

OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply®
"Portal Frame with Hold-Down" (12" to 24" CI PFH)

TER No. 1101-01

Issue Date: January 27, 2011

Updated: April 3, 2019

Subject to Renewal: April 1, 2020

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DIVISION: 06 00 00 – WOOD, PLASTICS AND COMPOSITES

Section: 06 11 00 – Wood Framing

Section: 06 12 19 – Shear Wall Panels

1. Products Evaluated:

- 1.1. 12" CI PFH: An OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® Portal Frame with Hold-Down (PFH) containing a pier width of 12" (min.) constructed with $\frac{7}{16}$ " OSB Wood Structural Panel (WSP) sheathing fastened within the cavity between four (4) flatwise SPF stud grade 2x4s.
- 1.2. 24" CI PFH: An OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® PFH containing a pier width of 24" constructed with $\frac{7}{16}$ " OSB WSP sheathing fastened within the cavity between four (4) flatwise SPF stud grade 2x4s.
- 1.3. For the most recent version of this Technical Evaluation Report (TER), visit drjcertification.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjcertification.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.4. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).

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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- 1.5. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in [IBC Section 1703](#). Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see [drjcertification.org](#).
- 1.6. Requiring an evaluation report from a specific private company (i.e., ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.7. DrJ's code compliance work:
 - 1.7.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
 - 1.7.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:¹

- 2.1. *2012, 2015 and 2018 International Building Code (IBC)*
- 2.2. *2012, 2015 and 2018 International Residential Code (IRC)*
- 2.3. *2016 California Building Standards Code*
- 2.4. *ANSI/AWC SDPWS – Special Design Provisions for Wind and Seismic*
- 2.5. *ASCE/SEI 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- 2.6. *ASTM E2126 – Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 2.7. *ASTM E564 – Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*

3. Performance Evaluation:

- 3.1. The OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® PFH were tested and evaluated for pier widths between 12" and 24" for equivalency to the following *IBC* requirement:

2308.6.5 **Alternative bracing.** An alternate braced wall (ABW) or a portal frame with hold-downs (PFH) described in this section is permitted to substitute for a 48-inch (1219 mm) *braced wall panel* of Method DWB, WSP, SFB, PBS, PCP or HPS. For Method GB, each 96-inch (2438 mm) section (applied to one face) or 48-inch (1219 mm) section (applied to both faces) or portion thereof required by Table 2308.6.1 is permitted to be replaced by one panel constructed in accordance with Method ABW or PFH.

- 3.2. The portal frame that is directly referenced in the code is shown in Figure 1 and adopted into the code in [IBC Section 2308.6.5.2](#)² as follows:

2308.6.5.2 **Portal frame with hold-downs (PFH).** A PFH shall be constructed in accordance with this section and IBC Figure 2308.6.5.2. The adjacent door or window opening shall have a full-length header...^{3, 4}

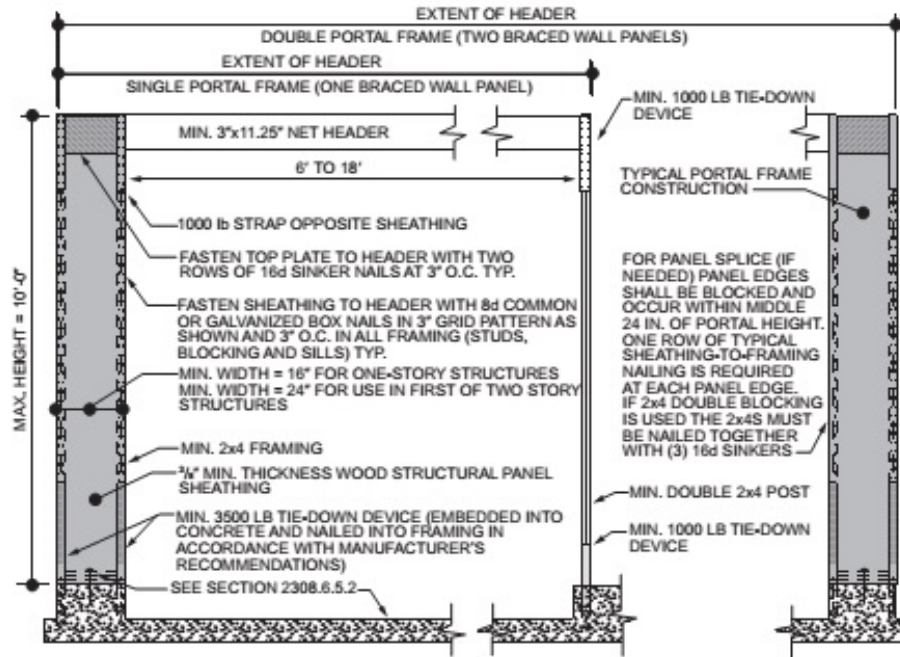
¹ Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, *ASCE 7*, *SDPWS* and *WFCM*. This product also complies with the 2000-2015 versions of the *IBC* 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](#).

