Technical Evaluation Report
TER 1010-01
DuPont Continuously Insulated
Sheathing Series "Portal Frame with
Hold-Down" Evaluation (DuPont 12.5"
Cl I-Joist PFH & DuPont 15" Cl I-Joist")

DuPont Performance Building
Solutions

Product:
DuPont 12.5" Cl I-Joist PFH
DuPont 15" Cl I-Joist PFH

Issue Date:
October 15, 2010
Revision Date:
July 19, 2019
Subject to Renewal:
July 1, 2020
COMPANY INFORMATION:

DuPont Performance Building Solutions
1501 Larkin Center Dr.
Midland, MI 48642
989-638-8655
dupont.com/building

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
DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION
SECTION: 07 21 00 - Thermal Insulation
SECTION: 07 27 00 - Air Barriers
SECTION: 07 25 00 - Water-Resistive Barriers/Weather Barriers

1 PRODUCTS EVALUATED
1.1 DuPont 12.5" CI I-Joist PFH
    DuPont 15” CI I-Joist PFH
    1.1.1 The DuPont 12.5" CI I-Joist PFH is a 12½" pier width DuPont Continuously Insulated (CI) Portal Frame with Hold-Down (PFH) Double Portal Frame constructed with a 9½" wood I-Joist.
    1.1.2 The DuPont 15” CI I-Joist PFH is a 14¾" pier width DuPont Continuously Insulated (CI) Portal Frame with Hold-Down (PFH) Double Portal Frame constructed with a 11¾" wood I-Joist.

¹ Building codes require data from valid research reports be obtained from approved sources. An approved agency, which is an approved source, is defined as “an established and recognized agency that is regularly engaged in… furnishing product certification where such agency has been approved...” Being approved, defined as “acceptable to the building official,” is accomplished via accreditation using ISO/IEC 17065 evaluation procedures meeting code requirements of independence, adequate equipment, and experienced personnel. DrJ is an ISO/IEC 17065 ANSI-Accredited Product Certification Body – Accreditation #1131.

Through ANSI accreditation, DrJ certification can be used to obtain product approval in any country that is an IAF MLA Signatory and covered by an IAF MLA Evaluation per the Purpose of the MLA – “certified once, accepted everywhere.” Manufacturers can go to jurisdictions in any IAF MLA Signatory Country and have their products readily approved by authorities having jurisdiction using DrJ’s ANSI accreditation.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, see drjcertification.org.
2 APPLICABLE CODES AND STANDARDS\textsuperscript{2,3}

2.1 Codes

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

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

2.2 Standards and Referenced Documents

2.2.1 ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic

2.2.2 ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures

2.2.3 ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings

3 PERFORMANCE EVALUATION

3.1 The “DuPont 12.5” CI I-Joist PFH” and “DuPont 15” CI I-Joist PFH” were tested and evaluated for equivalency to the following IBC requirement:

IBC Section 2308.6.5.2 Portal frame with hold-downs (PFH).\textsuperscript{4} Any bracing required by Section 2308.6.5 [e.g., 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 2308.6.3(2) and 2308.6.3(3)] is permitted to be replaced by the following (see Figure 1) when used adjacent to a door or window opening with a full-length header...

3.2 In addition to IBC Section 2308.6.5.2,\textsuperscript{5} the IRC defines the PFH detail in Figure R602.10.6.2 as an equivalent replacement to the capacity of a 4x8 sheet of 3/8” wood structural panel (WSP) sheathing through the use of the following language:

IRC Section R602.10.6.2 Method PFH: Portal frame with hold-downs. Method PFH braced wall panels constructed in accordance with the following provisions (see Figure 1) 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...

\textsuperscript{2}Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., ASCE 7, NDS, ASTM). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein. As required by code, where this TER is not approved, the building official shall respond in writing stating the reasons this TER was not approved. For any variations in state and local codes, see Section 8.

\textsuperscript{3}All terms defined in the applicable building codes are italicized.

