

Brace-Plate™

TER No. 1608-04

Issue Date: September 21, 2016

Updated: September 19, 2017

Subject to Renewal: October 1, 2019

Fibre Converters, Inc.

One Industrial Drive
P.O. Box 130
Constantine, MI 49042
269-279-1700
fibreconverters.com

Additional Listee:

National Shelter Products, Inc.

50 S.E. Bush Street
Issaquah, Washington 98027
425-557-7968
nationalshelter.com
support@nationalshelter.com

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

1. Products Evaluated

- 1.1. Brace-Plate™
- 1.2. 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.
- 1.3. 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.

Technical Evaluation Report (TER)

- 1.4. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements. 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](#).
- 1.5. Requiring an evaluation report from a specific organization (ICC-ES, IAPAMO, 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.

2. Applicable Codes and Standards:¹

- 2.1. 2009, 2012 and 2015 International Residential Code (IRC)
- 2.2. 2009, 2012 and 2015 International Building Code (IBC)
- 2.3. 2009, 2012 and 2015 International Energy Conservation Code (IECC)
- 2.4. ANSI/AWC Wind & Seismic – Special Design Provisions for Wind and Seismic (SDPWS)
- 2.5. ASCE/SEI 7 – Minimum Design Loads for Buildings and Other Structures
- 2.6. ASTM E564 – Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings

3. Performance Evaluation:

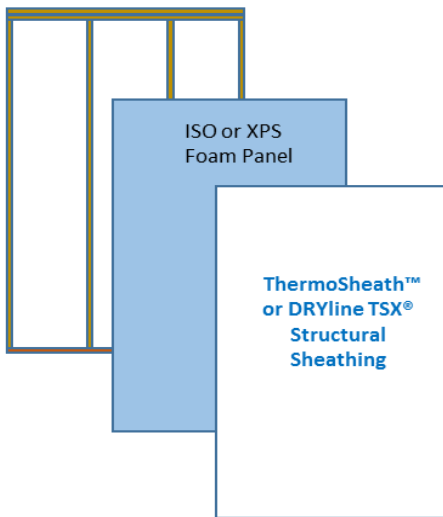
- 3.1. Brace-Plate™ was evaluated to determine:
 - 3.1.1. Structural performance under lateral load conditions (wind) for use as an alternative to the IRC Intermittent Wall Bracing provisions of [IRC Section R602.10](#) Method WSP.
 - 3.1.2. Structural performance under lateral load conditions for use as an alternative to the IRC Continuous Wall Bracing provisions of [Section R602.10.4](#) Method CS-WSP.
 - 3.1.3. Structural performance under lateral load conditions for use as an alternative to the IBC Conventional Wall Bracing provisions, [Section 2308.6](#), Method 3, for Type V construction.
 - 3.1.4. Structural performance under lateral load conditions for wind loading for use with the IBC performance-based provisions, [Section 2306.1](#) and [2306.3](#) for light-frame wood wall assemblies.
 - 3.1.5. Structural performance under lateral load conditions for use as an alternative to SDPWS Section 4.3 Wood-Frame Shear Walls.
- 3.2. Any code compliance issues not specifically addressed in this section are outside the scope of this evaluation.

¹ Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2015 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 2000-2012 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](#).

Technical Evaluation Report (TER)

4. Product Description and Materials:

Brace Plate Installation



- 1. Framing**
 - 16" On-center stud spacing
 - Studs/Plates: nominal 2" x 4"
 - Framing fasteners: Typical
- 2. ISO or XPS Foam panels**

Mechanically fasten ISO or XPS Foam panel securely against framing with enough fasteners to secure to framing (Do not pin the corners).
- 3. Structural ThermoSheath™ or DRYline TSX® Sheathing**

Install the ThermoSheath™ or DRYline TSX® Sheathing over the top of the Foam Panels with 1 3/4" ring-shank Galvanized Coil roofing nails. Seat the nail head flush with the Sheathing surface, ensuring that the nail shank is embedded into the framing. Fasten the nails 3" on-center, a minimum of 3/8" from the edge of the sheathing.

