

# UL Evaluation Report

## UL ER22158-01

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Sub-level 2: 06 16 00 Sheathing  
Sub-level 3: 06 16 63 Cementitious Sheathing

DIVISION: 09 00 00 Finishes  
Sub-level 2: 09 20 00 Plaster and Gypsum Board  
Sub-level 3: 09 28 00 Backing Boards and Underlayments  
Sub-level 4: 09 28 13 Cementitious Backing Boards

Sub-level 2: 09 70 00 Wall Finishes  
Sub-level 2: 09 78 00 Interior Wall Paneling  
Sub-level 3: 09 78 19 Cementitious Interior Wall Paneling

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## 1. SUBJECT:

### PERMABASE CEMENTITIOUS BACKER UNITS

## 2. SCOPE OF EVALUATION:

- 2009, 2012, 2015 *International Building Code*® (IBC)
- 2009, 2012, 2015 *International Residential Code*® (IRC)

### Properties evaluated:

- Surface Burning Characteristics (ANSI/UL723, ASTM E84)
- Fire-resistance-rated construction (ANSI/UL263, ASTM E119)
- Physical properties
- Structural
- Durability
- Noncombustible construction

## 3. REFERENCED DOCUMENTS

- ICC-ES:
  - ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling Sheathing and Floor Underlayment (AC376), dated May 2012 (Editorially revised February 2016)
  - ICC-ES Acceptance Criteria for Direct-Applied Exterior Finish Systems (DEFS) (AC59), dated July 1, 2010 (Editorially revised November 2015)
  - ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated January 2018
- ANSI/UL:
  - ANSI/UL 263 (ASTM E119), Fire Tests of Building Construction and Materials, 14<sup>th</sup> edition
  - ANSI/UL723 (ASTM E84), Test for Surface Burning Characteristics of Building Materials, 10<sup>th</sup> edition
  - ANSI/UL 1715, Fire Test of Interior Finish Material, 3<sup>rd</sup> edition
- ANSI:
  - A118.1, American National Standard Specifications for Dry-Set Cement Mortar
  - A118.4, American National Standard Specifications for Modified Dry-Set Cement Mortar
  - A118.9-99, American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units
- ASTM:
  - ASTM C1325, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units, dated August 15, 2014
  - ASTM E72, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, dated May, 2005
- NFPA:
  - NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition

## 4. USES

PermaBase Cement Boards are suitable for use in either combustible and/or noncombustible construction as described in 2015, 2012, or 2009 IBC [Section 602](#).

Primary uses for PermaBase Cement Boards include interior and exterior backer board or sheathing for manufactured stone, natural stone, slate, marble, ceramic, tile, brick, and stucco. The boards may also be used as interior wall and ceiling finishes as referenced in 2015, 2012, or 2009 IBC [Section 803.1](#), with a Class A interior finish Classification when tested in accordance with ANSI/UL723 (ASTM E84, NFPA 255).

PermaBase Cement Boards may be used as floor underlayment such as ceramic tile substrate complying with ASTM C1325 and ANSI A118.9 as referenced in 2015, 2012, or 2009 IBC [Section 2509.2](#) and 2015, 2012, or 2009 IRC [Section R702.4.2](#). When used as sheathing and/or floor underlayment, the boards comply with ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling Sheathing and Floor Underlayment (AC376). PermaBase Cement Boards used as a substrate for direct-applied exterior finish systems (DEFS) comply with ICC-ES Acceptance Criteria for DEFS (AC59).

PermaBase may be used in exterior sheathing applications as a substrate for adhered veneers, including manufactured stone, natural stone, slate, marble, ceramic tile, and thin brick which meet the requirements of AC376 and AC51, and as referenced in 2015, 2012, or 2009 IBC Sections 1404.4 and 1405.10 and/or 2015, 2012, or 2009 IRC Section R703.12.

