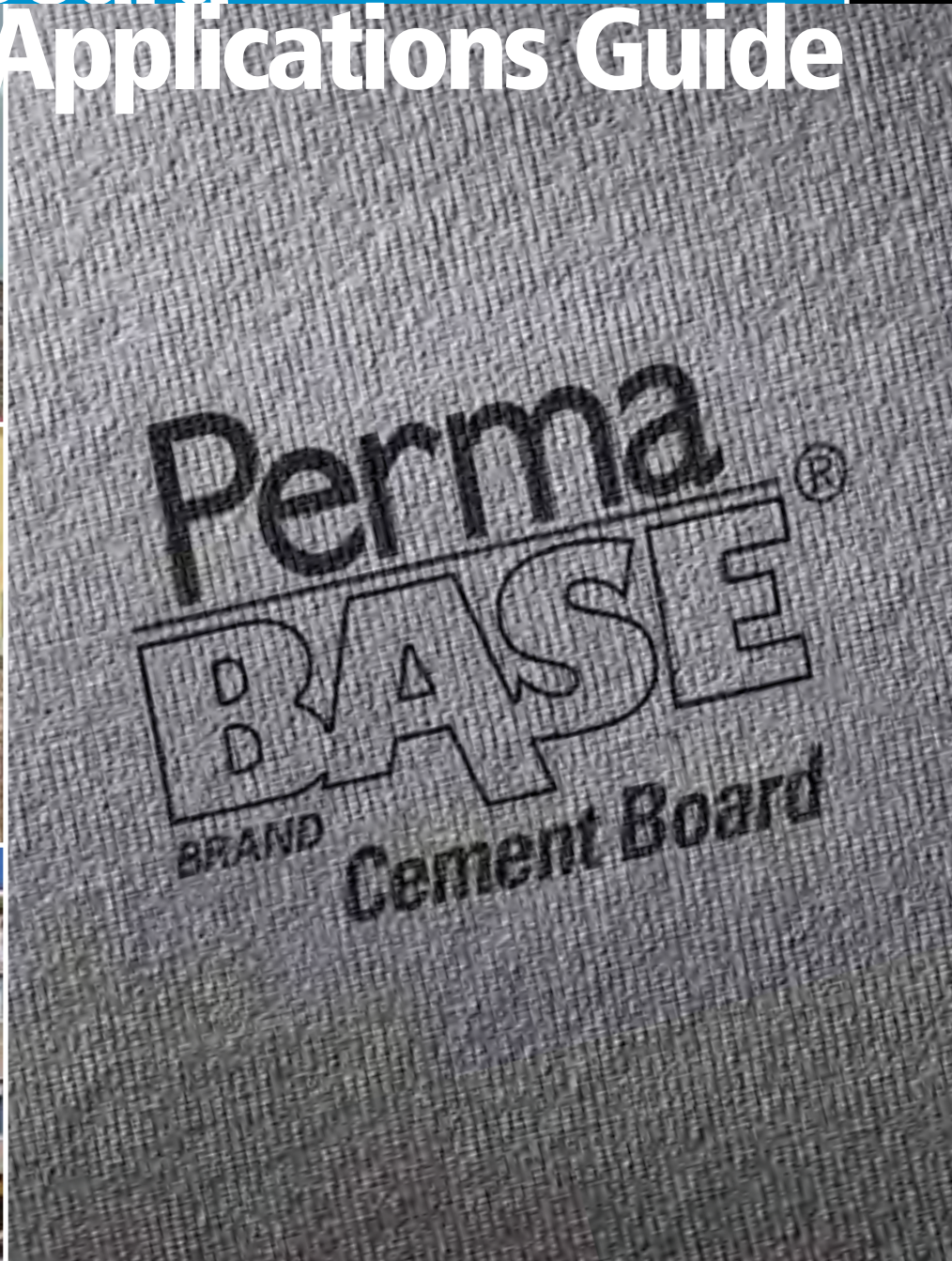


Cement Board Exterior Applications Guide



Building In Strength And Quality

Reinforce With The Best Rigid Substrate: PermaBase® BRAND Cement Board

PermaBase® provides a durable surface designed to withstand prolonged exposure to moisture. Made with Portland cement, aggregate and fiberglass mesh, it works well with exterior applications. Lightweight and easy to install, our patented EdgeTech® Technology allows a closer nail or screw application.