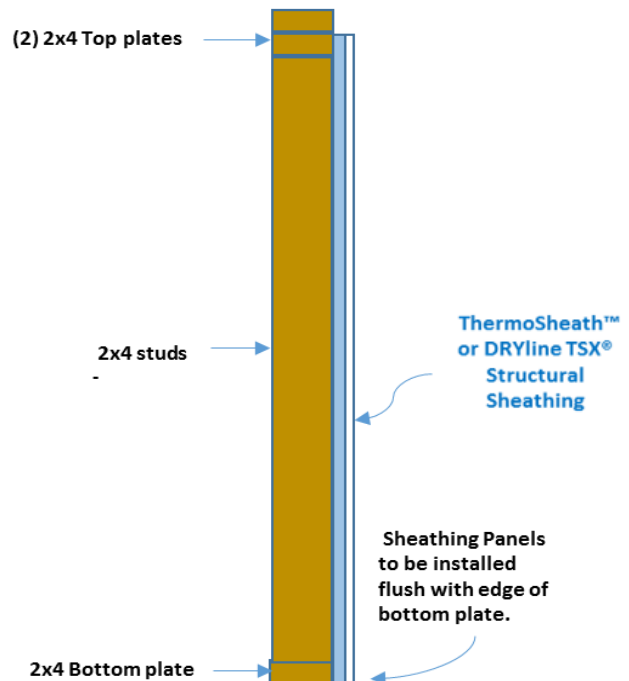
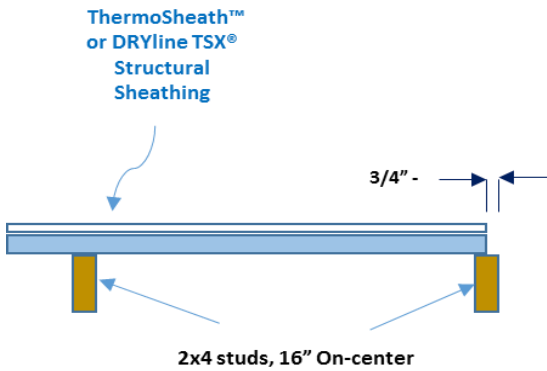


Figure 1: Brace-Plate™ Structural Sheathing

Technical Evaluation Report (TER)

- 4.1. Brace-Plate™ is a proprietary application of ThermoSheath™ and DRYline TSX® sheathing brands manufactured by Fibre Converters, Inc. The proprietary application consists of Thermo-Sheath combined with Polyisocyanurate Rigid Foam Insulation (polyiso) or Extruded Polystyrene Rigid Foam Insulation (XPS).
 - 4.1.1. Brace-Plate™ described in this TER and shown in [Figure 1](#) contains a combination of the following materials:
 - 4.1.1.1. Fibre Converters Red or Blue ThermoSheath™ or DRYline TSX® and,
 - 4.1.1.2. One of the following insulation products:
 - 4.1.1.2.1. ¾" or thinner [R-Max® Thermasheath®-3](#) FPIS or
 - 4.1.1.2.2. 1" or thinner [Dow® Styrofoam™ Brand](#) (Square Edge or Tongue and Groove) XPS
 - 4.1.2. **Material Availability**
 - 4.1.2.1. Standard product width: 48" (1219 mm) or 48-3/4" (1238 mm)
 - 4.1.2.2. Standard lengths: 96" (2438 mm), 108" (2743 mm), 120" (3048 mm), and other sizes are available by request.

5. Applications:

5.1. General

- 5.1.1. Brace-Plate™ is used as wall sheathing in buildings constructed in accordance with the *IRC and IBC* for light-frame wood construction.
- 5.1.2. Brace-Plate™ is used as structural wall sheathing to provide lateral load resistance (wind) for braced wall panels used in light-frame wood construction.
- 5.1.3. Brace-Plate™ panels are permitted to be used as wall sheathing in buildings constructed in accordance with the *IBC* requirements for Type V light-frame construction.