## 5. PRODUCT DESCRIPTION

PermaBase boards consist of a core made from cement, polystyrene beads and aggregates. Both sides of the board are embedded with fiberglass mesh with a smooth finish on one side and a coarse finish on the other side.

The boards are provided in various thicknesses such as 1/2 in. (12.7 mm) and 5/8 in. (15.9 mm), and range from 32, 36, and 48 in. (813, 914, and 1219 mm) wide. The boards are provided in lengths of 48, 60, 64, 72, and 96 in. (1219, 1524, 1626, 1829, and 2439 mm).

## 6. INSTALLATION

### 6.1 General

The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

PermaBase boards shall be installed using corrosion-resistant roofing nails or corrosion-resistant wafer head screws for wood studs or joists, or corrosion-resistant wafer head Type S-12 screws with steel studs or joists. The 1-1/2 in. (38 mm) long roofing nails must have a 7/16 in. (11.1 mm) diameter head and a 0.109 in. (2.8 mm) diameter shank. The S-12 screws must have a minimum 0.325 in. (8.3 mm) diameter head and must be No. 8 by 1-1/4 in. (32 mm) long.

When installing PermaBase boards over another sheet product such as gypsum board, plywood sheathing, or a subfloor, the screw length shall be increased to sufficiently penetrate wood framing by 5/8 in. (15.9 mm) or steel framing by 3/8 in. (9.5 mm). The seams, edges, corners and all openings around fixtures shall be reinforced with alkali-resistant, fiberglass mesh tape. Use 2 in. (51 mm) wide alkali-resistant, fiberglass mesh tape for interior applications, and 4 in. (102 mm) wide alkali-resistant, fiberglass mesh tape for exterior applications. A coat of either modified dry set cement mortar complying with ANSI A118.4, dry-set cement mortar complying with ANSI A118.1, basecoat, or Type 1 organic adhesive shall be used to bed the alkali-resistant fiberglass mesh tape. All fastener heads shall be treated with the same material used to treat the joints. PermaBase boards shall not be used as a nailable base, and any mechanical attachment of exterior covering shall be made to framing.

When steel framing is used, it shall be a minimum of No. 20 gage (0.0312 in (0.78 mm)) and provided with a corrosion-resistant coating as specified by the applicable code. Tiled or other surfaces prone to cracking must be protected from structural movement by the use of control or expansion joints in accordance with the manufacturer's recommendations.

### **6.1.1 Exterior Walls**

PermaBase boards shall be installed on exterior walls over wood or steel framing using corrosion-resistant fasteners as described in Section 6.1 of this report. Framing shall be spaced a maximum of 16 in. on center. Fasteners shall be spaced a maximum of 8 in. on center and shall be driven through the PermaBase into the framing. PermaBase installed over steel framing shall be installed in accordance with Section 6.2.3 of this report. Board joints shall be staggered from those of adjacent rows. All board joints shall be covered with cement mortar and taped with 4 in. (102 mm) wide alkali-resistant fiberglass tape in accordance with Section 6.1, with tape centered over joint. A single layer water-resistive barrier complying with the applicable code shall be installed either over or under the PermaBase boards as required for construction.

### **6.1.2 Interior Walls**

PermaBase boards shall be installed on walls over wood or steel framing spaced a maximum of 16 in. on center in accordance with 2015, 2012, or 2009 IBC [Section 2509](#) and 2015, 2012, or 2009 IRC [Section R702.4.2](#) with ends and edges closely butted using corrosion-resistant fasteners as described in Section 6.1 of this report. Edges of the boards parallel to framing shall be continuously supported. If needed, additional blocking shall be provided to support all vertical board edges. Board end joints shall be staggered from those of adjacent rows. Fasteners shall be spaced a maximum of 8 in. on center and shall be driven through the PermaBase into the framing. Fasteners shall be located a minimum of 2 in. (51 mm) from the horizontal ends and 3/8 in. (9.5 mm) from the vertical edges of the board. All gaps at joints and corners shall be filled and joints covered with cement mortar in accordance with Section 6.1. Taping of board joints with 2 in. (51 mm) wide alkali-resistant fiberglass tape is required, with tape centered over joint.