Resists Moisture Better

- Stays intact when exposed to water: will not rot, disintegrate or swell – built for the long run
- Achieves the industry's lowest water-absorption rating (ASTM C 473) – offering better installation
- Helps inhibit mold growth with the highest possible score on mold tests (ASTM D 3273 and ASTM G 21)



Stays Strong And Lasts Long

- Resists impact and remains dimensionally stable – extending the life of your project
- Holds up to the toughest conditions



Installs Quickly

- Lightweight and easy to cut – speeding up installation
- Reduces jobsite waste – easier, cleaner cut
- Patented EdgeTech® Technology allows for a closer edge fastening and reduces damage from handling



Works For Exterior Projects – One Panel, Many Applications

- Adhere tile, stone or thin brick directly to PermaBase in exterior applications – saving time and money
- Durable substrate for direct-applied coating systems
- Meets UL classifications for one- and two-hour fire-rated assemblies
- Building code approved – one substrate that does the job of many



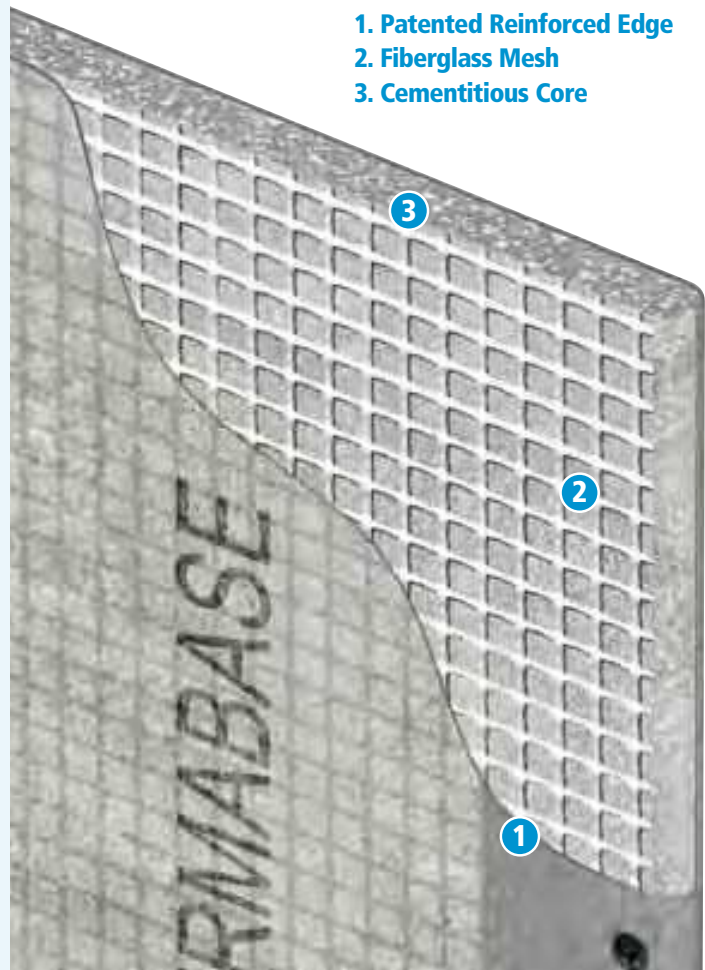
Offers Best In Class Warranty

- 15-Year Limited Warranty: Exterior applications



Quality To The Core

1. Patented Reinforced Edge
2. Fiberglass Mesh
3. Cementitious Core





Cement Board Masonry Veneer Wall System (CBMV)

Combine the strength and durability of PermaBase with the popular beauty of stone and thin brick veneers. Use in residential and low-rise commercial applications.