\textsuperscript{4}2012 IBC Section 2308.9.3.2

\textsuperscript{5}2012 IBC Section 2308.9.3.2
3.3 The testing conducted by the Structural Building Components Research Institute (SBCRI) and the supporting data meets the intent of the *IBC* and *IRC* through the use of accepted engineering procedures, experience, and technical judgment, where the “DuPont 12.5" CI I-Joist PFH” and “DuPont 15" CI I-Joist PFH” assemblies have been found to be an alternative material, design, or method of construction that is at least the equivalent of that prescribed in the code in quality, strength, effectiveness, durability, and safety, and can be approved as such. 6,7

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

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

4 PRODUCT DESCRIPTION AND MATERIALS

4.1 A “DuPont 12.5" CI I-Joist PFH” or a “DuPont 15" CI I-Joist PFH” is constructed as shown in Figure 2, Figure 3, and Figure 4.

---

6 *IBC Section 104.11* (Alternative materials, design and methods of construction and equipment) and *IRC Section R104.11* (Alternative materials, design and methods of construction and equipment): “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 least the equivalent of that prescribed in this code…”

7 Definition of approved in *IBC Section 202*: “Acceptable to the building official.”
**Figure 2. Construction Details of DuPont 12.5" CI I-Joist PFH or DuPont 15" CI I-Joist PFH**

---

8 For downloadable construction details in DWG and PDF formats, refer to [https://www.dupont.com/building.html](https://www.dupont.com/building.html).
**figure 3. Construction Details of DuPont 12.5" CI I-Joist PFH or DuPont 15" CI I-Joist PFH³**

³ For downloadable construction details in DWG and PDF formats, refer to [https://www.dupont.com/building.html](https://www.dupont.com/building.html)
5 APPLICATIONS

5.1 A “DuPont 12.5" CI I-Joist PFH” and “DuPont 15" CI I-Joist PFH” were built and tested to determine if equivalency could be achieved.

5.2 3/8" Braced Wall Panel: To define braced wall panel equivalency in accordance with the IBC Section 104.11 and IRC Section R104.11, SBCRI tested a 12'x30' single-story building, framed and assembled precisely to the IRC prescriptive requirements. The building was constructed using the WSP (wood structural panel) braced wall panel (BWP) construction method where a BWP is defined by the IBC and IRC as follows:

IBC Section 202 Definitions, BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel's length meets the requirements of its particular bracing method, and contributes toward the total amount of bracing required along its braced wall line.

30 For downloadable construction details in DWG and PDF formats, refer to https://www.dupont.com/building.html.
IRC Section R202 Definitions. BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel’s length meets the requirements of its particular bracing method, and contributes toward the total amount of bracing required along its braced wall line in accordance with Section R602.10.1.

5.3 A shear wall is defined by the ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic standard with Commentary as follows:

AWC SDPWS Section 4.3.7 Shear Wall Systems. 4.3.7.1 Wood Structural Panel Shear Walls: Shear walls sheathed with wood structural panel sheathing shall be permitted to be used to resist seismic and wind forces. The size and spacing of fasteners at shear wall boundaries and panel edges shall be as provided in Table 4.3A. The shear wall shall be constructed as follows: 1. Panels shall not be less than 4' x 8', except at boundaries and changes in framing. All edges of all panels shall be supported by and fastened to framing members or blocking.

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.

5.5 The IBC, IRC, and SDPWS all provide the ability to use a 3/8”-thick WSP, which is the minimum BWP specification in the conventional light-frame construction sections of the IBC and IRC as shown in Figure 5.

**FIGURE 5. TEST ASSEMBLY’S 30’ BRACED WALL LINE ILLUSTRATING LOCATIONS OF LATERAL LOAD APPLICATION & DEFLECTION MEASUREMENTS**

5.5.1 To be typical and consistent in approach, braced wall lines were built in compliance with the maximum end distances defined in IRC Figure R602.10.1.1 and as also allowed by IBC Section 2308.6TC (see Figure 6).

---

11 2015 IBC Section 2308.9.3
5.6 **IBC/IRC 16” PFH:** This portal frame was constructed as shown in Figure 1 and tested in accordance with ASTM E564 testing procedures. Testing determined its 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 “DuPont 12.5” CI I-Joist PFH” and “DuPont 15” CI I-Joist PFH” assemblies.

5.6.1 Two 30’ braced wall lines were framed using standard code complying framing techniques with SPF top plate, sill plate and studs from stud grade lumber. The braced wall lines were then tested simultaneously.

5.6.2 The assembly was constructed with ⅜”-thick OSB WSP sheathing as detailed in *IRC Section R602.10.6.2* and *IBC Section 2308.6.5.2* and fastened with 0.113-diameter nails penetrating 1½”, 3” o.c. spacing at the edges and to all framing members, per Figure 7.