### **6.1.3 Floors**

A plywood subfloor, made from exterior-grade plywood and with a minimum thickness of 5/8 in. (15.9 mm), shall be designed such that the maximum sheathing deflection under total loads (live and dead loads) is 1/360 of the span, or as specified by the applicable code. Plywood shall have tongue-and-groove edges or shall be supported with blocking. The subfloor shall have joists spaced a maximum of 16 in. on center for 5/8 in. thick plywood, or a maximum of 24 in. on center for 3/4 in. thick plywood.

PermaBase boards, when used as floor underlayment, shall have ends and edges closely butted but not forced together and shall have joints staggered from the subfloor joints and adjacent boards. PermaBase boards shall be applied over the subfloor and installed over a setting bed of dry set cement mortar in accordance with Section 6.1 with a 1/4 in. (6.4 mm) space along the wall edges. While the setting bed is still workable, the boards shall be fastened to the subfloor 8 in. (201 mm) on center throughout the board using corrosion-resistant fasteners as described in Section 6.1 of this report. Edge fasteners shall be located at least 2 in. (51 mm) from the corners and a minimum of 3/8 in. (9.5 mm) from the edges of the board. All joints and corners shall be filled with cement mortar in accordance with Section 6.1. Taping of board joints with 2 in. (51 mm) wide alkali-resistant fiberglass tape is required, with tape centered over joint. Floor shall be finished with tile or other floor finishing material.

### 6.1.4 Ceilings

PermaBase boards shall be installed on ceilings over wood or steel framing spaced a maximum of 16 in. on center in accordance with 2015, 2012, or 2009 IBC [Section 2509](#) and 2015, 2012, or 2009 IRC [Section R702.4.2](#) with ends and edges closely butted using corrosion-resistant fasteners as described in Section 6.1 of this report. Edges of the boards parallel to framing shall be continuously supported. If needed, additional blocking shall be provided to support all board edges parallel to framing. Board joints shall be staggered from those of adjacent rows. Ceilings shall be designed such that the deflection of the assembly due to dead load of the completed ceiling assembly does not exceed 1/360 of the span. The total dead load applied to the ceiling frame shall not exceed 10 psf. Fasteners shall be spaced a maximum of 6 in. on center and shall be driven through the PermaBase into the framing. Fasteners shall be located a minimum of 3/8 in. (9.5 mm) and a maximum of 5/8 in. (15.9 mm) from the ends and edges of the board. All gaps at joints and corners shall be filled and joints covered with cement mortar in accordance with Section 6.1. Taping of board joints with 2 in. (51 mm) wide alkali-resistant fiberglass tape is required, with tape centered over joint.

### 6.2 FIRE-RESISTANCE-RATED ASSEMBLIES:

**6.2.1** The products described in this section have been evaluated in accordance with 2015, 2012, or 2009 IBC [Section 703.2](#) for fire resistance.

#### 6.2.2 UL Fire-Resistance-Rated Designs

Refer to the UL Fire Resistance Certification information for File R22158 ([CAGP](#)) for applicable design coverage and details of the UL Certified fire-resistance-rated assemblies covered under this report. Fire resistance ratings are only applicable when the assemblies are constructed in accordance with the published designs.

