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# ICC-ES Report

## ESR-1510

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Reissued 04/2015  
This report is subject to renewal 04/2017

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**  
**SECTION: 06 16 00—SHEATHING**

**REPORT HOLDER:**

**NATIONAL GYPSUM COMPANY**

**2001 REXFORD ROAD**  
**CHARLOTTE, NORTH CAROLINA 28211**

**EVALUATION SUBJECT:**

**PERMABASE BRAND CEMENT BOARD**



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# ICC-ES Evaluation Report

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**DIVISION: 06 00 00—WOOD, PLASTICS AND  
COMPOSITES**
**Section: 06 16 00—Sheathing**
**REPORT HOLDER:**
**NATIONAL GYPSUM COMPANY**  
 2001 REXFORD ROAD  
 CHARLOTTE, NORTH CAROLINA 28211  
 (704)551-5807  
[www.nationalgypsum.com](http://www.nationalgypsum.com)
**EVALUATION SUBJECT:**
**PERMABASE BRAND CEMENT BOARD**

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)

**Properties evaluated**

- Physical properties
- Structural
- Durability
- Fire-resistance-rated construction
- Surface burning characteristics
- Noncombustible construction

## 2.0 USES

PermaBase® Brand Cement Board is used as floor underlayment and interior and exterior backer board for ceramic tile, slate, marble, stone, thin brick, Portland cement stucco, synthetic stucco and manufactured stone. PermaBase is also used as sheathing behind anchored brick and stone veneer. PermaBase® Brand Cement Board is suitable for use in combustible and noncombustible construction under the IBC, and in buildings constructed in accordance with the IRC.

The PermaBase® Brand Cement Boards may be used as a ceramic tile substrate and underlayment complying with ASTM C1325 as referenced in Section 2509.2 of the IBC and Section R702.4.2 of the IRC.

The PermaBase® Brand Cement Boards may also be used as a substrate for use with direct-applied exterior finish systems (DEFS) complying with the ICC-ES Acceptance Criteria for DEFS (AC59), and as a

sheathing in accordance with the ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling Sheathing and Floor Underlayment (AC376).

## 3.0 DESCRIPTION

PermaBase Brand Cement Boards comply with ASTM C1325 and ANSI A118.9. PermaBase boards consist of a core of cement, polystyrene beads and aggregates. The unexposed face has a smooth finish with an embedded fiberglass mesh, and the exposed face has a rough cementitious finish with a fiberglass mesh embedded in the core.

The boards are supplied in 1/2- and 5/8-inch (12.7 and 15.9 mm) thicknesses, having widths of 32, 36 and 48 inches (813, 914 and 1219 mm) and lengths of 48, 60, 64, 72, and 96 inches (1219, 1524, 1626, 1829, and 2438 mm). The 1/2-inch and 5/8-inch boards weigh, respectively, approximately 3.0 and 3.7 pounds per square foot (14.6 and 18.1 kg/m<sup>2</sup>). The boards have a Class A interior finish classification when tested in accordance with ASTM E84.

## 4.0 INSTALLATION

### 4.1 General:

When installed over wall framing, the framing members must be spaced not more than 16 inches (406 mm) on center. When installed on a floor, the joists must be spaced not more than 24 inches (610 mm) on center, and a subfloor (complying with the applicable code) must be installed prior to installation of the PermaBase boards. Allowable deflection of horizontal and vertical framing must be limited to 1/360 of the span, unless otherwise specified by finish material requirements. Steel framing must be a minimum of No. 20 gage [0.035-inch (0.89 mm)] and corrosion-resistant in accordance with the applicable code.

Tiled surfaces must be protected from structural movement by the use of control or expansion joints in accordance with the manufacturer's recommendations.

PermaBase boards must be installed using corrosion-resistant roofing nails or corrosion-resistant, bugle head, high-low thread, sharp point screws for wood studs or joists; or using corrosion-resistant, bugle head, Type S-12 self-drilling screws with steel studs or joists. The 1 1/2-inch-long (38 mm) roofing nails must have a 7/16-inch (11.1 mm) head and a 0.109-inch-diameter (2.8 mm) shank. The self-drilling screws must have a minimum 0.325-inch-diameter (8.3 mm) head and must be No. 8 by 1 1/4-inches (32 mm) long. When installing PermaBase

boards over another sheet product (such as gypsum board, plywood sheathing or a subfloor) the screw length must be increased to sufficiently penetrate wood framing by  $\frac{5}{8}$ -inch (15.9 mm) or steel framing by  $\frac{3}{8}$ -inch (9.5 mm). The seams, edges, corners and all openings around fixtures must be sealed with 2-inch-wide (51 mm), alkali-resistant, fiberglass mesh tape for interior applications and a 4-inch-wide (101.6 mm), alkali-resistant, fiberglass mesh tape for exterior applications and a coat of either latex modified portland cement mortar complying with ANSI A118.4, dry-set portland cement mortar complying with ANSI A118.1, basecoat, or Type I organic adhesive. All fastener heads must be treated with one coat of joint treatment. The boards must not be used as a nailable base, and any mechanical attachment of exterior covering must be made directly to framing.

