Technical Evaluation Report
TER 1507-03
BamCore Prime Wall System

BamCore, LLC

Product:
BamCore Prime Wall System
(BamCore Panelized Prime Wall System)

Issue Date:
September 10, 2015
Revision Date:
February 25, 2020
Subject to Renewal:
January 1, 2021
1 PRODUCT EVALUATED

1.1 BamCore Prime Wall System (BamCore Panelized Prime Wall System)
   1.1.1 Prime Wall Panel – load bearing walls

2 APPLICABLE CODES AND STANDARDS

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 C1363: Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
   2.2.4 ASTM C1699: Standard Test Method for Moisture Retention Curves of Porous Building Materials Using Pressure Plates
   2.2.5 ASTM C1794: Standard Test Methods for Determination of the Water Absorption Coefficient by Partial Immersion

1 Building codes require data from valid research reports be obtained from approved sources. Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the building official. DrJ is an ISO/IEC 17065 ANSI-Accredited Product Certification Body – Accreditation #1133.

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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.

3 All terms defined in the applicable building codes are italicized.
2.2.6 ASTM C303: Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation


2.2.8 ASTM D198: Standard Test Methods of Static Tests of Lumber in Structural Sizes

2.2.9 ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials

2.2.10 ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings

2.2.11 ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

2.2.12 ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

2.2.13 ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

2.2.14 ASTM E90: Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

2.2.15 ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials

2.2.16 NIJ Standard 0108.01: Ballistic Resistant Protective Materials

3 PERFORMANCE EVALUATION

3.1 The BamCore Prime Wall System was evaluated to determine the following:

3.1.1 Structural performance under lateral load conditions for both wind and seismic loading for use with the IBC performance-based provisions, IBC Section 2306.1 and Section 2306.3, for light-frame wood wall assemblies.

3.1.1.1 Table 1 provides wind allowable shear capacity in accordance with IBC Section 1609.

3.1.1.2 Table 2 provides allowable shear capacity and seismic design coefficients (SDC) that conform to the requirements in ASCE 7 Section 12.2.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design in accordance with ASCE 7 (i.e., all seismic design categories) per IBC Section 1613.

3.1.1.3 The basis for equivalency testing is outlined in ASCE 7 Section 12.2.1.1:

Alternative Structural Systems. Use of seismic force-resisting systems not contained in Table 12.2-1 shall be permitted contingent on submittal to and approval by the Authority Having Jurisdiction and independent structural design review of an accompanying set of design criteria and substantiating analytical and test data. The design criteria shall specify any limitations on system use, including Seismic Design Category and height; required procedures for designing the system’s components and connections; required detailing; and the values of the response modification coefficient, R; overstrength factor, Ω; and deflection amplification factor, C_d.

3.1.1.4 The SDC evaluation uses the approach found in documentation entitled “Establishing Seismic Equivalency for Proprietary Prefabricated Shear Panels”5 and “Seismic Design Coefficients: How they are determined for light-frame components”6 using code-defined accepted engineering procedures, experience, and technical judgment.

3.1.2 Compressive strength in accordance with ASTM E72.

3.1.3 In-plane bending strength in accordance with ASTM E72.

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4 2010 ASCE 7 Section 12.2.1


6 SBC Magazine; Seismic Design Coefficients: How they are determined for light-frame components (2014)
3.1.4 Performance under transverse load conditions in accordance with IBC Section 1609.1.1 and IRC Section R301.2.1.

3.1.5 Density in accordance with ASTM C303.

3.1.6 Performance in accordance with ASTM E84 for flame spread and smoke-developed index ratings in accordance with IBC Section 2603.5.4 and IRC Section R316.4.

3.1.7 Performance in fire-resistance rated assemblies in accordance with IBC Section 2603.5.1.

3.1.8 Performance for use as an air barrier assembly in accordance with the IECC Section C402.5.1.2.7.

3.1.9 Water vapor transmission performance in accordance with IBC Section 1404.3 and IRC Section R702.7.

3.1.10 Sound transmission rating performance in accordance with IBC Section 1206 and IRC Appendix K.

3.1.11 Thermal performance in accordance with IECC Section C402.1.

3.1.12 Ballistics protection performance in accordance with NIJ Standard 0108.01.

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

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

4 PRODUCT DESCRIPTION AND MATERIALS

4.1 The product evaluated in this TER is shown in Figure 1.

![Figure 1. House being built with BamCore Panelized Prime Wall System](image)

4.2 The BamCore Prime Wall System is comprised of two laminated veneer bamboo (LVB) panels forming the interior and exterior faces of the wall assembly. The panels are fastened to wood plates or a metal track at the top and bottom of the wall assembly, as specified by approved construction documents. Contiguous panels are fastened to each other using one of the options listed in Section 4.2.4.3. Blocking between panels is added per specific job requirements. Specifically, the BamCore Prime Wall System consists of the following:

4.2.1 BamCore Prime Wall Panel Composition:

4.2.1.1 The panels consist of multiple LVB layers covered with nominal ½" (3.2 mm) Douglas Fir veneer on both faces.

4.2.1.2 The panels have a nominal thickness of 1¼" (32 mm) (Figure 2).

7 2012 IECC Section C402.4.1.2.2
8 2015 IBC Section 1405.3
4.2.1.3 The BamCore Prime Wall System may be designed with plate widths that allow outer wall dimensions from 8" (203 mm) to 13¾" (349 mm).