##### 6.2.2.1 One-hour load-bearing fire-resistance rated wall assemblies

Product Designation	Stud Type	Applicable UL Designs
PermaBase	Wood	<a href="#">U305</a> , <a href="#">U309</a> , <a href="#">U392</a> , <a href="#">V319</a>
	Steel	<a href="#">U425</a>

##### 6.2.2.2 Two-hour load-bearing fire-resistance rated wall assemblies

Product Designation	Stud Type	Applicable UL Designs
PermaBase	Wood	<a href="#">U301</a> , <a href="#">U371</a>
	Steel	<a href="#">U425</a>

##### 6.2.2.3 Non-load bearing fire resistance rated wall assemblies

Product Designation	Stud Type	Maximum Hourly Rating	Applicable UL Designs
PermaBase	Steel	1, 2, 3, 4	<a href="#">V438</a>
	Steel	1 and 2	<a href="#">U420</a> , <a href="#">V452</a>

### 6.2.2.4 Roof Ceiling Assemblies

Product Designation	Restrained Assembly Rating (Hrs)	Unrestrained Assembly Rating (Hrs)	Applicable UL Designs
PermaBase	1, 1-1/2, 2	1, 1-1/2, 2	<a href="#">P567</a>

### 6.2.3 Wind Load Resistance (ASTM E72)

The PermaBase boards have an allowable positive and negative transverse load of 34 psf when installed on minimum No. 20 gage (0.0312 in. (0.78 mm) base metal thickness), 1-1/4 in. wide by 3-5/8 in. deep (32 mm by 92 mm) C-shaped steel studs spaced at a maximum of 16 in. (406 mm) on center. The PermaBase boards are installed in the vertical direction, backed by stud framing members on all edges, and attached utilizing the screws specified in section 6.1 of this report, spaced 8 in. (203 mm) on center both in the field and around the perimeter. The self-drilling screws for the stud framing shall have a 0.45 in. (8.26 mm) diameter head, a 0.190 in. (4.83 mm) shank, a high-low thread and a length of 1-5/8 in. (41.3 mm).

### 6.2.4 Structural Performance Under Uniform Static Air Pressure Difference (ASTM E330 - Modified)

**6.2.4.1** PermaBase boards were installed as described in Section 6.1.1, and used as the substrate for cementitious wall systems. The test method used was based upon ASTM E330 with the following modifications:

1. Pre-load exposure was omitted;
2. The load was not released between incremental loading; and
3. Test load was maintained for 5 minutes before increasing load to next increment.

**6.2.4.1.1** The wood framing shall be nominal 2 in. x 4 in. (51 mm x 102 mm) wood framing spaced at a maximum of 16 in. (406 mm) on center. The PermaBase boards are applied over 3 mil plastic sheathing and installed utilizing the screws specified in section 6.1 of this report, and spaced 8 in. (203 mm) on center both in the field and around the perimeter. The screws shall have a 0.45 in. (8.26 mm) diameter head, a 0.190 in. (4.83 mm) shank, and penetrate into framing a minimum of 3/4 in. (19.05 mm). Cement Board Stucco 500 is directly applied to the PermaBase boards. A sheet of 4 ft (1.22 m) by 4 ft (1.22 m) sheet of 5/8 in. thick type Gold Bond Fire Shield Type X gypsum board or was applied to the opposite side of the assembly to assist with bracing the studs.

Applying a safety factor of 3, PermaBase boards have an allowable positive and negative transverse load of 35 psf when installed to wood framing.

**6.2.4.1.2** The steel framing shall be nominal 16 gauge, C-shaped, minimum 3-5/8 in. (92 mm) wide and spaced at a maximum of 16 in. (406 mm) on center. The PermaBase boards are applied over 3 mil plastic sheathing and installed utilizing the screws specified in section 6.1 of this report, spaced 8 in. (203 mm) on center both in the field and around the perimeter. The screws shall have a 0.45 in. (8.26 mm) diameter head, a 0.190 in. (4.83 mm) shank, and penetrate into framing a minimum of 3/4 in. (19.05 mm). Seneflex Wall System was applied to 3/4 in. (19 mm) thick insulation and then applied to PermaBase boards. A sheet of 4 ft (1.22 m) by 4 ft (1.22 m) sheet of 5/8 in. thick type Gold Bond Fire Shield Type X gypsum board was applied to the opposite side of the assembly to assist with bracing the studs.