² [2012 IBC Section 2308.9.3.2](#)

³ Note that the 2015 and 2018 versions of the *IBC* Figure differ from the 2012 version in that the capacity of the required hold-down straps is reduced from 4200 lbs. to 3500 lbs.

⁴ Wood structural panel sheathing with a thickness not less than 3/8" (9.5 mm) for 16" (406 mm) or 24" (610 mm) stud spacing in accordance with Table 2308.6.3(2) and 2308.6.3(3).

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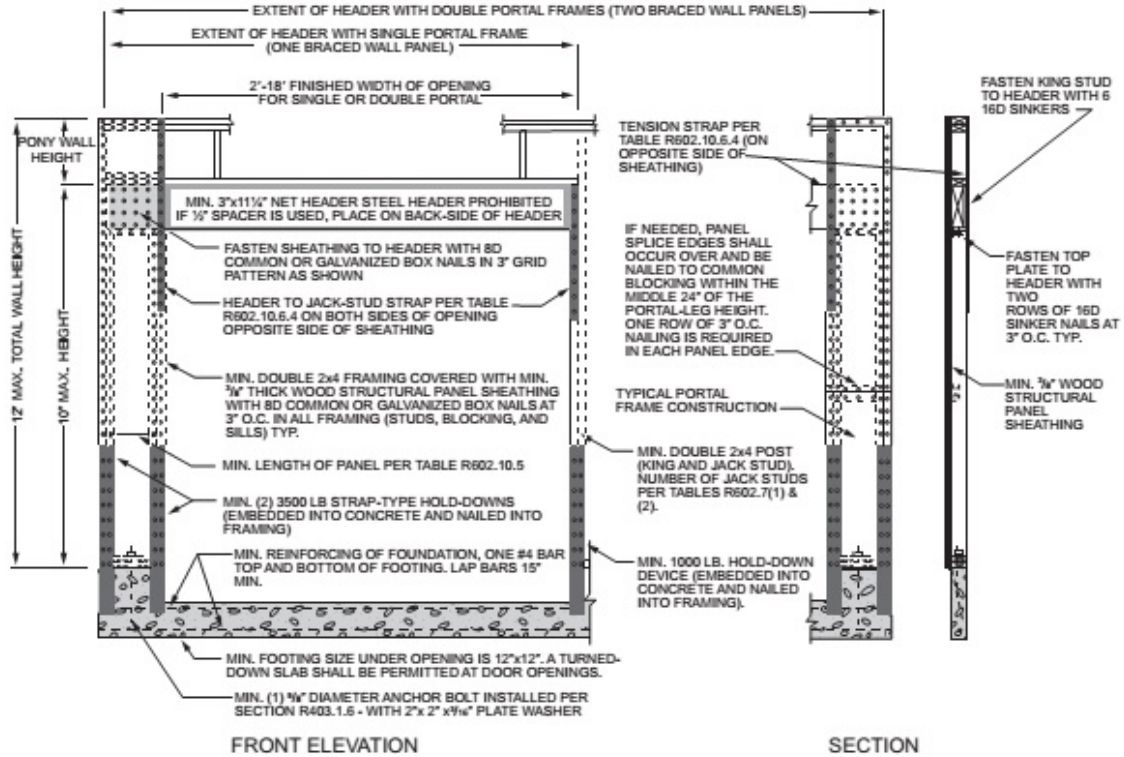
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

Figure 1. Portal Frame with Hold-Downs as depicted in IRC Figure 2308.6.5.2.

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- 3.3. The *IRC* defines the PFH detail in [IRC Figure R602.10.6.2](#) (Figure 2) and identifies it as an equivalent replacement to the capacity of a 4' x 8' sheet of $\frac{3}{8}$ " WSP sheathing in [IRC Table R602.10.5](#) (Table 1) through the use of the following language of [IRC Section R602.10.6.2](#):

Method PFH: Portal frame with hold-downs. Method PFH *braced wall panels* shall be constructed in accordance with [Figure R602.10.6.2](#).⁵



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Figure 2. Method PFH—Portal Frame with Hold-Downs as depicted in *IRC* Figure R602.10.6.2.