4.2.1.4 The finished wall assembly has a cavity that is slightly smaller (about 1/10") than the width of the plate due to finishing of top and bottom panel edges.

4.2.1.5 Individual BamCore Prime Wall panels are manufactured with routed edges to form half lap joints at adjoining panel edges. The half lap joint is 1½" (38 mm) wide; each panel has half their depth in the connection.

4.2.1.6 If steel top and bottom tracks are used, the panels are manufactured with top and bottom edges routed with grooves to allow for setting onto the 20-gauge steel tracks. The steel tracks are pre-formed with vertical legs which insert 1½" (38 mm) into the top and bottom of the panels.

4.2.1.7 If steel splines are used to join the vertical panel edges, a kerf can be manufactured in the vertical edges of the panels to accept the 20-gauge x 3" (76 mm) wide G60 galvanized sheet metal splines.

4.2.2 Wood Top and Bottom Plates:

4.2.2.1 The wood top and bottom plates shall be minimum of two 2x3 No. 2 dimensional lumber or one 2x6 No. 2 dimensional lumber with a minimum oven-dry specific gravity of 0.44. Moisture content at the time of installation shall be 19% or less.

4.2.2.2 Both the interior and exterior panels are connected to the wood plates with 0.131" dia. x 3¾" long (3.3 mm x 85 mm) nails spaced per Table 1 or Table 2. Install nails in the centerline of the 2x plates to maintain a minimum ¾" (19 mm) edge distance along the top and bottom of the panels (Figure 3).
4.2.3 Steel Top and Bottom Tracks:

4.2.3.1 As an alternative to solid sawn wood top and bottom plates, the BamCore Prime Wall System is permitted to be constructed using steel top and bottom tracks.

4.2.3.2 The top and bottom tracks are 20-gauge (0.036”) G60 galvanized metal, pre-formed with vertical legs which insert 1½” (38 mm) into the top and bottom of the panels and provide the appropriate spacing for the panels.

4.2.3.3 The panels are manufactured with top and bottom edges routed with grooves to allow for setting onto 20-gauge steel tracks.

4.2.3.4 Steel tracks are available in widths that allow outer wall dimensions from 8” (203 mm) to 13½” (349 mm).

4.2.3.5 The BamCore Prime Wall panel shall be attached to the steel tracks with #10 x 1 ¼” (32 mm), min. shank diameter - 0.184” (4.7 mm) flat head, square drive sheet metal screws spaced per Table 2.

4.2.4 Fastening:

4.2.4.1 Contiguous panels within a shear wall shall be connected together at vertical joints with a half lap joint (Figure 4).
4.2.4.2 The half lap joint is 1½" (38 mm) wide, and each panel has half their depth in the connection.

4.2.4.2.1 For shear walls with solid sawn wood plates, the half lap joint shall be connected with 0.113" dia x 2" long ring shank nails. Nails shall be spaced per Table 1 and Table 2.

4.2.4.2.2 For shear walls with steel tracks, the half lap joint shall be connected with #10 x 1¼" (32 mm) flat head standard wood screws at 8" o.c. (203 mm).

4.2.4.3 Contiguous panels are permitted to be connected using a 3" (76 mm) wide, 20-gauge sheet metal spline for connections not located in a shear wall.

4.2.4.3.1 For the spline connection, #10 x 1¼" (32 mm) flat head, square drive sheet metal screws at 8" o.c. (203 mm).

4.2.5 Hold-Downs:

4.2.5.1 For shear wall applications with solid sawn wood plates, hold-downs are composed of a partial height BamCore block nailed to the inside of each panel. A metal plate sits on top of the blocks and is attached the foundation/framing below using a threaded rod. See Figure 5 for attachment requirements.
4.2.5.2 For shear wall applications with steel tracks, hold-down blocks are installed at the top corners of each panel assembly and held down with threaded rods as required by the design.

4.2.5.2.1 The hold-down block is 12" (305 mm) long with a steel plate on top and a threaded rod centered on the block and plate connecting it to the foundation below.

4.2.5.2.2 The panels are routed ⅝" (15.6 mm) on the inside face of each panel with the hold-down block set into the routes so that it has direct bearing.

4.2.5.2.3 #8 x 3" (76 mm) deck screw, coarse, square drive – used to attach panels to hold down blocks.

4.2.6 Blocking:

4.2.6.1 Vertical panel blocking shall be installed in the cavity between the two runs of panels and fastened to the BamCore Prime Wall panels using minimum #10 by 3¾" (95 mm) wood screws at 4" o.c. (102 mm) maximum. Blocking height and spacing depend on specific job requirements as specified in the approved construction documents.

4.2.6.2 Blocking around window/door openings are to be fastened using minimum #10 by 3¾" (95 mm) wood screws at 8" o.c. (203 mm) maximum.