Cement Board Masonry Veneer Wall System is designed to:

- Offer a complete, engineered solution for installation
- Provide increased performance by utilizing polymer modified adhesive mortars (designed for hanging materials) versus type S and N mortars (developed for stacking materials)
- Speed up your schedule – faster, easier and cleaner than traditional metal lath/scratch coat method
- Offer the ability to incorporate an effective water-management system (type and placement of water barrier will vary based on local codes and/or warranties)
- Approved for use in ASTM C 1780, and cement board is cited as an approved substrate for this system by the Masonry Veneer Manufacturers Association (MVMA): *Installation Guide and Detailing Options for Compliance with ASTM C 1780*
- IBC/IRC Compliant. Meets ASTM C 1325.

- PermaBase is approved as a substrate for direct applied finishes, tile, stone and thin brick in exterior applications, as outlined in ICC-ES Evaluation Report ESR-1510.
- PermaBase is suitable for use in combustible and noncombustible construction under the IBC and IRC, as outlined in ICC-ES Evaluation Report ESR-1510.

Designs you can achieve with this system:

- Use for a variety of building exteriors with manufactured or natural stone and thin brick veneers

Note: A code-approved Water/Air Resistive Barrier (WRB) must first be installed to protect the cavity.

Limitations

- Sheathing selection and installation varies according to type of wall construction
- Code-approved Water/Air Resistive Barrier (WRB) must be installed to protect the cavity (type and placement will vary per local building codes and/or manufacturer's specifications, installation guidelines and warranties)

Thin Brick Exterior Metal Stud Assembly



Manufactured Stone Exterior Wood Stud Assembly



- | | |
|--|--|
| 1. EXP Sheathing | 6. Liquid Water/Air Resistive Barrier (WRB) Alternate Location |
| 2. Plywood Or Other Structural Sheathing | 7. Polymer Modified Adhesive Mortar |
| 3. Water/Air Resistive Barrier | 8. Thin Brick |
| 4. PermaBase Cement Board | 9. Manufactured Stone |
| 5. 4" Alkali-Resistant Mesh Tape | |

Cement Board Stucco Wall System (CBSS)

Combine the strength and durability of PermaBase with the performance and aesthetics of reinforced base coats and textured finishes. Use in residential and low-rise commercial applications.

Cement Board Stucco Wall System is designed to:

- Provide increased impact and weather resistance (appropriate for all climates)
- Resist dirt, fading, cracking and peeling – uses 100% acrylic polymers
- Speed up your schedule – easier, cleaner installation than traditional stucco

- Provide drainage system to help prevent water from penetrating behind cladding in frame construction
- Engineered system that allows a faster installation while providing superior quality control (manufactured product that must comply with ASTM product specifications).
- Provides a 15-year limited exterior warranty – the industry's best

Designs you can achieve with this system:

- Attachment of special pre-molded shapes
- Variety of finishes – many texture and color options

Limitations

- Treat joints in PermaBase with mesh tape and base coat
- Thin veneer construction can reveal planar irregularities in framing
- Minor cracking at joints may

become visible in finished exterior surface

- Exterior finishes applied directly to PermaBase: Reinforcing mesh must be embedded in base coat (consult exterior finish manufacturer for additional installation requirements)
- Code-Approved Water/Air Resistive Barrier (WRB) must first be installed to protect the cavity (type and placement will vary per local building codes and/or manufacturer's specifications, installation guidelines and warranties)

Cement Board Stucco



1. Insulation
2. EXP Sheathing
3. Water/Air Resistive Barrier
4. PermaBase Cement Board
5. Reinforcing Mesh
6. Base Coat
7. Finish Coat

The following manufacturers have Evaluation Service Reports that list PermaBase Cement Board as a component:

STO: ESR-2536 / **Parex:** ESR-2045

Senergy: ESR-2357, ESR-2358, ESR-2359, ESR-2022

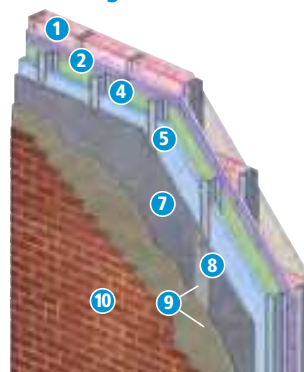
Continuous Insulation

As building codes and building insulation requirements become increasingly stringent, you can count on PermaBase to help meet your substrate needs for Continuous Insulation (CI). CI on the exterior envelope helps to eliminate air and moisture leakage as well as reduce thermal bridging, or the heating/cooling loss transmitted through steel studs. Methods to install the final exterior finish over the exterior insulation are now being refined, including z-furring channels, batten strips and direct fastener applications. Use in all types of construction, including commercial, residential and multi-family.

Advantages Of Creating Continuous Insulation With PermaBase:

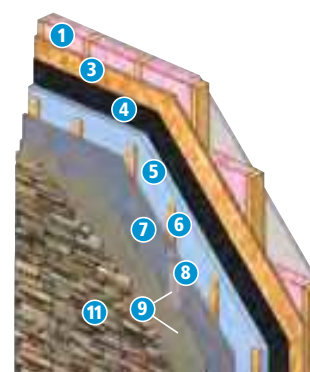
- Provides better thermal comfort, lowers heating and cooling costs, reduces likelihood of trapped moisture
- Helps mitigate the loss of heat/air conditioning by insulating the studs
- Allows multiple finishes on one substrate
- Works in all climates – adaptable to varying regional system requirements
- Guarantees 15-year exterior warranty – the industry's leading warranty
- Speeds up your schedule – faster to install than traditional methods
- Engineered system that allows a faster installation while providing superior quality control (manufactured product that must comply with ASTM product specifications)

Continuous Insulation – Z-Furring Installation



1. Insulation
2. EXP Sheathing
3. Sheathing
4. Water/Air Resistive Barrier
5. Rigid Insulation
6. Wood Batten
7. PermaBase Cement Board
8. Reinforcing Mesh
9. Mortar
10. Thin Brick
11. Manufactured Stone

Continuous Insulation – Wood Batten Installation



This section of the PermaBase Exterior Applications Guide provides information on how to utilize PermaBase within both a CBMV System and a Continuous Insulation System. While some typical examples are shown for reference purposes, the specifications on how to design and construct individual systems should be obtained from the adhering material or veneer manufacturer of the materials being used to complete the system.

For more information go to: permabase.com/exterior

Exterior Applications

An ideal substrate for exterior applications such as:

- Tile applications
- Stucco applications
- Cement board stucco
- Thin brick
- Adhered stone veneer
- Thin porcelain tile
- Ventilated rainscreen facade
- EIFS
- Soffit panels
- Sheathing panels
- Outdoor kitchens/grills

Installation

General: All framing should comply with local building code requirements and be designed to provide support with a maximum allowable deflection of L/360 under all intended live (including wind) and dead loads.

Note: Cut or score PermaBase on rough side of panel.

Control Joints: For exterior installations, allow a maximum of 16 lineal feet between control joints. Consult finish manufacturer for other requirements. For exterior tile applications, control joints should be spaced a maximum of every 12'. A control joint must be installed but not limited to the following locations: where expansion joints occur in the framing or building (discontinue all cross furring members located behind joint); when boards abut dissimilar materials; where framing material changes; at changes of building shape or structural system; at each story separation. Place control joints at corners of window and door openings, or follow specifications of architect. Control joint cavity shall not be filled with coating or other materials.

Walls And Ceilings

Wall Framing: Studs should be spaced a maximum of 16" o.c. Edges/ends of PermaBase parallel to framing should be continuously supported. Provide additional blocking when necessary to permit proper PermaBase attachment. Do not install PermaBase directly over protrusions from stud plane such as heavy brackets or fastener heads.