Table 1. Minimum Length of Braced Wall Panels as depicted in *IRC* Table R602.10.5.

METHOD (See Table R602.10.4)		MINIMUM LENGTH ^a (inches)					CONTRIBUTING LENGTH (inches)
		Wall Height					
		8 feet	9 feet	10 feet	11 feet	12 feet	
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual ^b
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual
LIB		55	62	69	NP	NP	Actual ^b
ABW	SDC A, B and C, wind speed < 110 mph	28	32	34	38	42	48
	SDC D ₀ , D ₁ and D ₂ , wind speed < 110 mph	32	32	34	NP	NP	
PFH	Supporting roof only	16	16	16	18°	20°	48
	Supporting one story and roof	24	24	24	27°	29°	48

⁵ Note that the 2015 and 2018 versions of the *IRC* Figure R602.10.6.2 differ from the 2012 version in that the capacity of the required hold-down straps is reduced from 4200 lbs. to 3500 lbs.

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- 3.4. While the PFH referenced in the code is one alternate method of compliance, other methods of compliance are permissible, provided they can show equivalence to the code in accordance with [IBC Section 104.11](#) and [IRC Section R104.11](#).
- 3.5. It is clear from [IBC Section 2308.6.5.2](#)⁶ and [IRC Figure R602.10.6.2](#) that the performance requirement is to be an equivalent replacement to the capacity of a 4' x 8' sheet of 3/8" WSP sheathing.
- 3.6. Testing conducted by the SBC Research Institute (SBCRI) compares the performance of an alternative PFH to replace a 4' x 8' Method WSP braced wall panel using 3/8" WSP sheathing.
- 3.7. Since deflection limits are neither a consideration of the *IRC* nor a consideration of the light-frame provisions of the *IBC*, they are not a consideration of this assessment.
- 3.8. Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

4. Product Description and Materials:

- 4.1. OX-IS[®], SI-Strong, ISO RED ci and Thermo-Ply[®] PFH assemblies differ from the PFH details in the [IBC](#) and [IRC](#) in that the intent is to allow the use of these sheathing materials in place of the WSP shown in the code prescribed details to facilitate use of continuous insulation or carry through the proprietary sheathing materials without the need to change the sheathing thickness at the portal frame.
 - 4.1.1. OX-IS[®] and SI-Strong are structural insulated sheathing (SIS) products and, therefore, are also referred to as SIS in this TER.
- 4.2. Details of the construction are as follows:
 - 4.2.1. Piers
 - 4.2.1.1. The piers are made up of 7/16" OSB sandwiched between nominal 2x4 studs installed flatwise. This pier is then attached to the adjoining full-height studs and the opening header.
 - 4.2.2. Header
 - 4.2.2.1. The header is made up of a minimum of two (2) 2x12s with a 7/16" OSB spacer or an equivalent engineered wood beam.
 - 4.2.2.2. The header extends over the top of the pier(s) and is fastened to the pier(s) using straps, plates and fasteners, as shown in Figure 3, Figure 4, and Figure 5.
 - 4.2.3. The maximum PFH height is 10'. Where needed, a pony wall may be built above the header to extend the framing to a maximum of 12'.
 - 4.2.4. Sheathing Options
 - 4.2.4.1. OX-IS[®] or SI-Strong Structural Insulation:
 - 4.2.4.1.1. For other sheathing performance characteristics that may be required in an exterior wall assembly, please refer to [TER No. 0804-01](#).
 - 4.2.4.2. ISO RED ci Polyiso Insulation:
 - 4.2.4.2.1. For other sheathing performance characteristics that may be required in an exterior wall assembly, please refer to [TER No. 1306-02](#).
 - 4.2.4.3. Thermo-Ply[®] Structural Sheathing: Green, Red or Blue Grade.
 - 4.2.4.3.1. For other sheathing performance characteristics that may be required in an exterior wall assembly, please refer to one of the following:
 - 4.2.4.3.1.1. Thermo-Ply[®]: Green ([TER No. 1004-03](#))
 - 4.2.4.3.1.2. Thermo-Ply[®]: Red ([TER No.1004-01](#))
 - 4.2.4.3.1.3. Thermo-Ply[®]: Blue ([TER No. 1004-02](#))

⁶ [2012 IBC Section 2308.9.3.2](#)

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5. Applications:

5.1. IBC/IRC Method WSP:

- 5.1.1. To establish the baseline for equivalency, a full scale 12' x 30' building was constructed in accordance with the minimum requirements of the *IRC* and *IBC*.
- 5.1.2. In the first series of tests, two 4' braced wall panels (BWP) were placed in each of the 30' walls.
- 5.1.3. Each BWP was placed 6' from each end of each braced wall line.
- 5.1.4. Anchor bolts were placed every 4' along the base of the wall. No other hold down devices were used as they are not required by the *IRC* or the prescriptive provisions of the *IBC*.
- 5.1.5. The roof of the structure was constructed with trusses, and dead loads were applied to simulate typical dead loads on a single story roof.
- 5.1.6. All other wall construction details are per [IRC Table R602.3\(1\)](#).
- 5.1.7. The walls were tested in accordance with the provisions of *ASTM E564*.
- 5.1.8. Additional testing with the OSB in various positions in the wall was assessed as well as fully sheathed walls and walls with window and door openings.
- 5.1.9. Additional 23' walls were constructed and tested in accordance with *ASTM E2126* to understand the performance of these walls under cyclic loading conditions.
- 5.1.10. The results of the testing were then compared to the capacity of the OSB sheathing as defined in the provisions of the *IBC* and *IRC*, and an equivalent capacity was derived such that comparisons can be made on an equivalency basis.

5.2. Alternate PFH Portal Frame:

- 5.2.1. An alternate PFH Portal Frame was developed to see if an equivalent replacement of the 4' x 8' Method WSP Braced Wall Panel could be achieved (see Figure 3, Figure 4, and Figure 5).
- 5.2.2. Two (2) 23' braced wall lines were framed using standard code-complying framing techniques with SPF top plate, sill plate and studs from stud grade lumber.
- 5.2.3. The assembly was constructed with $\frac{7}{16}$ "-thick OSB sheathing (10 $\frac{1}{2}$ "-wide for the 12" PFH and 22 $\frac{1}{2}$ "-wide for the 24" PFH) fastened between four (4) flatwise SPF 2x4s attached to a SPF king stud.
- 5.2.4. Interior gypsum was not applied.
- 5.2.5. The portal frames were tested in accordance with *ASTM E2126* testing procedures. Testing determined their lateral resistance within an identical braced wall line so that a direct performance comparison could be made with respect to the tests performed on the isolated braced wall panel assemblies.

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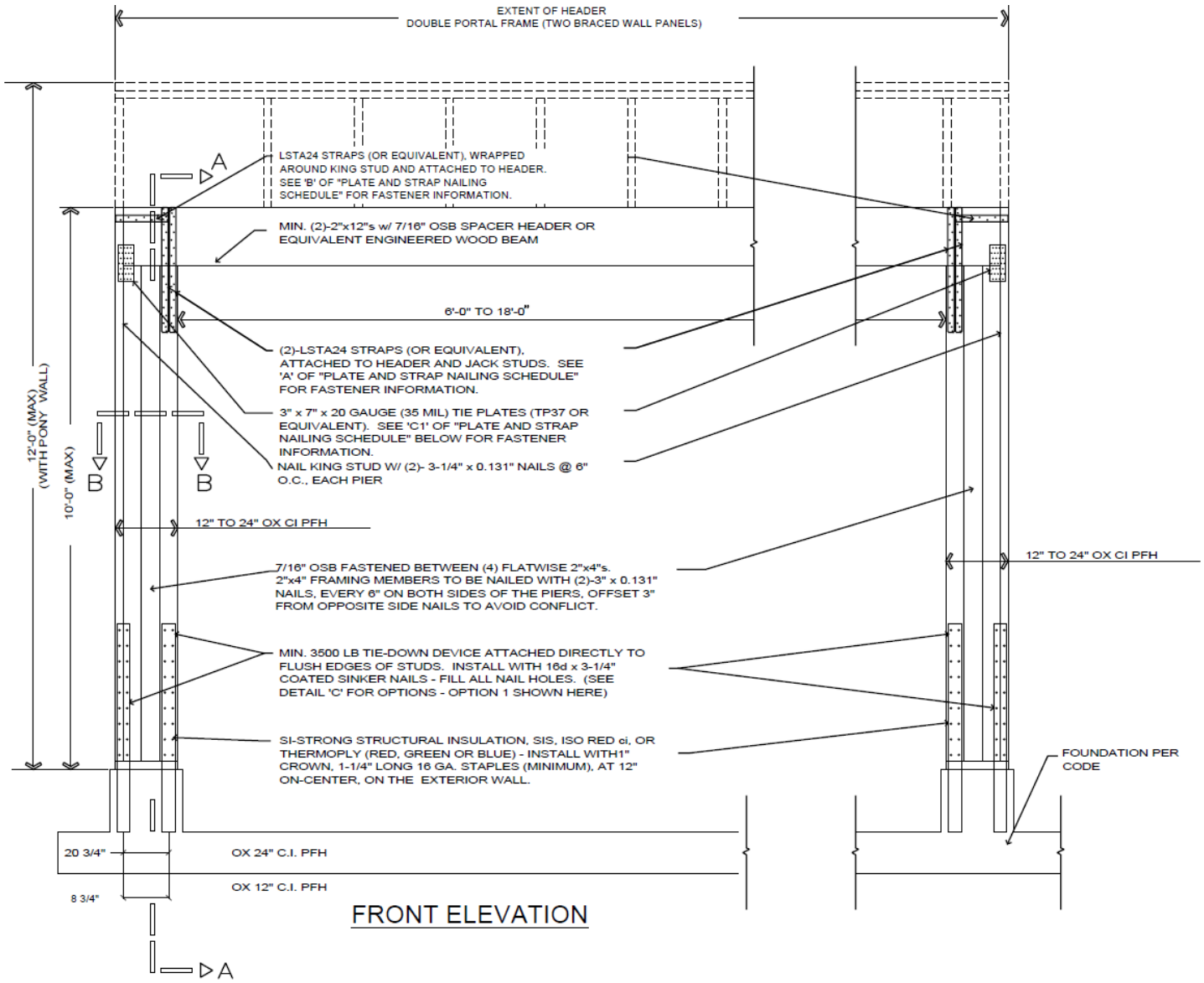