Applying a safety factor of 3, PermaBase boards have a maximum allowable positive and negative transverse load of 44 psf when installed to steel framing.

**6.2.4.2** PermaBase boards were installed as described in Section 6.2.4.2.1 and used as the substrate for cementitious wall systems. The test method used was based upon ASTM E330 with the following modifications:

1. Structural performance testing was conducted in one direction only (negative wind load direction). Because of this, the preload pressure (one-half of the test pressure) was not applied prior to the application of the test pressure.

**6.2.4.2.1** The wood framing shall be nominal 2 in. x 4 in. (51 mm x 102 mm) wood framing spaced at a maximum of 16 in. (406 mm) on center. CDX plywood, 1/2 in. (12.7 mm) thick, is installed over 6 mil thick plastic sheathing with 6d common nails. Nails were spaced 6 in. (152 mm) around perimeter and 12 in. (305 mm) on intermediate studs. PermaBase boards, 1/2 in. (12.7 mm) thick, were screwed onto CDX plywood with 2-1/4 in. (57 mm) screws. Screws were spaced 6 in. (152 mm) throughout. At 8 ft (2.4 m), a second sheet of PermaBase was installed adjacent to the full sheet. The butt joint is treated with veneer mortar and cement board fiberglass tape. Two coats of Hydro Ban™ were rolled on covering the PermaBase®. Masonry units described as manufactured stone, natural stone or brick were applied to the PermaBase boards. Sheets of 5/8 in. (15.9 mm) thick gypsum board was applied to the opposite side of the assembly and screwed to the studs with 1-1/4 in. (31.8 mm) screws and spaced 12 in. (305 mm) throughout.

Applying a safety factor of 3, PermaBase boards have a maximum allowable negative transverse load of 46 psf when installed over plywood.

## CONDITIONS OF USE

- 7.1 PermaBase boards must be produced, identified, and installed in accordance with the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions this report governs.
- 7.2 Use of the boards over a vapor retarder when used as a base for wall tile or as wall boards in wet areas shall be determined by the Authority Having Jurisdiction (AHJ).
- 7.3 **Manufacturing Locations:**

The products are manufactured at the following locations described below under the UL LLC Listing or Classification and Follow-Up Service Program, which includes audits in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC10.

LISTEE	LOCATION	PLANT ID NO.
New NGC Inc., DBA National Gypsum Co.	Clinton, IN	CIN
New NGC Inc., DBA National Gypsum Co.	Cleburne, TX	CLE
New NGC Inc., DBA National Gypsum Co.	Green Cove Springs, FL	GCS
Unifix Inc.	Bromont, Canada	BRO

## 8. SUPPORTING EVIDENCE

- 8.1.1 Data in accordance with ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling Sheathing and Floor Underlayment (AC376), dated May 2012 (Editorially revised February 2016).
- 8.1.2 Data in accordance with ICC-ES Acceptance Criteria for Direct-Applied Exterior Finish Systems (DEFS) (AC59), dated July 1, 2010 (Editorially revised November 2015).
- 8.1.3 UL Classification reports in accordance with UL263 (ASTM E119). See UL Product Certification Category ([CAGP](#)).
- 8.1.4 UL Classification reports in accordance with UL723 (ASTM E84). See UL Product Certification Category ([BQXR](#)).
- 8.1.5 Reports in accordance with NFPA 285.
- 8.1.6 Reports in accordance with ANSI/UL1715.
- 8.1.7 Reports in accordance with ANSI A118.9.
- 8.1.8 Documentation of quality system elements described in AC10.

## 9. IDENTIFICATION

The PermaBase cement boards described in this evaluation report are identified by a marking bearing the report holder's name (NGC), the plant identification, the product name, the UL Classification Mark, and the evaluation report number UL ER22158-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Classification Mark certificate.

## 10. USE OF UL EVALUATION REPORT

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- 10.2 UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.
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