4.3 BamCore Prime Wall Systems are prefabricated to a job-specific engineered plan and delivered to the jobsite with materials as specified in BamCore-to-client contracts. The BamCore Prime Wall System is not installed by BamCore LLC.
5 APPLICATIONS

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.

5.2 Shear Wall Design

5.2.1 BamCore Prime Wall panels may be designed as shear walls to resist lateral loads using the ASD allowable unit shear capacities for wind and seismic given in Table 1 and Table 2 respectively.

5.2.2 The maximum aspect ratio for full height BamCore Prime Panel shear walls shall be 4:1.

5.2.2.1 For shear walls with aspect ratios \( \frac{h}{b_s} \) greater than 2.5:1, the nominal shear capacity shall be multiplied by the Aspect Ratio Factor (WSP) = 1.13 - 0.052h/b_s.

5.2.3 Seismic design for BamCore Prime Wall panels shall not be required in buildings exempt from seismic design in accordance with IBC Section 1613.

5.2.4 BamCore Prime Wall panel shear walls that require wind design in accordance with IBC Section 1609 shall use the wind allowable unit shear capacities set forth in Table 1.

### Table 1. Wind Allowable Unit Shear Capacity

<table>
<thead>
<tr>
<th>Force-Resisting System</th>
<th>Top and Bottom Plate Material</th>
<th>Plate Fastener Type and Size</th>
<th>Half Lap Fastener Type and Size</th>
<th>Plate Fastener Spacing</th>
<th>Half Lap Fastener Spacing</th>
<th>Allowable Unit Shear Capacity³ plf (kN/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall System¹</td>
<td>2x Lumber</td>
<td>0.131” x 3.25” Smooth Shank Nail</td>
<td>0.113” x 2” Ring Shank Nail</td>
<td>6</td>
<td>6</td>
<td>775 (11.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>1195 (17.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>1405 (20.5)</td>
</tr>
</tbody>
</table>

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. For BamCore Prime Wall System treated with ACQ, multiply the allowable shear capacity by a reduction factor of 0.64.
2. BamCore Prime Wall System attached in accordance with Section 4 and Section 6.
3. The allowable unit shear capacity is calculated using a factor of safety of 2 per ASCE 7.

5.2.5 BamCore Prime Wall panel shear walls that require seismic design in accordance with IBC Section 1613 shall use the seismic allowable unit shear capacities set forth in Table 2.

5.2.5.1 The response modification coefficient, R, system overstrength factor, Ω₀, and deflection amplification factor, C_d, indicated in Table 2 shall be used to determine the base shear, element design forces, and design story drift in accordance with ASCE 7 Chapter 12 and Section 14.5.

5.2.5.2 An example of a BamCore Prime Wall shear panel is given in Figure 6.
## Table 2. Seismic Allowable Unit Shear Capacity & Seismic Design Coefficients

<table>
<thead>
<tr>
<th>Seismic Force-Resisting System</th>
<th>Top and Bottom Plate Material</th>
<th>Plate Fastener Type and Size</th>
<th>Half Lap Fastener Type and Size</th>
<th>Plate Fastener Spacing</th>
<th>Half Lap Fastener Spacing</th>
<th>Apparent Shear Stiffness, ( G_a ), kips/in</th>
<th>Response Modification Factor, ( R^6 )</th>
<th>System Overstrength Factor, ( \Omega^7 )</th>
<th>Deflection Amplification Coefficient, ( C_d^8 )</th>
<th>Allowable Unit Shear Capacity(^5 ) plf (kN/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall System</td>
<td>2x Lumber</td>
<td>0.131” x 3.25” Smooth Shank Nail</td>
<td>0.113” x 2” Ring Shank Nail</td>
<td>6</td>
<td>6</td>
<td>21.8</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>440 (6.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>24.2</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>815 (11.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>25.4</td>
<td>6.5</td>
<td>3</td>
<td>4</td>
<td>1000 (14.6)</td>
</tr>
<tr>
<td>Steel Track</td>
<td>#10 x 1.25” Screws</td>
<td>#10 x 1.25” Screws</td>
<td></td>
<td>8</td>
<td>8</td>
<td>10.5</td>
<td>3.4</td>
<td>3</td>
<td>4</td>
<td>555 (8.1)</td>
</tr>
</tbody>
</table>

\( 1 \) in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. For BamCore Prime Wall System treated with ACQ, multiply the allowable shear capacity by a reduction factor of 0.65.
2. BamCore Prime Wall System attached in accordance with Section 4 and Section 6.
3. Structural System Limitations & Building Height Limit:
   a. Lumber Bottom Plate: \( B = \text{NL}, C = \text{NL}, D = 65, E = 65, F = 65 \)
   b. Steel Track: \( B = \text{NL}, C = \text{NL}, D = 35, E = \text{NP}, F = \text{NP} \)
   c. NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2.
4. All seismic design parameters follow the equivalency as defined in Section 3 of this TER.
5. The allowable unit shear capacity is calculated using a factor of safety of 2.5 per ASCE 7.
6. Response modification coefficient, \( R \), for use throughout ASCE 7 (Note: \( R \) reduces forces to a strength level, not an allowable stress level.)
7. The tabulated value of the overstrength factor, \( \Omega \), is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.
8. Deflection amplification factor, \( C_d \), for use with ASCE 7 Section 12.8.6, Section 12.8.7, and Section 12.9.2
9. Panel shear wall deflection shall be calculated as:

\[
\delta_{sw} = (v\,h / 1000G_a) + (h\,\Delta_a / b)
\]