PLATE AND STRAP NAILING SCHEDULE

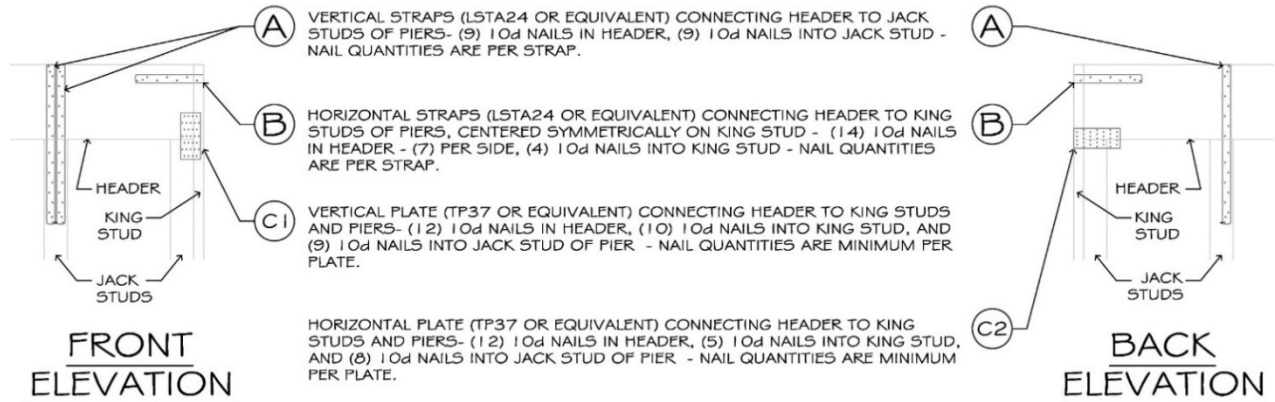


Figure 3. Construction Details of OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" to 24" CI PFH