Ceiling Framing: The deflection of the complete ceiling assembly due to dead load (including insulation, PermaBase, bonding material and facing material) should not exceed L/360. The dead load applied to the ceiling frame should not exceed 10 psf. Ceiling joist or furring channel should not exceed 16" o.c. (Edges of PermaBase parallel to framing should be continuously supported.) Provide additional blocking when necessary to permit proper PermaBase attachment.

Water Barrier: While PermaBase is unaffected by moisture, a Water/Air Resistive Barrier (WRB) must be installed to protect the cavity. The type and specific placement or location of the water barrier will vary based on local building codes and/or manufacturer's warranties. Consult the WRB manufacturer's recommendations for specific installation guidelines.

PermaBase Cement Board: Apply PermaBase with ends and edges closely butted but not forced together. Stagger end joints in successive courses. Drive fasteners into field of cement board first, working toward ends and edges. Space fasteners maximum 8" o.c. for walls, 6" o.c. for ceilings with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges.

Joint Reinforcement: Trowel bonding material to completely fill the tapered recessed board joints and gaps between each panel. On non-tapered joints apply a 6" wide, approximately 1/16" thick coat of bonding material over entire joint. For all joints, immediately



embed 4" alkali-resistant fiberglass mesh tape fully into applied bonding material and allow to cure. Same bonding material should be applied to corners, control joints, trims or other accessories. Feather bonding material over fasteners to fully conceal.

Decks

Subfloor: Plywood should be securely glued and fastened to floor joists spaced a maximum of 16" o.c. Subfloor should be sloped at a minimum pitch of 1/4" per foot. The floor surface should be true to plane within 1/8" in 10'.

Underlayment: Using a 1/4" square-notched trowel, apply a setting bed of Latex-Portland cement mortar to the subfloor. Immediately laminate UltraBacker to subfloor leaving a 1/8" space between boards at all joints and corners. Leave a 1/4" gap along walls. Stagger joints so they do not line up with underlying substrate joints. Fasten UltraBacker every 8" o.c. throughout board field and around all edges while setting bed mortar

is still workable. Around perimeter of each board, locate fasteners 2" from the corners and not less than 3/8" from the edges. Fill all joints solid with bonding material. On non-tapered joints such as butt ends, apply a 6" wide, 1/16" thick coat over the entire joint. For all joints, embed alkali-resistant fiberglass mesh tape fully into applied bonding material; ensure that tape is centered over joint. Apply bonding material over fasteners to fully conceal. Remove all excess bonding material and allow it to cure.

Waterproof Membrane:

Trowel apply waterproof membrane to the entire surface of the cement board, following membrane manufacturer's installation instructions in detail.

UL Listed PermaBase® Cement Board Partitions – Steel Framing

1-hour Fire Rating
V452 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally to one side of 3-5/8" steel studs 16" o.c. 5/8" Fire-Shield Gypsum Board applied vertically to opposite side. 3" mineral wool insulation in stud cavities.

2-hour Fire Rating
V452 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically over 1/2" Fire-Shield C or 5/8" Fire-Shield Gypsum Board, applied vertically to one side of 3-5/8" steel studs 16" o.c. 2 layers 1/2" Fire-Shield C or 5/8" Fire-Shield Gypsum Board applied vertically to opposite side. 3" mineral wool insulation in stud cavities.

1-hour Fire Rating
V438 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally over 5/8" Fire-Shield Gypsum Board applied vertically to each side of 3-5/8" steel studs 16" o.c. PermaBase secured to studs with cement board screws of adequate length to penetrate studs 3/8" spaced 8" o.c.

2-hour Fire Rating
V438 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally over two layers 5/8" Fire-Shield Gypsum Board applied vertically to each side of 2-1/2" steel studs 16" o.c. PermaBase secured to studs with cement board screws of adequate length to penetrate studs 3/8" spaced 8" o.c.

1-hour Fire Rating
V452 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally to one side of double row of 3-5/8" steel studs 16" o.c. 5/8" Fire-Shield Gypsum Board applied vertically to opposite side. 3" mineral wool insulation in stud cavities.

