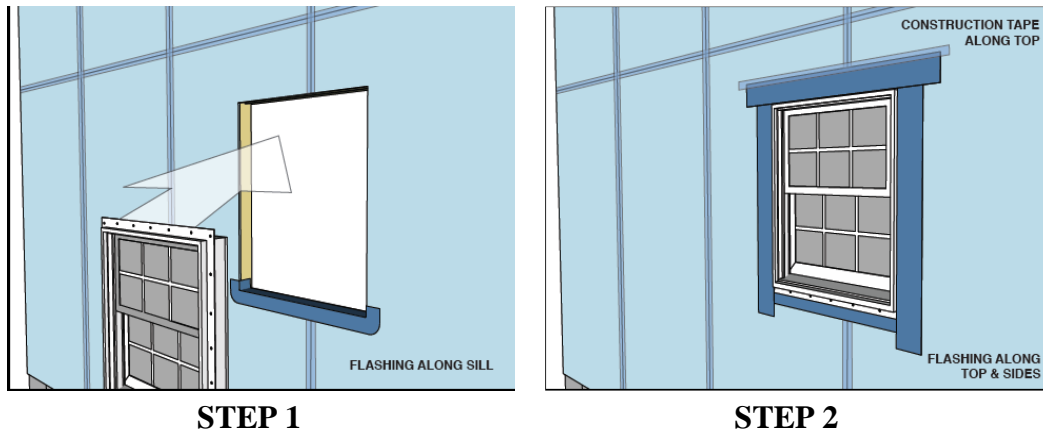


Figure 5: Typical Window Flashing Detail

5.6. Fire Safety Performance

5.6.1. Surface Burn Characteristics

5.6.1.1. ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD have the flame spread and smoke developed ratings as shown in [Table 3](#), when tested in accordance with *ASTM E84* per [IRC Section R316.3](#) and [IBC Section 2603.3](#).

Product	Flame Spread	Smoke Developed
ISO RED CI ¹	< 75	< 450
ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD ²	< 25	< 450
1" = 25.4 mm 1. Tested in accordance with <i>ASTM E84</i> , with maximum foam thickness of 2". 2. Tested in accordance with <i>ASTM E84</i> , with maximum foam thickness of 4".		

Table 3: Fire Performance of ISO RED CI & ISO RED MAX, ISO RED MAX WF and ISO RED MAX LD

5.6.2. Vertical and Lateral Fire Propagation

5.6.2.1. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD were tested to assess performance with regard to vertical and lateral fire propagation in accordance with *NFPA 285* and [IBC Section 2603.5.5](#).

5.6.2.2. Engineering analysis has also been conducted to assess substitution of other products within the approved wall assemblies.

5.6.2.3. The wall assemblies listed in [Table 4](#) and [Table 5](#) are approved for use in buildings of Type I-IV construction.