5.6.3 Interior GWB was not applied.

---

**FIGURE 6. BRACED WALL PANEL END DISTANCE REQUIREMENTS PER /IRC FIGURE 602.10.1.1**

**FIGURE 7. TEST ASSEMBLY’S 30’ BRACED WALL LINE ILLUSTRATING LOCATIONS OF LATERAL LOAD APPLICATION & DEFLECTION MEASUREMENTS**

---

12 *IRC Section R602.10.3.3*

13 *IBC Section 2308.9.3.2*

14 Per *IBC Table 2306.3* and SDPWS Table 4.3A
5.7 “DuPont 12.5" CI I-Joist PFH” and “DuPont 15" CI I-Joist PFH”: These portal frames were constructed as shown in Figure 2, Figure 3, and Figure 4 and tested in accordance with ASTM E564 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 3/8" BWP and the IBC/IRC 16" PFH assemblies.

5.7.1 Two 30’ braced wall lines were framed using standard code complying framing techniques with SPF top plate, sill plate, and stud grade lumber. The braced wall lines were then tested simultaneously.

5.7.2 The assembly was constructed with either 9½" Wood “I”-Joist (2½"-wide and 1½"-thick flange with 3/8" web or equivalent) (“DuPont 12.5" CI I-Joist PFH”) or 117/8" Wood “I”-Joist (2½" wide and 1½" thick flange with 3/8" web or equivalent) (“DuPont 15" CI I-Joist PFH”) fastened between SPF studs as shown in Figure 2 and Figure 8.17

5.7.3 Interior GWB was not applied.

![Figure 8. Cross-section View of the DuPont 12.5" or DuPont 15"

5.7.4 Providing for thermal insulation and the code required water-resistive barrier, ½"-thick DuPont STYROFOAM™ RS was attached to the exterior of the PFH piers with staples (1" crown x 1¼" long 16 gauge staples, ¾" embedment into stud) 12" o.c. spacing at the edges and 12" o.c. spacing in the field (Figure 10).

---

15 Georgia Pacific WI 40 or equivalent
16 ibid.
17 King stud and jack stud attachment per Figure 2. If nailing from the 2"x4" king or jack stud side into the “I”-Joist, nails shall be staggered to prevent splitting of the “I”-Joist flange. If nailing from the “I”-Joist side through the flange into the 2"x4" king and jack studs, nails may be placed along the same side of “I”-Joist flange-web joint.
5.8 The test data provides confirmation that the performance of the “DuPont 12.5” CI I-Joist PFH” and the “DuPont 15” CI I-Joist PFH” provide comparable equivalence to the 3/8” BWP and the IBC/IRC 16” PFH.

5.9 Based on the test results using the equivalency principle as defined in IBC Section 104.11 and IRC Section R104.11, the “DuPont 12.5” CI I-Joist PFH” and “DuPont 15” CI I-Joist PFH” are assigned the recommended design values for designs controlled by wind or gravity loading conditions as provided in Table 1.

TABLE 1. RECOMMENDED ALLOWABLE WIND DESIGN VALUES FOR DU Pont 12.5” CI I-JOIST PFH & Du Pont 15” CI I-JOIST PFH

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Maximum Wall Height (ft)</th>
<th>ASD Allowable Design Value per Pier (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC/IRC 16” PFH (16” Wide Pier)</td>
<td>8</td>
<td>1,047</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>785</td>
</tr>
<tr>
<td>DuPont 12.5” CI I-Joist PFH (12½” Wide Pier)</td>
<td>8</td>
<td>949</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>712</td>
</tr>
<tr>
<td>DuPont 15” CI I-Joist PFH (14½” Wide Pier)</td>
<td>8</td>
<td>1,145</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>858</td>
</tr>
</tbody>
</table>

1. Interpolation between wall heights permitted.
2. In APA Technical Topics Form No. TT-100, the 10'-high portals have 77-78% of the 8'-high portal capacity. Since SBCRI testing provides conservative equivalency to the APA TT-100 test data, 10'-high wall design values are provided that use a 75% factor to reduce the 8'-high wall design values generated by the SBCRI test data.