5.2. Structural Applications

5.2.1. General Structural Provisions

- 5.2.1.1. Except as otherwise described in this TER, Brace-Plate™ shall be installed in accordance with the applicable building codes listed in [Section 2](#) using the provisions set forth therein for the design and installation of wood structural panels (WSP).
 - 5.2.1.1.1. Brace-Plate™ is permitted to be designed in accordance with *SDPWS* for the design of shear walls using the methods set forth therein, including the perforated shear wall methodology, and subject to the *SDPWS* boundary conditions, except as specifically allowed in this TER.
- 5.2.1.2. Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall.
 - 5.2.1.2.1. For wind design, anchor bolt spacing shall not exceed 6' o.c. (1829 mm).
- 5.2.1.3. The maximum aspect ratio for Brace-Plate™ shall be 4:1.
- 5.2.1.4. The minimum full height panel width shall be 24" (610 mm).
- 5.2.1.5. All panel edges shall be blocked with a minimum 2" (51 mm) nominal lumber.
- 5.2.1.6. Installation is permitted for single top plate (advanced framing method) or double top plate applications.
- 5.2.1.7. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with code-defined accepted engineering procedures, experience and technical judgment.

Technical Evaluation Report (TER)

5.2.2. Prescriptive IRC Bracing Applications

5.2.2.1. The following provisions are permitted:

- 5.2.2.1.1. Brace-Plate™ may be used on braced wall lines as an equivalent alternative to Method WSP of the IRC, when installed in accordance with [IRC Section R602.10](#) and this TER.
- 5.2.2.1.2. Brace-Plate™ may be used to brace walls of buildings as an alternative to the Continuous Wall Bracing provisions of [IRC Section R602.10.4](#).
- 5.2.2.1.3. Required braced wall panel lengths for Brace-Plate™ shall be as determined by the equivalency factor shown in [Table 1](#) and [IRC Table R602.10.3\(1\)](#) and [Table R602.10.3\(2\)](#)², including all footnotes. Brace-Plate™ tested equivalency factors in [Table 1](#) allow the user to determine the length of bracing required, by multiplying the factor from [Table 1](#) by the length shown in the WSP or CS columns in [IRC Table R602.10.3\(1\)](#), as modified by all applicable factors in [IRCTable R602.10.3\(2\)](#).

Brace-Plate™ Wall Bracing Factors per Comparative Equivalency Testing for IRC Prescriptive Wall Bracing Applications	Maximum Stud Spacing (in.)	Fastener	Fastener Spacing	Wind
				SPF Framing
				Brace-Plate™ Tested Equivalency Factors to IRC WSP or CS-WSP
Brace-Plate™ (Blue ThermoSheath™ or Blue DRYline TSX® installed over ¾" or thinner Rmax ThermoSheath-3 or 1" or thinner Dow Styrofoam Square Edge or Tongue and Groove Foam)	16 o.c.	1¾" x 0.120" Ring Shank Galvanized Roofing Nail	3:3	0.98
Brace-Plate™ (Red ThermoSheath™ or Red DRYline TSX® over ½" or thinner R-Max Thermo-Sheath-3	16 o.c.	1¾" x 0.120" Ring Shank Galvanized Roofing Nail	3:3	1.02

For SI: 1" = 25.4 mm 1 lb./ft. = 0.0146 kN/m

1. Demonstrates equivalency to [IRC Table R602.10.3\(1\)](#). All adjustment factors from [IRC Table R602.10.3\(2\)](#) shall be applied. A minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1¼" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels.
2. Demonstrates equivalency to 2009 IRC Table R602.10.1.2(1). All adjustment factors shall be applied. A minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1¼" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels.
3. Brace-Plate™ attached with 1¾" x 0.120 ring shank galvanized roofing nail. Fasteners are to be spaced a maximum of 3" o.c. at the edges and 3" o.c. in the field with a minimum edge distance of ¾".
4. Brace-Plate™ joints shall be butted at framing members and a single row of fasteners must be applied to each panel edge framing.

Table 1: Brace-Plate™ Braced Wall Line Length Equivalency Factors Based on Equivalency Testing for Use with the IRC

5.2.2.1.3.1. These braced wall line length equivalency factors are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the IRC.