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NFPA 285 Approved Wall Assemblies¹	
Wall Component	Materials
Base Wall System Use either 1, 2, 3 or 4 Note: May use 4 optionally when FRTW framing is allowed by code.	1. Cast Concrete Wall 2. Concrete Masonry Wall 3. 20-gauge (min.) 3 ⁵ / ₈ " (min.) steel studs spaced 24" o.c. (max) a. 1 layer – 5/ ₈ "-thick Type X gypsum wallboard on interior b. Lateral bracing every 4' 4. Where allowed in Types I-IV construction, FRTW (Fire Retardant Treated Wood) studs complying with IBC Section 2303.2, minimum nominal 2x4 spaced at a maximum 16" o.c. a. 5/ ₈ " (min.) Type X gypsum wallboard interior. b. Wall braced at mid-height and fire-stopped at top and bottom.
Fire-Stopping in Stud Cavities at Floor Lines. Use 2 with FRTW framing.	1. Any approved 4 pcf mineral fiber based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth. 2. Solid FRTW fire blocking at floor line when Base Wall System, Item 4 is used.
Cavity Insulation Use any option 1-13	1. None 2. 1½" (min.) BASF Wallite™ 2 pcf SPF (or equivalent) up to full cavity fill. 3. 1½" (min.) Premium Spray Products Foamsulate 20 up to full cavity fill. 4. Any noncombustible insulation per ASTM E136. 5. Any mineral fiber (Batt or board type Class A ASTM E84 faced or unfaced). 6. Any fiberglass (Batt type Class A ASTM E84 faced or unfaced). 7. Icynene Classic, Classic Plus, Classic Ultra or Classic Ultra Select; MD-R-210; MD-C-200; or Proseal. Partial cavity fill with a max. air space of 2" or full cavity fill not exceeding 7 ⁵ / ₈ ". Use with ½" exterior gypsum sheathing (min.). 8. NCFI Polyurethanes, full cavity depth or less of InsulBloc, InsulStar, InsulStar Plus or ThermalStop™ closed cell (2.0 lb/ft ³) spray polyurethane foam applied using sheathing as substrate and covering the width of the cavity. Use with ½" exterior gypsum sheathing (min.). 9. SWD Urethane Quik-Shield 112 spray polyurethane foam applied using 5/ ₈ " Type X sheathing as substrate. Air gap must not exceed 2½". 10. Demilec Sealection 500 or HeatLok Soy 200, up to full cavity fill. Use with 5/ ₈ " Type X exterior gypsum sheathing. 11. Accella Polyurethane Bayseal® OC and OCX or Bayseal® CC, up to full cavity fill using minimum ½" exterior gypsum sheathing. 12. Lapolla™ Foam-Lok™ FL 2000 with 5/ ₈ " Type X exterior sheathing in 3 ⁵ / ₈ " studs (max.) 13. Any cavity insulation which has been tested per ASTM E1354 (at a min. of 20 kw/m ² heat flux) and shown by analysis to be of equivalent or lesser flammability (based on T _{ign} , Pk. HRR) than the foam tested in Item 2 or 3 above.
Exterior Sheathing Use either 1, 2 or 3 (with limitations noted in Cavity Insulation Allowances) Note: Exterior FRTW sheathing or gypsum wallboard is optional for Base Walls 1 and 2.	1. None 2. Minimum ½" exterior gypsum sheathing (unless 5/ ₈ " Type X exterior sheathing is otherwise specified with cavity insulations). 3. ½" (min.) FRTW structural panels complying with IBC section 2303.2 and installed in accordance with the code requirements for Types I-IV construction.
Water-Resistive Barrier Over Base Wall Use either 1, 2 or 3 Note: Item 3 applies when exterior gypsum sheathing is used.	1. None 2. WRB's over Steel Framing: a. Kingspan GreenGuard® Max Building Wrap b. Dupont Tyvek (Various per ESR 2375) c. Dow Weathermate™ d. Dow Weathermate™ Plus e. Ox ThermoPly 3. WRBs over exterior sheathing: a. Henry Air Bloc 32MR b. Henry Foilskin c. Henry MetalClad d. CCW 705 FR-A

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NFPA 285 Approved Wall Assemblies¹	
Wall Component	Materials
	<ul style="list-style-type: none"> e. Kingspan GreenGuard® Max Building Wrap f. Dupont Tyvek (various per ESR-2375) g. Dow Weathermate™ h. Dow Weathermate™ Plus i. Any WRB that has been tested per <i>ASTM E1354</i> (at a min. of 20 kw/m² heat flux) and shown by analysis to be of equivalent or lesser flammability (based on T_{ign}, Pk. HRR) than the exterior insulation foam core or baseline Item 3a above.
Exterior Insulation	Up to 4"-thick OX ISO RED MAX, consisting of a single panel or multiple thinner panels
WRB Over Exterior Insulation Use either 1 or 2	<ul style="list-style-type: none"> 1. Aluminum construction tape as tested (or equivalent), max. 6" wide over staggered insulation joints. 2. For use with all Exterior Cladding options as written below: <ul style="list-style-type: none"> a. Henry Foilskin b. Henry MetalClad c. CCW 705 FR-A d. Kingspan GreenGuard® Max Building Wrap e. Dupont Tyvek (various per ESR-2375) f. Dow Weathermate™ g. Dow Weathermate™ Plus h. Any WRB which has been tested per <i>ASTM E1354</i> (at a min. of 20 kw/m² heat flux) and shown by analysis to be of equivalent or lesser flammability (based on T_{ign}, Pk. HRR) than those listed above.
Exterior Cladding Use 1 through 6 Note: Masonry cladding items 2-6 do not employ an air gap or open joints.	<ul style="list-style-type: none"> 1. Brick – Nominal 4" clay brick or veneer with max. 2" air gap behind the brick. Brick ties/anchors 24" o.c. (max.). 2. Stucco – Minimum 3/4"-thick exterior cement plaster and lath with approved WRB over insulation. 3. Limestone – Minimum 2" thick, using any standard non-open joint installation technique such as shiplap. 4. Natural Stone Veneer – Minimum 2" thick using any standard non-open joint installation technique. 5. Terracotta Cladding – Minimum 1 1/4" thick (solid or equivalent by weight) using any standard non-open joint installation technique such as shiplap. 6. Cast Artificial Stone – Minimum 1 1/2" thick complying with <i>ICC-ES AC51</i> installed using any standard non-joint installation technique such as shiplap.
1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis by Priest & Associates Consulting, LLC. 2. Acceptance criteria for <i>ASTM E1354</i> testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis by Priest & Associates. 3. T _{ign} is the time to ignition from the start of the test until the sheathing ignites. Pk. HRR is the peak heat release rate during the test.	