Where:

- \( v \) = induced unit shear, lbs/ft
- \( h \) = shear wall height, ft
- \( G_a \) = apparent shear wall stiffness, kips/in
- \( \Delta_a \) = total vertical elongation of the wall anchorage system at the induced unit shear in the shear wall, in
- \( b \) = shear wall length, ft
5.3 Hold Down Tensile Capacity

5.3.1 The hold downs used in BamCore Prime Wall Systems have the allowable wind and seismic tensile capacities shown in Table 3.

5.3.2 See Figure 5 for additional information on the hold down assembly.

**TABLE 3. BAMCORE PRIME WALL HOLD DOWN TENSILE CAPACITY**

<table>
<thead>
<tr>
<th>Number of Fasteners per Side of Hold Down</th>
<th>3x Block Height (in)</th>
<th>Plate Washer Size (in)</th>
<th>Allowable Tensile Load, lb (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wind</td>
</tr>
<tr>
<td>36</td>
<td>38</td>
<td>4.75 x 4.75 x 0.625</td>
<td>14,040 (62.5)</td>
</tr>
<tr>
<td>28</td>
<td>30</td>
<td>4.75 x 4.75 x 0.625</td>
<td>10,920 (48.6)</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>3.5 x 3.5 x 0.5</td>
<td>7,020 (31.2)</td>
</tr>
</tbody>
</table>

Seismic: 10,010 (44.5), 7,785 (34.6), 5,005 (22.3)

SI: 1 in = 25.4 mm, 1 lb = 4.45 N
1. Testing per ASTM E2126.
5.4 **Axial Compressive Strength**

5.4.1 BamCore Prime Wall Systems have the compressive strength shown in Table 4.

### Table 4. BAMCORE PRIME WALL ALLOWABLE COMpressive STRENGTH

<table>
<thead>
<tr>
<th>Wall Height ft</th>
<th>Minimum Nominal Thickness of Wall System in (mm)</th>
<th>Allowable Compressive Strength plf (kN/m)</th>
<th>Allowable Compressive Strength with ACQ Pressure Treatment plf (kN/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8 (203)</td>
<td>3730 (54.4)</td>
<td>2425 (35.4)</td>
</tr>
<tr>
<td>9</td>
<td>8 (203)</td>
<td>3490 (50.9)</td>
<td>2270 (33.1)</td>
</tr>
<tr>
<td>10</td>
<td>8 (203)</td>
<td>3245 (47.4)</td>
<td>2110 (30.8)</td>
</tr>
</tbody>
</table>

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m
1. Testing per ASTM E72 Section 9.

5.5 **BamCore Prime Wall System Headers – In-Plane Bending Strength**

5.5.1 BamCore Prime Wall panels may be designed as wall headers to carry gravity loads using the reference design values given in Table 5. See Figure 7 for details of header construction.

5.5.2 Design of BamCore Prime Wall headers is governed by the applicable code and the provisions for Structural Composite Lumber (SCL) in NDS.

5.5.3 Unless otherwise noted, adjustment of the reference design values for duration of load shall be in accordance with the applicable code.

### Table 5. REFERENCE DESIGN VALUES FOR BAMCORE PRIME WALL SYSTEM (ALLOWABLE STRESS DESIGN)

<table>
<thead>
<tr>
<th>Bending, $F_b$ psi (MPa)</th>
<th>Compression, $F_c$ psi (MPa)</th>
<th>Horizontal Shear, $F_y$ psi (MPa)</th>
<th>Modulus of Rigidity, $G$ psi (MPa)</th>
<th>Modulus of Elasticity, $E$ psi (MPa)</th>
<th>Modulus of Elasticity for Beam Stability, $E_{min}$ psi (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam4,5,6</td>
<td>Parallel-to-Grain</td>
<td>Perpendicular-to-Grain7</td>
<td>Beam</td>
<td>Beam</td>
<td>True</td>
</tr>
<tr>
<td>2,400 (16.55)</td>
<td>2625 (18.10)</td>
<td>660 (4.55)</td>
<td>270 (1.86)</td>
<td>75,300 (519)</td>
<td>2,600,000 (17,931)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>730,000 (5,034)</td>
</tr>
</tbody>
</table>