**4.1.1 Floors:** PermaBase boards used as underlayment must be installed over a subfloor. The subfloor must be minimum  $\frac{5}{8}$ -inch-thick (15.9 mm), code-complying exterior-grade plywood complying with, and installed in accordance with, the applicable code. The plywood subfloor must be designed so that maximum sheathing deflection under total loads (live and dead loads) is  $\frac{1}{240}$  of the span or  $\frac{1}{360}$  of the span for live loads only, in accordance with the applicable code. The board joints must be staggered from the subfloor joints. Plywood edges must have tongue-and-groove edges or must be supported with blocking. The subfloor must be glued and mechanically fastened to floor joists. A setting bed of latex–portland cement mortar is applied to the subfloor using a  $\frac{1}{4}$ -inch-by- $\frac{1}{4}$ -inch-by- $\frac{1}{4}$ -inch (6.4 by 6.4 by 6.4 mm) square notched trowel. Immediately after the setting bed is applied, the PermaBase boards are laminated to the subfloor, leaving a  $\frac{1}{8}$ -inch (3.2 mm) space between the boards at all joints and corners and a  $\frac{1}{4}$ -inch (6.4 mm) space along walls. Joints in the boards must be staggered from the subfloor joints and adjacent boards. While the setting bed is still workable, the boards must be fastened to the subfloor, using fasteners described in Section 4.1 at 8 inches (203 mm) on center throughout the board. Edge fasteners must be located 2 inches (51 mm) from corners and a minimum of  $\frac{3}{8}$  inch (9.5 mm) from the edges of the board. All joints and corners must be filled with latex–portland cement mortar. Taping of board joints is required. Subsequent finishing with tile or other finished flooring is required.

**4.1.2 Exterior Walls:** PermaBase boards on exterior walls must be installed on steel framing in accordance with Section 4.3 of this report. Fasteners must be corrosion-resistant as described in Section 4.1. A water-resistive barrier complying with the applicable code must be installed either over or under the PermaBase boards, as required for construction.

**4.1.3 Interior Walls and Ceilings:** PermaBase boards must be fastened to studs spaced a maximum of 16 inches (406 mm) on center in accordance with IBC Section 2509 or IRC Section R702.4.2. Edges of boards parallel to framing must be continuously supported. Additional blocking must be provided as necessary to support all vertical board edges. The boards must be installed with ends and edges closely butted. Board joints must be staggered from those of adjacent rows. The boards are fastened every 8 inches (203 mm) on center on walls and every 6 inches (152 mm) on center on ceilings with fasteners noted in Section 4.1.

Fasteners must be located 2 inches (51 mm) from the ends and  $\frac{3}{8}$  inch (9.5 mm) from the edges of the board. On all joints and corners, gaps must be prefilled with bonding (mortar) material and covered with 2-inch (51 mm) mesh tape embedded in additional bonding material.

## 4.2 Fire-resistance-rated Assemblies:

**4.2.1 One-hour Nonload-bearing Fire-resistance-rated Wall Assembly:** The stud wall is constructed of minimum No. 25 gage [0.019 inch (0.5 mm)],  $3\frac{5}{8}$ -inch-deep (92 mm) steel studs on 16-inch (406 mm) centers, with 3-inch-thick (76 mm), 2.47 pcf (39.6 kg/m<sup>3</sup>), mineral wool fiber insulation friction-fitted between studs.

One layer of minimum  $\frac{1}{2}$ -inch-thick (12.7 mm) PermaBase boards is installed with the boards oriented either horizontally or vertically on one side of a steel stud wall, and one layer of  $\frac{5}{8}$ -inch-thick (15.9 mm) Gold Bond Fire-Shield Type X gypsum wallboard installed with the wallboard oriented vertically or horizontally to the other side.

The PermaBase boards must be installed with vertical joints located over studs. Horizontal board edges must be blocked. The boards must be installed with ends and edges closely butted. The boards must be secured to each stud with  $1\frac{5}{8}$ -inch long (41.3 mm), high-low thread, corrosion-resistant screws spaced 8 inches (203 mm) on center. Joints and fastener heads in the boards must be treated as described in Section 4.1. The gypsum wallboard must be attached vertically or horizontally to the framing with  $1\frac{1}{4}$ -inch-long (31.7 mm), Type S drywall screws spaced at 8 inches (203 mm) on center on the perimeter and 12 inches (305 mm) on center in the field. Wallboard joints must be staggered from joints in the PermaBase boards. The wallboard joints must be covered with paper tape and joint compound in accordance with ASTM C840. Exposed screw heads must be covered with a coat of joint compound.