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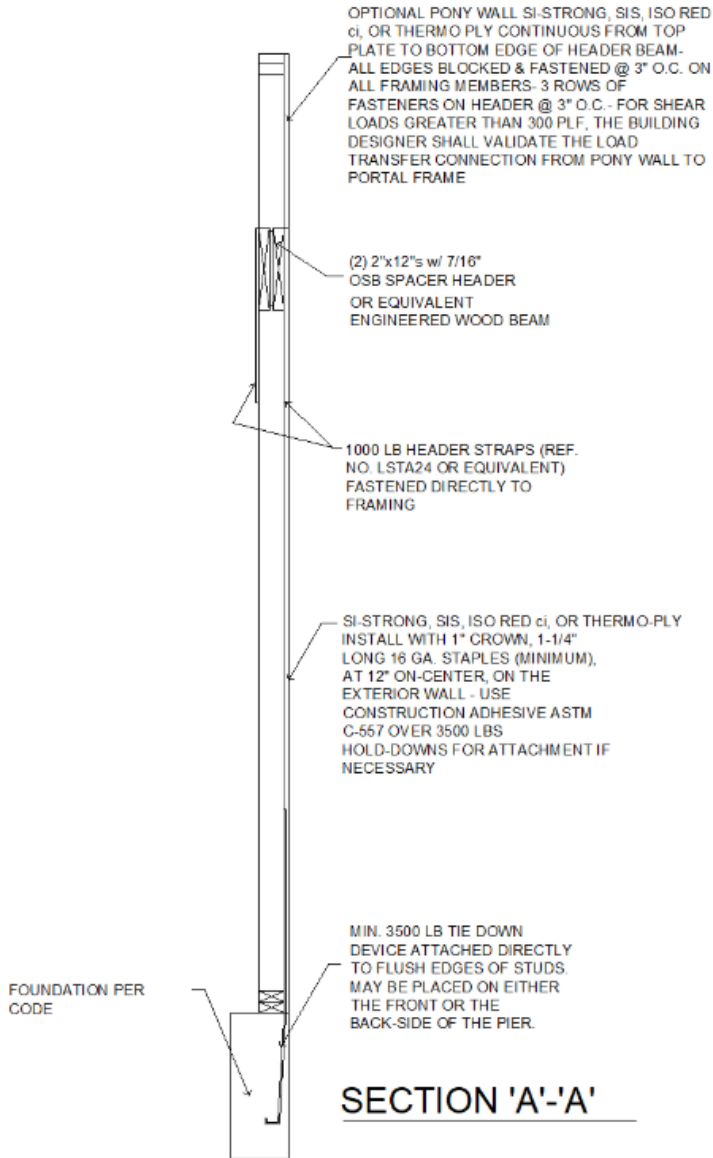
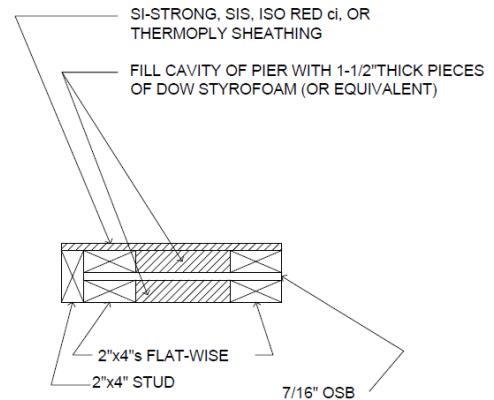


Figure 4. PFH Section A-A.



SECTION 'B'-B'
OPTIONAL INSULATION
OF JOIST CAVITIES

Figure 5. PFH Section B-B.

5.3. Equivalency Results

- 5.3.1.** A comparison of the $\frac{3}{8}$ " WSP braced wall lines and the OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" CI PFH and 24" CI PFH is shown in Table 2.
- 5.3.2.** The test data and subsequent engineering analysis provides confirmation that the performance of the OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" CI PFH and 24" CI PFH provide comparable equivalency to the $\frac{3}{8}$ " BWP.

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Table 2. Test Results Based on SPF Framing^{1,2,3}

Test Name	Sheathing Material	Fastener Size & Spacing	Total Bracing Width (in)	Equivalent Capacity per Panel/Pier (lbs)	Maximum Wall Height (ft)	ASD Allowable Design Value per Panel/Pier (lbs) ^{4,5}
IBC/IRC Benchmark	³ / ₈ " OSB, Isolated 4'x8' panels, 6' from corners	2 ³ / ₈ " x 0.113Ø nails, 6:12 spacing	96	2,000	Up to 10	1,000
12" CI PFH	OX-IS®, SI-Strong, ISO RED ci, or Thermo-Ply® (Green, Red or Blue Grade)	see Table R602.10.5 (Table 1)	12	2,820	8	1,410
					10	1,060
24" CI PFH	OX-IS®, SI-Strong, ISO RED ci, or Thermo-Ply® (Green, Red or Blue Grade)	see Table R602.10.5 (Table 1)	24	5,115	8	2,560
					10	1,920

1. Capacity derived from multiple full-scale tests at SBCRI, as well as testing from other labs, showing the capacity of OSB sheathing in buildings constructed in accordance with the minimum requirements of the IRC.
 2. The PFH bracing type in the IRC/IBC is defined as equivalent to a 4' BWP using ³/₈" WSP. Equivalent capacity is based on comparison of SBCRI testing of the PFH and ³/₈" OSB as compared to the published capacities as defined in the IBC and SDPWS.
 3. For seismic design, reduce capacities by a factor of 1.4.
 4. Interpolation between the wall heights and pier widths for the 12" CI PFH & 24" CI PFH is permitted.
 5. 10'-high wall design values are provided here that use a 75% factor to reduce the 8'-high wall design values generated by the SBCRI test data.