SI: 1 psi = 0.00689 MPa
1. The reference design values in this table are applicable for the product used in dry, well-ventilated interior applications, in which the equivalent moisture content of sawn lumber is less than 16%. See Section 9.5 of this TER.
2. The reference design values in this table are for normal load duration. Loads of other duration shall be adjusted in accordance with the applicable code. Duration of load adjustments shall not be applied to $F_c$ and $E$.
3. Reference design values (except for compression parallel-to-grain) are for the BamCore Prime Wall with vertical load applied along the panel edge with the strength axis (i.e., long direction of the panel) oriented parallel to the span.
4. The calculated deflection of flexural members must account for combined bending and shear deflection. For uniformly loaded simple span beams, the deflection is calculated as follows:
   \[
   \Delta = \frac{5WL^4}{32EI} + \frac{63WL^2}{20Ebh^2} \\
   \text{where: } \Delta = \text{deflection in inches (mm)} \\
   \text{W = uniform load in lb/in (N/mm)} \\
   \text{L = span in inches (mm)} \\
   \text{E = modulus of elasticity in psi (MPa)} \\
   \text{b = width of beam in inches (mm)} \\
   \text{h = depth of beam in inches (mm)}
   \]
5. The bending values in these tables are based on a reference depth of 12” (305 mm). For other depths, the bending value shall be adjusted by a size factor adjustment of $(12/d)^{0.94}$, where $d$ is measured in inches with a minimum depth of 12” (178 mm). Bending values are valid for members 1.25” in thickness and a unit volume not to exceed 10,752 in$^2$ based on the member length times the member depth.
6. When structural members qualify as repetitive members in accordance with the applicable code, a 4% increase is permitted.
7. The minimum bearing length shall be checked based on Compression Perpendicular-to-Grain. Where needed, additional bearing blocking may be added.
FIGURE 7. DETAILS FOR BAMCORE PRIME WALL HEADER CONSTRUCTION
5.6 Transverse Strength

5.6.1 BamCore Prime Walls were tested in accordance with ASTM E72 for transverse load (Table 6).

5.6.2 BamCore Prime Walls were evaluated to assess the strength and deflection of the panels when subjected to transverse wind loading.

### Table 6. Deflection Performance of BamCore Prime Walls

<table>
<thead>
<tr>
<th>Application</th>
<th>Blocking</th>
<th>Deflection Limit</th>
<th>Wall Height, H (ft)</th>
<th>Allowable Transverse Load psf (kN/m²)</th>
<th>Allowable Transverse Load with ACQ Pressure Treatment psf (kN/m²)</th>
<th>Max. Wind Speed, V_{ult} (mph)</th>
<th>Max. Wind Speed with ACQ Pressure Treatment, V_{ult} (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Walls – wind loads with flexible finishes</td>
<td>H/120</td>
<td></td>
<td>8</td>
<td>78.1 (3.7)</td>
<td>68.8 (3.2)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>54.9 (2.6)</td>
<td>48.3 (2.3)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>40.0 (1.9)</td>
<td>35.2 (1.7)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Exterior Walls – wind loads with flexible finishes</td>
<td>H/180</td>
<td></td>
<td>8</td>
<td>78.1 (3.7)</td>
<td>68.8 (3.2)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>54.9 (2.6)</td>
<td>48.3 (2.3)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>40.0 (1.9)</td>
<td>35.2 (1.7)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Exterior Walls – wind loads with other brittle finishes</td>
<td>H/240</td>
<td></td>
<td>8</td>
<td>62.5 (3.0)</td>
<td>55.0 (2.6)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>43.9 (2.2)</td>
<td>38.6 (1.8)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>32.0 (1.5)</td>
<td>28.2 (1.4)</td>
<td>180</td>
<td>170</td>
</tr>
<tr>
<td>Exterior Walls – wind loads with plaster or stucco finish</td>
<td>H/360</td>
<td></td>
<td>8</td>
<td>49.0 (2.3)</td>
<td>43.1 (2.1)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>34.4 (1.6)</td>
<td>30.3 (1.5)</td>
<td>180</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>25.1 (1.2)</td>
<td>22.1 (1.1)</td>
<td>160</td>
<td>150</td>
</tr>
<tr>
<td>Exterior Walls – wind loads with flexible finishes</td>
<td>H/120</td>
<td></td>
<td>8</td>
<td>38.5 (1.8)</td>
<td>33.9 (1.6)</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>27.0 (1.3)</td>
<td>23.8 (1.1)</td>
<td>170</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>19.7 (0.9)</td>
<td>17.3 (0.8)</td>
<td>150</td>
<td>140</td>
</tr>
<tr>
<td>Exterior Walls – wind loads with other brittle finishes</td>
<td>H/180</td>
<td></td>
<td>8</td>
<td>20.3 (1.0)</td>
<td>17.9 (0.9)</td>
<td>150</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>14.3 (0.7)</td>
<td>12.6 (0.6)</td>
<td>130</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>10.4 (0.5)</td>
<td>N/A</td>
<td>110</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. Based on ASTM E72 Section 12 testing with 8” x 10” panels. Blocking (85% full height) installed at panel edges and mid-panel at 4” o.c. Allowable transverse load is based the lesser of strength and deflection checks. Deflection controls in all cases. Deflection is calculated based on 0.7 times components and cladding loads per IRC Table R301.2(2) for Wall Zone 5, an effective area of 20 ft², Exposure B, and a mean roof height of 30 ft.