Table 4: Approved NFPA 285 Wall Assemblies – Brick Cladding

NFPA 285 Approved Wall Assemblies¹	
Wall Component	Materials
Base Wall System Use either 1, 2, 3 or 4 Note: May use 4 optionally when FRTW framing is allowed by code	<ul style="list-style-type: none"> 1. Cast Concrete Wall 2. Concrete Masonry Wall 3. 20-gauge (min.) 3 5/8" (min.) steel studs spaced 24" o.c. (max) <ul style="list-style-type: none"> a. 1 layer – 5/8"-thick Type X gypsum wallboard on interior b. Lateral bracing every 4' 4. Where allowed in Types I-IV construction, FRTW (Fire Retardant Treated Wood) studs complying with IBC Section 2303.2, minimum nominal 2x4 spaced at a maximum 16" o.c. <ul style="list-style-type: none"> a. 5/8" (min.) Type X gypsum wallboard interior. b. Wall braced at mid-height and fire-stopped at top and bottom.
Fire-Stopping in Stud Cavities at Floor Lines. Use 2 with FRTW framing. Use either 1 or 2. As an option, use 2 with FRTW framing	<ul style="list-style-type: none"> 1. Any approved 4 pcf mineral fiber based safing insulation in each stud cavity at floor line. Safing thickness must match stud cavity depth. 2. Solid FRTW fire blocking at floor line when Base Wall System, Item 4 is used.
Cavity Insulation Use any option 1-13	<ul style="list-style-type: none"> 1. None 2. 1 1/2" (min.) BASF Wallite™ 2 pcf SPF (or equivalent) up to full cavity fill.