5.3.3. Based on the SBCRI test results using the equivalency principle as defined in [IBC Section 104.11](#) and [IRC Section R104.11](#), the ISO RED ci and Thermo-Ply® 12" to 24" CI PFH are assigned the recommended design values for designs controlled by wind or gravity loading conditions as provided in Table 2.

5.3.4. The design values for the OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" to 24" CI PFH are based on SBCRI testing and the evaluation of the test data compared to ³/₈" OSB braced wall panel test data using Method WSP.

5.3.5. As detailed in Figure 3 through Figure 5, the maximum allowable compressive strength of the Ox 12" to 24" CI PFH is 11,156 lbs. per pier. Additional compressive capacity may be engineered into each pier. Structurally attaching full-height framing members within the pier cavity is one possible engineered option.

5.3.6. The SBCRI test results in Table 2 provide assurance that the OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® PFH provide equivalent or better shear resistance to the code-compliant benchmark (IBC/IRC ³/₈" OSB).

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

6. Installation:

6.1. General Applications

6.1.1. OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® shall be installed in accordance with the manufacturer's published installation instructions and this TER as defined in Figure 3, Figure 4, and Figure 5.

6.1.2. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.

6.2. Orientation

6.2.1. OX-IS®, SI-Strong, ISO RED ci

6.2.1.1. OX-IS®, SI-Strong and ISO RED ci may be installed vertically or horizontally over studs with framing that has a nominal thickness of not less than 2" (50.8 mm) and spaced a maximum of 24" (610 mm) o.c.

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6.2.1.2. Sheathing joints must be butted at framing members, and all panel edges shall be blocked with framing that has a nominal thickness of not less than 2" (50.8 mm) and spaced a maximum of 24" (610 mm) o.c. A single row of fasteners must be applied to each panel edge into the stud or blocking below. Do not tack product to framing, but fasten each panel completely after fastening begins.

6.2.2. Thermo-Ply®

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

6.3. Fastener Type

6.3.1. OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply®

6.3.1.1. Minimum $^{15}/_{16}$ " crown, 16 ga staples or minimum 0.120" x galvanized roofing nail. Length of fastener to provide 1" embedment into framing.

6.3.1.2. Fasteners shall be installed with a nominal edge distance of $^{3}/_{8}$ " (9.5 mm).

6.3.1.3. Where used, always fasten staples parallel to the framing member.

6.3.1.4. Fasteners for Thermo-Ply® shall be driven such that the head of the fastener is in contact with the surface of the sheathing. Do not overdrive fasteners.

6.4. Treatment of Joints

6.4.1. OX-IS®, SI-Strong and ISO RED ci

6.4.1.1. OX-IS®, SI-Strong and ISO RED ci sheathing joints must be butted at framing members, and a single row of fasteners must be applied to each panel edge into the stud below. Run staples parallel to framing.

6.4.2. Thermo-Ply®

6.4.2.1. Lapped joints shall be overlapped $^{3}/_{4}$ " (19 mm) (nominal) and fastened with a single row of fasteners. Always run staples parallel with framing.

6.4.2.2. Butt joints shall be placed over framing members and fastened with a single row of fasteners at each panel edge and shall be installed with a small gap ($^{1}/_{16}$ " to $^{1}/_{8}$ ") between panels.

6.5. Structural Applications

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

7. Test and Engineering Substantiating Data:

- 7.1.** OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" CI PFH Braced Wall Panel Testing in a 23' wall using a PFH Double Portal Frame Under Laterally Applied Cyclic Loading, conducted by SBCRI, based on *ASTM E2126*.
- 7.2.** OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 24" CI PFH Braced Wall Panel Testing in a 23' wall using a PFH Double Portal Frame Under Laterally Applied Cyclic Loading, conducted by SBCRI, based on *ASTM E2126*.
- 7.3.** OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" CI PFH and 24" CI PFH Braced Wall Panel Testing in a 12'x30' Full Scale Building Double Portal Frame Performance Under Laterally Applied Monotonic Loading, conducted by SBCRI, based on *ASTM E564*
- 7.4.** Comparison Braced Wall Panel testing using Method WSP with $^{3}/_{8}$ " OSB. Multiple tests conducted using *ASTM E2126* cyclic loading protocols and *ASTM E564* for Monotonic testing. Multiple tests conducted providing continued confirmation of the capacity of $^{3}/_{8}$ " OSB performance in a braced wall line. Testing conducted by SBCRI.
- 7.5.** 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.