2. Based on ASTM E72 Section 12 testing with 8” x 10” panels. Blocking (50% full height) installed at mid-height of panel edges at 8” o.c. Allowable transverse load is based the lesser of strength and deflection checks. Deflection controls in all cases. Deflection is calculated based on 0.7 times components and cladding loads per IRC Table R301.2(2) for Wall Zone 5, an effective area of 50 ft², Exposure B, and a mean roof height of 30 ft.

5.7 Density

5.7.1 BamCore Prime Walls have the density shown in Table 7.

### Table 7. Density of BamCore Prime Walls

<table>
<thead>
<tr>
<th>Product</th>
<th>Average Density, lb/ft³ (kg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall</td>
<td>36.7 (587)</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM C303
5.8 Surface Burning Characteristics

5.8.1 BamCore Prime Walls have the flame spread and smoke developed characteristics shown in Table 8.

TABLE 8. SURFACE BURN CHARACTERISTICS

<table>
<thead>
<tr>
<th>Product</th>
<th>Flame Spread</th>
<th>Smoke Developed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall</td>
<td>≤ 75</td>
<td>≤ 450</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E84. Flame spread, and smoke developed numbers are shown for comparison purposes only and are not intended to represent the performance of BamCore Prime Wall panels and related components under actual fire conditions.

5.9 Fire-Resistance Rated Wall Assemblies

5.9.1 BamCore Prime Wall has the fire-resistance ratings shown in Table 9.

TABLE 9. FIRE-RESISTANCE RATING

<table>
<thead>
<tr>
<th>Product</th>
<th>Layers of Type X Gypsum on Each Side of Assembly</th>
<th>Fire-Resistance Rating (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>BamCore Prime Wall</td>
<td>2</td>
<td>120</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E119 with one layer of Type X gypsum installed on each side of assembly. Construction shall be in accordance with Section 5.9.2.

2. Tested according to ASTM E119 with two layers of Type X gypsum installed on each side of assembly. Construction shall be in accordance with Section 5.9.3.

5.9.2 One-Hour Rated Assembly:

5.9.2.1 BamCore Prime Wall assemblies were tested per ASTM E119 and have a 1-hour fire resistance rating when constructed as follows:

5.9.2.1.1 BamCore Prime Walls are assembled using the steel top and bottom track method and are fastened with 1 1/8" (29 mm) [self-tapping screws at 8" o.c. (203 mm)]. Minimum cavity depth of 5½" (140 mm) is required.

5.9.2.1.2 Panel joints are constructed using the metal splines and are fastened with 1 1/8" (29 mm) self-tapping screws at 8" o.c. (203 mm).

5.9.2.1.3 A panel stiffener (minimum 1 1/4" x 5 1/2" x 5') (29 mm x 140 mm x 1,524 mm) is installed vertically at mid-height within 5' (1524 mm) of the end of the wall and every 10' o.c. (3048 mm) along the length of the wall. The stiffener is attached with minimum #8 x 3" (76 mm) screws.

5.9.2.1.4 A bead of fire sealant (3M Fire Barrier Sealant, 3-hr or equivalent) is applied to all joints and voids in the panel surfaces.

5.9.2.1.5 Cellulose insulation is installed in the cavity at approximately 3 lb/ft³.

5.9.2.1.6 One layer of 5/8" (15.9 mm) Type X gypsum is installed on each face of the wall assembly with 1 5/8" (41 mm) drywall screws fastened 12" o.c. (305 mm). All joints are taped and covered with two layers of joint compound. Exposed screw heads are also covered with two coats of joint compound. Gypsum joints on one side of the wall are staggered from the joints on the opposite side by 24" (610 mm).
5.9.3 **Two-Hour Rated Assembly:**

5.9.3.1 BamCore Prime wall assemblies were tested per ASTM E119 and have a 2-hour fire resistance rating when constructed as follows:

5.9.3.1.1 BamCore Prime Walls are assembled using the steel top and bottom track method and are fastened with 1½” (29 mm) self-tapping screws at 8” o.c. (203 mm). Minimum cavity depth of 5½” (140 mm) is required.

5.9.3.1.2 Panel joints are constructed using the metal splines and are fastened with 1½” (29 mm) self-tapping screws at 8” o.c. (203 mm).

5.9.3.1.3 A panel stiffener (minimum 1¼” x 5½” x 5’) (29 mm x 140 mm x 1,524 mm) is installed vertically at mid-height within 5’ (1524 mm) of the end of the wall and every 10’ o.c. (3048 mm) along the length of the wall. The stiffener is attached with minimum #8 x 3” (76 mm) screws.

5.9.3.1.4 A bead of fire sealant (3M Fire Barrier Sealant, 3-hr or equivalent) is applied to all joints and voids in the panel surfaces.

5.9.3.1.5 Cellulose insulation is installed in the cavity at approximately 3 lb/ft³.

5.9.3.1.6 Two layers of 5/8” (15.9 mm) Type X gypsum are installed on each face of the wall assembly. The base layer is attached with 15/8” (41 mm) drywall screws fastened 12” o.c. (305 mm). The face layer is attached with 2½” (64 mm) screws at 8” o.c. (203 mm).