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NFPA 285 Approved Wall Assemblies¹	
Wall Component	Materials
	<ol style="list-style-type: none"> 3. 1½" (min.) Premium Spray Products Foamsulate 20 up to full cavity fill. 4. Any noncombustible insulation per <i>ASTM E136</i>. 5. Any mineral fiber (Batt or board type Class A <i>ASTM E84</i> faced or unfaced). 6. Any fiberglass (Batt type Class A <i>ASTM E84</i> faced or unfaced). 7. Icynene Classic, Classic Plus, Classic Ultra or Classic Ultra Select; MD-R-210; MD-C-200; or Proseal. Partial cavity fill with a max. air space of 2" or full cavity fill not exceeding 7⁵/₈". Use with ½" exterior gypsum sheathing (min.). 8. NCFI Polyurethanes, full cavity depth or less of InsulBloc, InsulStar, InsulStar Plus or ThermalStop™ closed cell (2.0 lb/ft³) spray polyurethane foam applied using sheathing as substrate and covering the width of the cavity. Use with ½" exterior gypsum sheathing (min.). 9. SWD Urethane Quik-Shield 112 spray polyurethane foam applied using 5/8" Type X sheathing as substrate. Air gap must not exceed 2½". 10. Demilec Sealection 500 or HeatLok Soy 200, up to full cavity fill. Use with 5/8" Type X exterior gypsum sheathing. 11. Accella Polyurethane Bayseal® OC and OCX or Bayseal® CC, up to full cavity fill using minimum ½" exterior gypsum sheathing. 12. Lapolla™ Foam-Lok™ FL 2000 with 5/8" Type X exterior sheathing in 3⁵/₈" studs (max.) 13. Any cavity insulation which has been tested per <i>ASTM E1354</i> (at a min. of 20 kw/m² heat flux) and shown by analysis to be of equivalent or lesser flammability (based on T_{ign}, Pk. HRR) than the foam tested in Item 2 or 3 above.
<p>Exterior Sheathing Use either 1, 2 or 3</p> <p>Note: Exterior FRTW sheathing or gypsum wallboard is optional for Base Walls 1 and 2.</p>	<ol style="list-style-type: none"> 1. Minimum ½" exterior gypsum sheathing (5/8" Type X exterior gypsum sheathing required when SPF in cavity). 2. ½" (min.) FRTW structural panels complying with IBC section 2303.2 and installed in accordance with the code requirements for Types I-IV construction.
<p>Water-Resistive Barrier Over Base Wall Use any item 1-8</p>	<ol style="list-style-type: none"> 1. None 2. Any WRB that has been tested per <i>ASTM E1354</i> (at a min. of 20 kw/m²) and shown by analysis to be of equivalent or lesser flammability (based on T_{ign}, Pk. HRR) than the exterior insulation foam core or baseline Item 3 below. 3. Henry Air Bloc 32MR 4. Kingspan GreenGuard® Max Building Wrap 5. Dupont Tyvek (Various per ESR-2375) 6. Dow Weathermate™ 7. Dow Weathermate™ Plus 8. WRBs over exterior sheathing: <ol style="list-style-type: none"> j. Henry Foilskin k. Henry MetalClad l. CCW 705 FR-A m. Kingspan GreenGuard® Max Building Wrap n. Dupont Tyvek (various per ESR-2375) o. Dow Weathermate™ p. Dow Weathermate™ Plus
<p>Exterior Insulation</p>	Up to 4"-thick OX ISO RED MAX, consisting of a single panel or multiple thinner panels
<p>WRB Over Exterior Insulation Use any item 1-5</p>	<ol style="list-style-type: none"> 1. None 2. Aluminum construction tape as tested (or equivalent), max. 6" wide over staggered insulation joints. 3. Henry Foilskin 4. Henry MetalClad 5. CCW 705 FR-A
<p>Exterior Cladding Use any item 1-11</p>	<ol style="list-style-type: none"> 1. Brick – Nominal 4" clay brick or veneer with max. 2" air gap behind the brick. Brick ties/anchors 24" o.c. (max.). 2. Stucco – Minimum ¾"-thick exterior cement plaster and lath with an optional secondary water resistive barrier between the exterior insulation and lath. The secondary barrier shall not be full coverage asphalt or self-adhered butyl membrane. 3. Limestone – Minimum 2" thick, using any standard installation technique. 4. Natural Stone Veneer – Minimum 2" thick using any standard installation technique.

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NFPA 285 Approved Wall Assemblies ¹	
Wall Component	Materials
	5. Cast Artificial Stone – Minimum 1 1/2" thick complying with <i>ICC-ES AC51</i> installed using any standard installation technique. 6. Terracotta Cladding – Minimum 1 1/4" thick, using any standard installation technique. 7. Any MCM, ACM (aluminum, steel, copper, zinc) (w/ 1 1/2" ± 1/2" air gap) that has successfully passed NFPA 285 using any standard installation technique. 8. Uninsulated sheet metal building panels including aluminum, steel or copper using any standard installation technique. 9. Uninsulated Fiber-cement siding using any standard installation technique. 10. Stone/Aluminum honeycomb composite building panels that have passed <i>NFPA 285</i> or equivalent (StoneLite Wall Panels by Stone Panels – ESR-1500) 11. Autoclaved-aerated-concrete (AAC) panels that have successfully passed <i>NFPA 285</i> using any standard installation technique.
1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis by Priest & Associates Consulting, LLC. 2. Acceptance criteria for <i>ASTM E1354</i> testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis by Priest & Associates. 3. T _{ign} is the time to ignition from the start of the test until the sheathing ignites. Pk. HRR is the peak heat release rate during the test.	