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- 7.6. 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.
- 7.7. 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.
- 7.8. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms to DrJ's procedure for acceptance of data from approved sources.
- 7.9. DrJ's responsibility for data provided by approved sources conforms to [IBC Section 1703](#) and any relevant professional engineering law.
- 7.10. Where appropriate, DrJ's analysis is based on design values that 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. The testing and generally accepted engineering analysis performed provides the basis for the use of the OX-IS[®], SI-Strong, ISO RED ci and Thermo-Ply[®] 12" to 24" CI PFH as a substitution for a 4' braced wall panel using 3/8" OSB, fastened 6:12 with 2³/₈" x 0.113" diameter nails, and have the relative performance as defined in Table 2.
- 8.2. The testing and engineering analysis performed provides the basis for the use of the OX-IS[®], SI-Strong, ISO RED ci and Thermo-Ply[®] 12" to 24" CI PFH in all locations that require the use of a 4' BWP within the *IBC*⁷ and *IRC*⁸.
- 8.3. [IBC Section 104.11](#) ([IRC Section R104.11](#) and [IFC Section 104.9](#) are similar) states:

104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code. ... Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.
- 8.4. This product has been evaluated in the context of the codes listed in [Section 2](#) and is compliant with all known state and local building codes. Where there are known variations in state or local codes 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.

⁷ 2015 and 2018 [IBC Section 2308.6.5](#); 2012 [IBC Section 2308.9.3.2](#) Alternate bracing wall panel adjacent to a door or window opening. Any bracing required by [Section 2308.9.3](#) [i.e., 3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing in accordance with [Tables 2308.9.3\(2\)](#) and [2308.9.3\(3\)](#).] is permitted to be replaced by the following when used adjacent to a door or window opening with a full-length header:

⁸ 2012, 2015 and 2018 [IRC Section R602.10.6.2](#) Method PFH: Portal frame with hold-downs. Method PFH braced wall panels constructed in accordance with one of the following provisions are also permitted to replace each 4 feet (1219 mm) of braced wall panel as required by [Section R602.10.6](#) for use adjacent to a window or door opening with a full-length header:

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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. The OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" to 24" CI PFH described in this TER comply with, or are suitable alternatives to, the applicable sections of the *IBC* and the *IRC* listed in [Section 2](#) and are subject to the following conditions:
 - 9.4.1. This TER and the installation instructions, when required by a code official, shall be submitted at the time of permit application.
 - 9.4.2. Where required by the statutes of the jurisdiction where the building is to be constructed, the design drawings shall be prepared by a Registered Design Professional licensed in the jurisdiction.
 - 9.4.3. Sheathing material located on the exterior side of the portal frame shall be one of the following:
 - 9.4.3.1. ½" minimum OX-IS®, SI-Strong or ISO RED ci
 - 9.4.3.2. Green, Red or Blue grade Thermo-Ply®
 - 9.4.4. Each portal frame may replace 4' of braced wall panel. All other braced wall provisions shall be followed per the applicable code.
- 9.5. Design
 - 9.5.1. Building Designer Responsibility
 - 9.5.1.1. 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](#).
 - 9.5.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).
 - 9.5.2. Construction Documents
 - 9.5.2.1. 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.
- 9.6. Responsibilities
 - 9.6.1. 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.
 - 9.6.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
 - 9.6.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
 - 9.6.4. This product is manufactured under a third-party quality control program in accordance with [IRC Section R104.4](#) and [R109.2](#) and [IBC Section 104.4](#) and [110.4](#).
 - 9.6.5. 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.
 - 9.6.6. 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.

Technical Evaluation Report (TER)

10. Identification

- 10.1.** The OX-IS®, SI-Strong, ISO RED ci and Thermo-Ply® 12" to 24" CI PFH described in this TER are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, label of the third-party inspection agency, and other information to confirm code compliance.
- 10.2.** Additional technical information can be found at oxengineeredproducts.com.

11. Review Schedule:

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



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