2-hour Fire Rating
V452 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically over 1/2" Fire-Shield C or 5/8" Fire-Shield Gypsum Board, applied vertically to one side of double row of 3-5/8" steel studs 16" o.c. 2 layers 1/2" Fire-Shield C or 5/8" Fire-Shield Gypsum Board applied vertically to opposite side. 3" mineral wool insulation in stud cavities.

UL Listed PermaBase® Cement Board Partitions – Wood Framing

1-hour Fire Rating
U392 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally to one side of 2x4 wood studs 16" o.c. with 1-1/4" cement board screws spaced 8" o.c. Ceramic tile installed over PermaBase. 5/8" Fire-Shield Gypsum Board applied vertically or horizontally to opposite side with 6d nails spaced 7" o.c. 3-1/2" mineral wool insulation in stud cavities.

2-hour Fire Rating
U301 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically over two layers 5/8" Fire-Shield Gypsum Board, applied either horizontally or vertically to each side of 2x4 wood studs 16" o.c. PermaBase secured to studs with cement board screws of adequate length to penetrate studs 3/4" spaced 8" o.c.

1-hour Fire Rating
U392 UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically or horizontally to each side of 2x4 wood studs 16" o.c. with 1-1/4" cement board screws spaced 8" o.c. Ceramic tile installed over PermaBase. 3-1/2" mineral wool insulation in stud cavities.

2-hour Fire Rating
U371a UL Design



7/16" PermaBase PLUS or 1/2" PermaBase applied vertically over two layers 5/8" Gypsum Board, applied either horizontally or vertically to the interior side of 2x4 wood studs 16" o.c., or over 5/8" Gypsum Sheathing applied to exterior side with portland cement stucco, brick veneer, thin brick finishes. PermaBase secured to studs with cement board screws of adequate length to penetrate studs 3/4" spaced 8" o.c.

PHYSICAL PROPERTIES					
Property Method	Test	1/4"	7/16" PLUS	1/2"	5/8"
Water Absorption % By Weight/24 Hours	ASTM C 473	<8	10	<8	<8
Flexural Strength (psi)	ASTM C 947	>1750	750	750	>1000
Fastener Holding (Wet And Dry, lbs.) (0.400" head diameter)	ASTM D 1037	>85	>90	>90	>90
Weight (psf)	ASTM C 473	1.8	2.1	2.9	3.65
Freeze/Thaw (Cycles) Per ANSI A118.9 Procedure B	ASTM C 666	100	100	100	100
Flame Spread/ Smoke Developed	ASTM E 84	0/0	0/0	0/0	0/0
Compressive Strength (psi) (Indentation)	ASTM D 2394	N/A	N/A	2250	2250
Wind Load (psf, Studs 16" o.c.)	ASTM E 330	N/A	30	40	40
Thermal "R"/k Value	Property of Material	0.28/2.7	0.28/2.7	0.37/2.7	0.47/2.7
Bending Radius (ft.)	Property of Material	N/A	5	5	5
Falling Ball Impact (12" Drop)	ASTM D 1037	pass	pass	pass	pass
Linear Variation (Due to change in moisture content)	ASTM D 1037	<0.07%	0.05%	0.05%	0.05%
Fungus Resistance	ASTM G 21	No growth	No growth	No growth	No growth
Mold Growth On Surface	ASTM D 3273*	10	10	10	10

* When tested by an independent laboratory per ASTM D 3273 ("Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"), PermaBase achieved a panel score of 10, the highest score possible, indicating no mold growth under the laboratory test conditions. The use of PermaBase in actual installations may not produce the same results as were achieved in controlled laboratory conditions. No material can be considered "mold proof," nor is it certain that any material will resist mold indefinitely.