Table 5: Approved *NFPA 285* Wall Assemblies – ACM Cladding

5.6.3. Thermal Barrier

5.6.3.1. ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD boards with a maximum thickness of 4" were tested in accordance with *NFPA 286* and have met the acceptance criteria of [IBC Section 803.1.2.1](#) for use on walls or ceilings without a thermal barrier, in accordance with [IBC Section 2603.4](#) and [2603.5.2](#).

5.6.3.2. ISO RED CI shall be fully protected from the interior of the building by an approved 15-minute thermal barrier or ignition barrier as required by [IRC Section R316.4](#) and [IBC Section 2603.4](#), except as follows:

5.6.3.2.1. When installed in an attic, crawlspace or other uninhabitable space, ISO RED CI, at a maximum thickness of 2", is approved for use without a thermal barrier or ignition barrier. This includes, but is not limited to, knee and gable end walls.

5.6.3.2.2. Use without an approved thermal barrier or ignition barrier is limited to areas where:

5.6.3.2.2.1. ISO RED CI is installed on the walls only.

5.6.3.2.2.2. Access to the space is required by [IRC Section R807.1](#) or [R408.4](#).

5.6.3.2.2.3. Entry is made only for the purposes of repairs or maintenance.

6. Installation:

6.1. ISO RED CI, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD must be installed in accordance with the [manufacturer's installation instructions](#), the applicable code, and this TER. In the event of conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern. See [The Foam Sheathing Committee \(FSC\) Best Practices](#) guide for further details.

6.2. These products may be cut to size with a utility knife, hand saw, or power saw.

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Application ¹	Stud Spacing ² (in.)	Attachment Method	Fastener Spacing (in.)
Wood Framing	16" or 24"	Capped nails capped staples or roofing nails (~1" framing embedment)	12" perimeter 12" field
Metal Framing	16" or 24"	Corrosion-resistant self-tapping screws with 1" diameter cap or washer (~1" framing embedment)	12" perimeter 12" field
Interior Masonry or Concrete	N/A	Suitable construction adhesive or masonry fasteners with 1" diameter cap or washer or combination of adhesive & mechanical fasteners (~1" embedment into substrate)	Adhesive beads spaced 16" horizontally & full perimeter Mechanical fasteners 12" perimeter and 12" field spaced 16" horizontally
Exterior Masonry or Concrete Below Grade	N/A	Granular water-draining fill	Only as required to ensure intimate contact to masonry surface or water proofed surface

1" = 25.4 mm
 1. Butt panels tightly and seal all joints, where intrusion of bulk moisture or moisture vapor is undesirable, with sealant and/or approved tape.
 2. Panels used to resist transverse wind pressure or used as a WRB shall be installed on studs spaced a maximum of 16" o.c and all panel edges shall be located on framing or blocking.
 3. For required attachments in fire rated construction, consult the manufacturer's approved fire rated assembly details and refer to [Table 4](#)

Table 6: Attachment Information

- 6.3. Windows and doors shall be installed in accordance with the manufacturer's installation instructions.
- 6.4. Windows, door openings and other penetrations shall be flashed in accordance with [IRC Section R703.4](#) and [IBC Section 1405.4](#).
- 6.5. Follow the manufacturer's instructions for installation of claddings and rain screens over these products.
- 6.6. 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.

7. Test and Engineering Substantiating Data:

- 7.1. Evaluation and analysis of testing, data and reporting of thermal properties in accordance with *ASTM C518 – Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*, performed by LaserComp.
- 7.2. Evaluation and analysis of testing, data and reporting of material properties in accordance with *ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board* by Architectural Testing, Inc., an Intertek company.
- 7.3. Evaluation and analysis of testing, data and reporting of surface burning characteristics performed in accordance with *ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials*, conducted by Architectural Testing, Inc., an Intertek company, and Commercial Testing Inc.
- 7.4. Evaluation and analysis of testing, data and reporting of fire resistance testing performed in accordance with *ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials*, conducted by Architectural Testing, Inc., an Intertek company.
- 7.5. Evaluation and analysis of testing, data and reporting of transverse wind pressure performed in accordance with *ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*, conducted by SBCRI.
- 7.6. Evaluation and analysis testing data and reporting of water penetration performed in accordance with *ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*, conducted by NTA, Inc.
- 7.7. Evaluation and analysis of testing, data and reporting of air permeance in accordance with *ASTM E2178 – Standard Test Method for Air Permeance of Building Materials*, conducted by Architectural Testing, Inc., an Intertek company.
- 7.8. Test reports and data for determining use in attics and crawlspaces without a thermal barrier or ignition barrier in accordance with *NFPA 286*, conducted by Intertek.