- 5.2.2.1.4. All IRC prescriptive bracing minimums, spacing requirements and rules must still be met.
- 5.2.2.1.5. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

² 2009 IRC Table R602.10.1.2(1) with all footnotes

Technical Evaluation Report (TER)

5.2.3. Performance-Based Wood-Framed Construction

- 5.2.3.1. Brace-Plate™ panels used in wall assemblies designed as shear walls are permitted to be designed in accordance with the methodology used in *SDPWS* for WSP using the capacities shown in [Table 2](#).
- 5.2.3.2. Brace-Plate™ panel shear walls are permitted to resist horizontal wind load forces using the allowable shear loads (in pounds per linear foot) set forth in [Table 2](#).

Brace-Plate™ Design Values	Brace-Plate™ Nominal Unit Shear Capacity (NUSC) & Allowable Strength Design (ASD) Capacity (Wind)					
	Brace-Plate™ Fastener (Spaced 3" o.c. edge / 3" o.c. field)	Maximum Stud Spacing (in.)	Gypsum Wallboard (GWB)	Gypsum Wallboard Fastener Spacing (in.) (edge/field)	Ultimate Unit Shear Capacity (plf)	Allowable Unit Shear Capacity (plf)
Brace-Plate™ (Blue ThermoSheath™ or Blue DRYline TSX® over 3/4" or thinner R-Max® Thermasheath®-3 Foam)	1¾" x 0.120 Ring Shank Galvanized Roofing Nail	16	1/2" GWB	8/8	800	400
Brace-Plate™ (Blue ThermoSheath™ or DRYline TSX® over 1" or thinner Dow® Styrofoam™ SE or Tongue and Groove Insulation)	1¾" x 0.120 Ring Shank Galvanized Roofing Nail	16	1/2" GWB	8/8	790	395
Brace-Plate™ (Red ThermoSheath™ or DRYline TSX® over 1/2" or thinner R-Max® Thermasheath®-3 Foam)	1¾" x 0.120 Ring Shank Galvanized Roofing Nail	16	1/2" GWB	8/8	750	375

For SI: 1" = 25.4 mm 1 lb./ft. = 0.0146 kN/m

1. Brace-Plate™ attached with 1¾" x 0.120 ring shank galvanized roofing nail. Fasteners are to be spaced a maximum of 3" o.c. at the edges and 3" o.c. in the field with a minimum edge distance of 3/8".

2. Gypsum attached with minimum 5d cooler nail or #6 type W or S screws 1¼" long. Fastener spacing shall be as required above.

3. Brace-Plate™ joints shall be butted at framing members and a single row of fasteners must be applied to each panel edge into the stud below.

Table 2: Ultimate Unit Shear & Allowable Unit Shear Design Values for Brace-Plate™ Structural Sheathing – Wind

6. Installation:

6.1. General

- 6.1.1. Brace-Plate™ shall be installed in accordance with the manufacturer's published 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.
- 6.1.2. A copy of the manufacturer's published installation instructions shall be available at all times on the jobsite during installation.

6.2. Orientation

- 6.2.1. Brace-Plate™ must be installed vertically or horizontally with all panel edges supported by framing or blocking.
- 6.2.2. Brace-Plate™ must be installed over studs, with framing that has a nominal thickness of not less than 2" (51 mm) and spaced a maximum of 16" (610 mm) o.c.

6.3. Fastener Type

6.3.1. Brace-Plate™

- 6.3.1.1. Minimum 0.120" x 1¾" (3 mm x 44 mm) ring shank galvanized roofing nail installed with the underside of the head flush with the surface of the sheathing.

6.3.2. Gypsum Wallboard

- 6.3.2.1. Gypsum wallboard shall be installed with a minimum:

Technical Evaluation Report (TER)

6.3.2.1.1. #6 x 1¹/₄" (32 mm) Type W or S screws

6.3.2.1.2. 5d cooler nails

6.4. Fastener Spacing

6.4.1. Brace-Plate™

6.4.1.1. Maximum of 3" o.c. (76 mm) along the edge and 3" o.c. in the field.

6.4.2. Gypsum Wallboard

6.4.2.1. For *IRC* and *IBC* prescriptive applications, gypsum fasteners shall be spaced 8" (203 mm) o.c. at panel edges and 8" o.c. at intermediated framing. For engineered design, see [Table 2](#).