5.9.3.1.7 All joints in the face layer are taped and covered with two layers of joint compound. Exposed screw heads are also covered with two coats of joint compound. Gypsum joints on one side of the wall are staggered from the joints on the opposite side by 24” (610 mm).

5.10 **Air Barrier**

5.10.1 BamCore Prime Walls meet the requirements of IECC Section C402.5 (Table 10) for use in an air barrier assembly when installed in accordance with the manufacturer’s installation instructions and this TER.

5.10.1.1 The tested air barrier assembly consists of BamCore Prime Walls nominally 8” (203 mm) thick constructed with metal splines as described in Section 4.2. The cavity of the wall is filled with blown-in cellulose fiber insulation at 3.5 lb/ft³ density.

**TABLE 10. AIR BARRIER PROPERTIES**

<table>
<thead>
<tr>
<th>Product</th>
<th>Air Permeance [L/(s*m²)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall Panel</td>
<td>&lt; 0.2</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E283 at a 6.27 psf pressure differential. Cavity filled with blown cellulose insulation.
2. Joints between prime panels and any overdriven nails caulked with silicone.
3. Liter per second per square meter

5.11 **Water Vapor Transmission**

5.11.1 BamCore Prime Walls have the water resistance properties shown in Table 11.

**TABLE 11. WATER-RESISTANCE PROPERTIES**

<table>
<thead>
<tr>
<th>Product</th>
<th>Permeance¹ (perms)</th>
<th>Water Absorption Coefficient² [kg/(m²*h½)]</th>
<th>Equilibrium Moisture Content at 100% Relative Humidity³ (kg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BamCore Prime Wall Panel</td>
<td>7.9</td>
<td>0.190</td>
<td>0.55</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E96 using the “wet cup” method
2. Tested in accordance with ASTM C1794
3. Tested in accordance with ASTM C1699

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9 2012 IECC Section C402.4
5.12 Sound Transmission

5.12.1 BamCore Prime Walls have the sound transmission ratings shown in Table 12.

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Sound Transmission Class (STC)</th>
<th>Outside Inside Transmission Class (OITC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Layer 5/8&quot; Type X on One Side</td>
<td>46</td>
<td>42</td>
</tr>
<tr>
<td>Single Layer 5/8&quot; Type X on Both Sides</td>
<td>51</td>
<td>46</td>
</tr>
<tr>
<td>Double Layer 5/8&quot; Type X on Both Sides</td>
<td>55</td>
<td>48</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E90
2. Framing details: one-half height blocking installed at 8” (203 mm) o.c. along the length of the wall attached with #10 x 3½” (95 mm) wood screws at 4” o.c. (102 mm). Half lap splice joints at panel edges attached with 0.113” x 2” (51 mm) ring shank nails at 3” o.c. (76 mm). 5/8” (15.9 mm) Type X gypsum applied to both faces at 16” o.c. (406 mm) horizontally and 12” o.c. (305 mm) vertically with #6 Type W drywall screws. Gypsum seam caulked with silicone. Wall cavity filled with blown cellulose insulation.

5.13 Thermal Resistance (R-Value)

5.13.1 BamCore Prime Walls have the thermal resistance shown in Table 13.

<table>
<thead>
<tr>
<th>Product or Assembly</th>
<th>R-Value [(F<em>ft²</em>h)/Btu]</th>
<th>U-Factor [Btu/(F<em>ft²</em>h)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single 1.25” Thick BamCore Prime Wall Panel</td>
<td>1.6</td>
<td>0.625</td>
</tr>
<tr>
<td>BamCore Prime Wall with Single Layer 5/8” (15.9 mm) Type X on One Side</td>
<td>20.3</td>
<td>0.037</td>
</tr>
<tr>
<td>BamCore Prime Wall with Single Layer 5/8” (15.9 mm) Type X on Both Sides</td>
<td>22.3</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. Thermal values are determined using the ASTM C518 test method at 75°F mean temperature and 50°F temperature differential.
2. Thermal values are determined using the ASTM C1363 test method at 75°F mean temperature and 50°F temperature differential. Cavity of wall filled with 5½” (140 mm) dry cellulose blown-in insulation at 3.5 lb density. Seams of BamCore Prime Wall panels and gypsum filled with silicone caulking.
3. Framing factor of 6.65% (representative of an exterior wall configuration)
4. Framing factor of 3.91% (representative of a common wall configuration)

5.14 Ballistics

5.14.1 BamCore Prime Walls satisfied the ballistic resistance requirements of NIJ Standard 0108.01 – Level I (Figure 8).

5.14.2 Level I protection can resist .38 Special and .22 long rifle hyper velocity (.22 LRHV) rounds when fired 16’ or more from the installed wall.
6 INSTALLATION

6.1 The BamCore Prime Wall panels must be stored and handled to protect panels from damage in storage, during shipment, and on the job site. If panels must be stored outside, stack them on a level platform supported by at least three 4x4s to keep them off the ground. Place one 4x4 in the center and the other two 12” (305 mm) to 16” (406 mm) from the ends. Never leave the platform in direct contact with the ground. Cover the stack loosely with plastic sheets or tarps. Anchor the covering at the top of the stack, but keep it open and away from the sides and bottom to ensure good ventilation. Tight coverings prevent air circulation and when exposed to sunlight, may promote mold or mildew. Please refer to the APA EWS Technical Note E705 – March 2005, “Proper Storage and Handling of I-Joists and LVL” and the APA Builder Tips on “Storage and Handling of APA Trademarked Panels” for additional recommendations.