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- 7.9. Test reports and engineering analysis of vertical and lateral fire propagation properties in accordance with *NFPA 285*, conducted by Intertek.
- 7.10. ISO RED CI Quality Control Manual in accordance with a third-party quality control program with inspections conducted by an approved agency.
- 7.11. Engineering analysis on *NFPA 285* testing performed by Priest & Associates Consulting, LLC.
- 7.12. 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.
- 7.13. 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.
- 7.14. 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.
- 7.15. 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.
- 7.16. DrJ's responsibility for data provided by approved sources conforms with [IBC Section 1703](#) and any relevant professional engineering law.
- 7.17. 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, ISO RED CI 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. Wind pressure resistance performance for use as part of an exterior wall covering assembly in accordance with [IRC Section R703.3](#), [IBC Section 1404.8](#) and *ANSI/FS100*.
 - 8.1.2. Performance in accordance with the foam plastic requirements of [IRC Section R316](#) and [IBC Section 2603](#).
 - 8.1.3. Performance for use as continuous insulating sheathing in accordance with [IRC Section N1102](#) and [IECC Section C402](#).
 - 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 a vapor retarder in accordance with [IRC Section R202](#) and [R702.7](#), and [IBC Section 202](#) and [1405.3](#).
 - 8.1.6. Performance for use as an air barrier in accordance with [IECC Section C402](#).
- 8.2. When installed in accordance with the [manufacturer's installation instructions](#) and this TER, ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD comply with, or are a suitable alternative to, the applicable sections of the codes listed in [Section 2](#) for the following applications:
 - 8.2.1. Performance in accordance with the foam plastic requirements of [IRC Section R316](#) and [IBC Section 2603](#).
 - 8.2.2. Performance for use as continuous insulating sheathing in accordance with [IRC Section N1102](#) and [IECC Section C402](#).

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- 8.2.3. Performance for use as a vapor retarder in accordance with [IRC Section R202](#) and [R702.7](#), and [IBC Section 202](#) and [1405.3](#).
- 8.2.4. Performance for use as an air barrier in accordance with [IECC Section C402](#).
- 8.2.5. Performance for use without a thermal barrier in accordance with *NFPA 286* and the acceptance criteria of [IBC Section 803.1.2](#).
- 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 with 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:
- 8.4.1. No known variations
- 8.5. 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 and/or by the Building Designer (e.g., Owner, Registered Design Professional, etc.).
- 9.4. ISO RED CI shall be fully protected from the interior of the building by an approved 15-minute thermal barrier or ignition barrier where required by the applicable code, except where installed in attics and uninhabited spaces as described in [Section 5.6.3.2](#). ISO RED MAX, ISO RED MAX WF, ISO RED MAX LD and ISO RED MAX HD are not required to be protected by a thermal barrier when installed in accordance with [Section 5.6.3](#).
- 9.5. These products shall not be used as a structural nailing base for claddings.
- 9.6. In areas where the probability of termite infestation is very heavy in accordance with [IBC Section 2603.9](#) or [IRC Section R318.4](#), these products must not be placed on exterior walls located within 6" (152 mm) of the ground.
- 9.7. Walls sheathed with these products must not be used to resist horizontal loads from concrete or masonry walls.
- 9.8. When using these products, the stud walls shall be braced by other materials in accordance with the applicable code.
- 9.9. Design
- 9.9.1. Building Designer Responsibility
- 9.9.1.1. 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](#).
- 9.9.1.2. 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](#).

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9.9.2. Construction Documents

9.9.2.1. 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.

9.10. Responsibilities

- 9.10.1. 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.
- 9.10.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
- 9.10.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
- 9.10.4. This product is manufactured under a third-party quality control program in accordance with [/RC Section R104.4](#) and [R109.2](#) and [/BC Section 104.4](#) and [110.4](#).
- 9.10.5. 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.
- 9.10.6. 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. The products described in this TER 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 drjengineering.org.
- 11.2. For information on the current status of this TER, contact [DrJ Engineering](#).



- [Mission and Professional Responsibilities](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)