5.10 The design values for the “DuPont 12.5” CI I-Joist PFH” and “DuPont 15” CI I-Joist PFH” assemblies are based on testing and the evaluation of the test data compared to the IBC/IRC 16” PFH test data. The evaluation considered the following two design conditions found in the IBC/IRC, and the ASD Allowable Design Value per Pier listed in Table 1 is based on the lower of these two limits:
5.10.1 The allowable seismic design story drift for typical residential and conventional light-frame construction as found in ASCE 7.18

5.10.2 The tested capacity divided by a factor of safety.

5.11 As detailed in Figure 2, the maximum allowable compressive strength due to gravity of the “DuPont 12.5” CI I-Joist PFH” or the “DuPont 15” CI I-Joist PFH” is 7,162 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.

5.12 The test results provide assurance that both the “DuPont 12.5” CI I-Joist PFH” or the “DuPont 15” CI I-Joist PFH” provide equivalent shear resistance and comparable stiffness performance to code compliant benchmarks (the 3/8” BWP and the IBC/IRC 16” PFH).

5.12.1 At this time, the testing performed on the “DuPont 12.5” CI I-Joist PFH” or the “DuPont 15” CI I-Joist PFH” limits its use to replacing any bracing required by the IBC Section 2308.619 and IRC Table R602.10.6.1 in Seismic Design Categories A, B, and detached dwellings in Category C.

6 INSTALLATION

6.1 Installation shall comply with the manufacturer’s installation instructions and this TER. In the event of a conflict between the manufacturer’s installation instructions and this TER, the more restrictive shall govern.

6.2 Installation Procedure

6.2.1 The “DuPont 12.5” CI I-Joist PFH” and “DuPont 15” CI I-Joist PFH” shall be constructed as shown in Figure 2, Figure 3, and Figure 4.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 A Portal Frame with Hold Downs for Wall Bracing or Engineered Applications, APA Technical Topics, Form No. TT-100; APA – The Engineered Wood Association; Tacoma, WA.

7.2 Test reports and data for determining comparative equivalency for use as an alternative material conducted by SBCRI under contract with Qualtim, Inc., based on ASTM E564.

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

7.4 Where appropriate, DrJ’s analysis is based on design values that have been codified into law through codes and standards (e.g., IBC, IRC, NDS®, and SDPWS). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

---

18 Although the ASCE 7 criterion is specifically for seismic design and does not apply to wind design, it does provide a reasonable deformation point of reference. The ASD allowable unit shear capacity is determined per SDPWS Section 4.3.3. SDPWS also references the allowable story drift limits according to ASCE 7 Section 12.12.1 and Table 12.12-1

19 2015 IBC Section 2308.9.3
8 FINDINGS

8.1 The testing and engineering analysis performed provides the basis for the use of either the “DuPont 12.5” CI I-Joist PFH” or the DuPont 15” CI I-Joist PFH” as an equivalent alternative to and replacement for a 4’ WSP located within a braced wall line in accordance with the IBC20 and the IRC21.

8.2 The testing and engineering analysis performed provides the basis for the use of the of either the “DuPont 12.5” CI I-Joist PFH” or the “DuPont 15” CI I-Joist PFH” as a substitution for a IBC/IRC 16” PFH as defined in IBC Section 2308.6.5.222 and IRC Section R602.10.6.2,23 and have the relative performance as defined in Table 1.

8.3 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.9 are similar) states:

104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code....Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

8.4 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.

8.4.1 No known variations

9 CONDITIONS OF USE

9.1 The “DuPont 12.5” CI I-Joist PFH” and the “DuPont 15” CI I-Joist PFH” Designs are limited to use in buildings constructed in accordance with the IBC and IRC where wind loading controls the design or where constructed in accordance with the IRC for Seismic Design Categories A, B and detached dwellings in C.

9.2 The “DuPont 12.5” CI I-Joist PFH” and the “DuPont 15” CI I-Joist PFH” Designs are also permitted in buildings constructed in accordance with the Conventional Light frame provisions of the IBC Section 2308.

9.3 Where required by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.

9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.5 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the Building Designer (e.g., owner or registered design professional).

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

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

9.8 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner’s authorized agent. Therefore, the TER shall be reviewed for code compliance by the building official for acceptance.

22 2012 IBC Section 2308.9.3.2
23 2012 IRC Section R602.10.3.3

© 2019 DRJ ENGINEERING, LLC
9.9 The use of this TER is dependent on the manufacturer’s in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer’s instructions, the building official’s inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

10.1 The product(s) listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer’s name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at dupont.com/building.

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.