6.5. Fastener Edge Distance

6.5.1. Fastener edge distance is a minimum of 3/8" (10 mm) for both Brace-Plate™ and gypsum.

6.6. Treatment of Joints

6.6.1. Brace-Plate™ joints shall be butted at framing members, and a single row of fasteners must be applied to each panel edge into the stud below.

6.6.2. Do not tack Brace-Plate™ to framing, but fasten each panel completely once fastening begins.

7. Test and Engineering Substantiating Data:

7.1. Lateral load testing conducted by SBCRI, based on *ASTM E564*.

7.2. The product(s) evaluated by this TER falls 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.

7.3. 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 engineered alternative means of compliance. This TER assesses compliance with defined standards, generally accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

7.4. 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.

7.5. DrJ has reviewed and found the data provided by other professional sources are credible. This information has been approved in accordance with DrJ's procedure for acceptance of data from approved sources.

7.6. DrJ's responsibility for data provided by approved sources is in accordance with professional engineering law.

7.7. 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*, etc.). This includes review of code provisions and any related test data that helps with comparative analysis or provides support for equivalency to an intended end-use application.

8. Findings:

8.1. When installed in accordance with the manufacturer installation instructions and this TER, Brace-Plate™ complies with, or is a suitable alternative to, the applicable sections of the codes listed in [Section 2](#) for the following applications

8.1.1. Lateral load resistance due to wind loads carried by shear walls.

8.2. [IBC Section 104.11](#) and [IRC Section R104.11](#) ([IFC Section 104.9](#) is similar) state:

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, at

Technical Evaluation Report (TER)

least 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*.³

- 8.3.** The 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:
- 8.3.1.** No known variations
- 8.4.** This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. Dr.J's professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.
- 9. Conditions of Use:**
- 9.1.** Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.2.** Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.
- 9.3.** Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.
- 9.4.** Brace-Plate™ shall not be used as a nailing base.
- 9.5.** Walls sheathed with Brace-Plate™ shall not be used to resist horizontal loads from concrete and masonry walls.
- 9.6.** When Brace-Plate™ is not installed for use as wall bracing, as described in this TER, the walls shall be braced by other materials, in accordance with the applicable code.
- 9.7.** When used in accordance with the *IBC* in high wind areas, special inspections shall comply with [IBC Section 1705.11](#)⁴.
- 9.8.** Loads applied shall not exceed those recommended by the manufacturer as follows:
- 9.8.1.** Allowable shear loads do not exceed values in [Table 2](#) for wind loads.
- 9.9.** The manufacturer's installation instructions shall be available on the jobsite for inspection.
- 9.10.** All panel edges shall be supported by wall framing or solid blocking a minimum of 2" (51 mm) nominal in thickness.
- 9.11.** Brace-Plate™ is manufactured in Constantine, MI, under a quality control program with quality control inspections in accordance with [IRC Section R109.2](#) and [IBC Section 110.3.8](#) and [110.4](#).
- 9.12. Design**
- 9.12.1. Building Designer Responsibility**
- 9.12.1.1.** Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Owner, Registered Design Professional, etc.) for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
- 9.12.1.2.** The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).
- 9.12.2. Construction Documents**
- 9.12.2.1.** Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

³ The last sentence is adopted language in the 2015 codes.

⁴ [2012 IBC Section 1705.10](#)

Technical Evaluation Report (TER)

9.13. Responsibilities

- 9.13.1. The information contained herein is a product, engineering or building code compliance TER performed in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering procedures, experience and technical judgment.
- 9.13.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated section.
- 9.13.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
- 9.13.4. This product is manufactured under a third-party quality control program in accordance with [/RC Section R104.4](#) and [R109.2](#) and [/BC Section 104.4](#) and [110.4](#).
- 9.13.5. The actual design, suitability and use of this TER for any particular building is the responsibility of the Owner or the Owner's authorized agent, and the TER shall be reviewed for code compliance by the Building Official.
- 9.13.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party inspection process, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to assure accurate compliance with the applicable building code.

10. Identification:

- 10.1. Each Brace-Plate™ panel described in this TER is identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.
- 10.2. Additional technical information can be found at fibreconverters.com or nationalshelter.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](#)