6.2 BamCore Prime Walls shall be designed for dry use and shall be adequately protected from moisture and pests.

6.3 BamCore Prime Walls shall be installed in accordance with the approved construction documents, the installation instructions provided with the shipment of panels, and this TER. In the event of a conflict between the manufacturer’s installation instructions, approved construction documents by a registered design professional (RDP), and this TER, the more restrictive shall govern.

6.3.1 Generic details provided by BamCore shall be evaluated and revised by a RDP for applicability to a specific building.

6.3.2 Support for BamCore Prime Walls (e.g., foundation walls, footings, etc.) shall be designed by a RDP.

6.4 Support for BamCore Prime Walls must be flat, level, free of debris, and match the dimensions provided by a RDP.

6.5 BamCore Prime Walls are installed and aligned in accordance with the plans designed and submitted to the building official per Section 9.

6.6 All panels are stamped with sequencing identification to correspond to the approved construction documents for easy placement in the correct location.

6.7 Installation Procedure

6.7.1 Layout the bottom plate/track as shown on the approved construction documents. Attach to the structure above and below per approved construction documents.

6.7.2 Install panels for the exterior side of the wall starting at a corner.

6.7.3 Place adjoining panels per the numbered sequencing on the approved construction documents by placing each panel on/next to the plate. Fasten per Section 4.2 and approved construction documents. Continue until all exterior panels are set.

6.7.4 Repeat the steps above for the panels on the interior side of the exterior walls. Refer to approved construction documents to determine placement of additional blocking for deflection criteria to be met.
6.7.5 Add panel blocking around each window and door to connect the panels on the interior and exterior sides of the exterior walls together.

6.7.6 The top plate can either be set on blocking or clamped in place while fastening it to the panel. Fasten per Section 4.2 and approved construction documents.

6.7.7 Interior load bearing walls are installed in the same manner.

6.7.8 For more details on the installation of BamCore Prime Wall assemblies and subsequent installation of other trades within the assemblies, see bamcore.com.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 Shear wall performance in accordance with ASTM E72 and ASTM E2126 by the Composite Materials and Engineering Center of Washington State University

7.2 Shear wall performance in accordance with ASTM E2126 by SBCRI

7.3 Axial and transverse load performance in accordance with ASTM E72 Section 9 and Section 12 by Intertek/ATI.

7.4 Density in accordance with ASTM C303 by R&D Services

7.5 Flame spread and smoke density in accordance with ASTM E84 by QAI Laboratories

7.6 Fire-resistant assembly rating in accordance with ASTM E119 by Western Fire Center, Inc.

7.7 Air barrier assembly testing in accordance with ASTM E283 by Intertek and National Certified Testing Laboratories

7.8 Water vapor transmission in accordance with ASTM E96 by Radco, Inc. and ASTM C1699 and ASTM C1794 by R&D Services

7.9 Sound transmission in accordance with ASTM E90 by Intertek

7.10 Thermal properties in accordance with ASTM C518 by QAI Laboratories

7.11 Thermal properties in accordance with ASTM C1363 by Intertek

7.12 Ballistics testing in accordance with NIJ Standard 0108.01 by Oregon Ballistic Laboratories

7.13 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.

7.14 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.
8 FINDINGS

8.1 BamCore Prime Wall System as described in this TER comply with, or are suitable alternatives to, the applicable building codes listed in Section 2 within the scope of this TER and are subject to the conditions listed in Section 9.

8.2 **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.

8.3 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.

8.3.1 No known variations

9 CONDITIONS OF USE

9.1 BamCore Prime Walls must be designed, manufactured, labelled, and installed in accordance with this TER and the applicable building code.

9.2 All connections shall be in accordance with this TER, approved construction documents (by a registered design professional), and the applicable building code, based on individual job requirements.

9.3 Design calculations and details shall be furnished to the code official verifying that the material is used in compliance with this TER. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

9.4 The design values shall not exceed those set forth in this report as modified by all applicable table notes.

9.5 The service conditions for BamCore Prime Walls are dry conditions of use, for which the equilibrium moisture content must be less than 16%. Uses in applications exceeding 16% moisture content are outside the scope of this TER.

9.6 The service conditions for BamCore Prime Walls with fire-retardant treatments are outside the scope of this TER.

9.7 Cutting and notching of BamCore Prime Walls is prohibited, except where specifically permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

9.8 No increases for duration of load are permitted.

9.9 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.

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

9.11 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).

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

9.13 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.**

9.14 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.
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 bamcore.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.