**4.2.2 Two-hour Nonload-bearing Fire-resistance-rated Wall Assembly:** The stud wall is constructed of minimum No. 25 gage [0.019 inch (0.5 mm)],  $3\frac{5}{8}$ -inch-deep (92 mm) steel studs on 16-inch (406 mm) centers, with 3-inch-thick (76 mm), 2.47 pcf (39.6 kg/m<sup>3</sup>), mineral wool fiber insulation friction-fitted between studs. One layer of minimum  $\frac{1}{2}$ -inch-thick (12.7 mm) PermaBase boards must be installed over one layer of  $\frac{1}{2}$ -inch-thick (12.7 mm) Gold Bond Fire-Shield G<sup>TM</sup> gypsum wallboard on one side of a steel stud wall, and two layers of  $\frac{1}{2}$ -inch-thick (12.7 mm) Gold Bond Fire-Shield G<sup>TM</sup> gypsum wallboard are installed on the other side. All layers are applied vertically. Vertical and horizontal joints between base and face layers and between opposite faces must be staggered a minimum of 16 inches (406 mm).

On one side of the wall, the base layer of gypsum wallboard is attached to each stud using 1-inch-long (25.4 mm), Type S drywall screws spaced 24 inches (610 mm) on center. The face layer of the PermaBase boards is attached to each stud vertically using  $1\frac{5}{8}$ -inch-long (41.3 mm), high-low thread, corrosion-resistant screws spaced 8 inches (203 mm) on center. Joints and fastener heads in the PermaBase panels must be treated as described in Section 4.1. The wallboard joints of the base layer must be covered with paper tape and joint compound in accordance with ASTM C840. Exposed screw heads of the base layer are covered with a coat of joint compound.

On the opposite face, the base layer of gypsum wallboard must be attached to the framing with 1-inch-long (25.4 mm), Type S drywall screws spaced at 24 inches (203 mm) on center. The face layer is attached to the framing with 1<sup>5</sup>/<sub>8</sub>-inch-long (41.3 mm), Type S drywall screws spaced 12 inches (305 mm) on center. The base and face layers wallboard joints must be covered with paper tape and joint compound in accordance with ASTM C840. Exposed screw heads are covered with a coat of joint compound.

#### 4.3 Wind Load Resistance:

For resisting out-of-plane positive and negative uniform loads, the PermaBase boards are assigned an allowable positive and negative transverse load of 34 psf when applied to minimum No. 20 gage [0.036-inch base-metal thickness (0.91 mm)], 1<sup>1</sup>/<sub>4</sub>-inch-wide-by-3<sup>5</sup>/<sub>5</sub>-inch-deep (32 mm by 92 mm) C-shaped steel studs at a maximum of 16 inches (406 mm) on center. The self-drilling screws must have a 0.45-inch-diameter (8.26 mm) head, a 0.190-inch-diameter (4.83 mm) shank, a high-low thread and a length of 1<sup>5</sup>/<sub>8</sub> inches (41.3 mm). The PermaBase boards must be applied to the wall with the long dimension in the vertical direction with all edges backed by framing members. The boards must be attached with screws as described in Section 4.1 spaced 8 inches (203 mm) on center around the perimeter and in the field.

#### 5.0 CONDITIONS OF USE

The PermaBase Brand Cement Boards described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The panels are installed in accordance with this report and the manufacturer's published installation Instructions. In the event of a conflict between this report and the published manufacturer's installation instructions, this report governs.
- 5.2 Use of the boards over a vapor retarder when used as a base for wall tile or as wall boards in wet areas, must be determined by the code official.
- 5.3 The boards are manufactured in Green Cove Springs, Florida; Cleburne, Texas; Clinton, Indiana; and Bromont, Quebec, Canada, under a quality control program with inspections by UL LLC or Intertek Testing Services (ITS) NA Ltd.

#### 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and ceiling Sheathing and Floor Underlayment (AC376), dated May 1, 2012.
- 6.2 Data in accordance with the ICC-ES Acceptance Criteria for Direct-applied Exterior Finish Systems (DEFS) (AC59), dated July 1, 2010.
- 6.3 Data in accordance with ANSI A118.9

#### 7.0 IDENTIFICATION

Each panel bears the National Gypsum Company name, the product name, the evaluation report number (ESR-1510), and the name of the inspection agency (ITS or UL LLC).