SIZES AND PACKAGING	
Size: Thickness, Width And Length	# Of Pcs Per Unit
PermaBase Cement Board	
1/2" x 32" x 5' (12.7 mm x 813 mm x 1524 mm)	50
1/2" x 32" x 8' (12.7 mm x 813 mm x 2438 mm)	50
1/2" x 36" x 4' (12.7 mm x 914 mm x 1219 mm)	50*
1/2" x 36" x 5' (12.7 mm x 914 mm x 1524 mm)	50
1/2" x 36" x 6' (12.7 mm x 914 mm x 1829 mm)	50*
1/2" x 36" x 8' (12.7 mm x 914 mm x 2438 mm)	30
1/2" x 48" x 8' (12.7 mm x 1219 mm x 2438 mm)	30
5/8" x 36" x 5' (15.9 mm x 914 mm x 1524 mm)	35
5/8" x 48" x 8' (15.9 mm x 1219 mm x 2438 mm)	24
3/8" x 48" x 8' (9.5 mm x 1219 mm x 2438 mm)	40*
3/8" x 36" x 5' (9.5 mm x 914 mm x 1524 mm)	50*
3/4" x 48" x 8' (19.0 mm x 1219 mm x 2438 mm)	20*
PermaBase Underlayment	
1/4" x 48" x 4' (7.9 mm x 1219 mm x 1219 mm)	60
1/4" x 36" x 5' (7.9 mm x 914 mm x 1524 mm)	60

* Special Order

Installation Accessories

For a seamless installation, we recommend PermaBase Tape and PermaBase Screws.



Fasteners

PermaBase corrosion resistant screws or equivalent, 1-1/4" or 1-5/8" long, for use with wood framing. Type S-12 screws or equivalent, 1-1/4" or 1-5/8" long, for use with 20 gauge or heavier steel framing.

Galvanized roofing nails, 1-1/2" long with hot dipped galvanized coating for use with wood framing.

Nails should meet Federal Specification #FF-N105B/type 2 style 20.

Joint Reinforcement

PermaBase mesh tape must be used on all edges and cuts made to size. Use 2" wide polymer-coated (alkali resistant) mesh tape for interior applications and 4" wide polymer-coated (alkali resistant) mesh tape for exterior applications.

Bonding Materials

Treat joint and set facing material, preferably with latex-Portland cement mortar or with dry-set (thin-set) mortar. All mortars should comply with ANSI A118.1, A118.4 or A118.15 standards. Type 1 organic adhesive meeting ANSI A-136.1 may be utilized for interior use only.

LIMITED WARRANTY AND REMEDIES

Products manufactured and sold by National Gypsum Company are warranted by National Gypsum Company to its customers to be free from defects in materials and workmanship at the time of shipment. THIS EXPRESS WARRANTY IS THE ONLY WARRANTY APPLICABLE TO SUCH PRODUCTS, AND IS IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS ORAL OR WRITTEN WARRANTIES AND ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

National Gypsum Company will not be liable for any incidental, indirect or consequential losses, damages or expenses. The customer's exclusive remedy for any type of claim or action for defective products will be limited to the replacement of the products (in the form originally shipped) or, at National Gypsum's option, to a payment or credit not greater than the original purchase price of the products.

Mold And Mildew Resistance

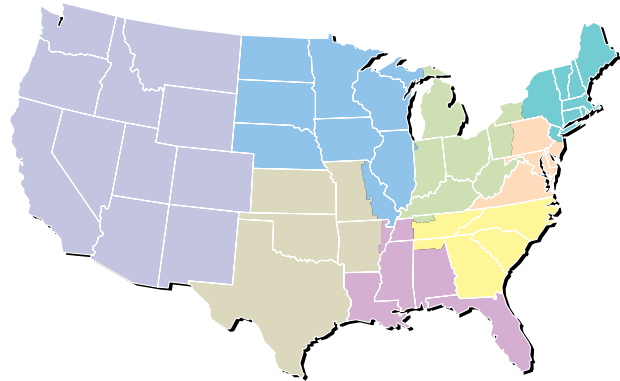
PermaBase was designed to provide extra protection against mold and mildew. When tested by an independent laboratory, PermaBase received the highest possible ratings on ASTM G 21 and D 3273. The use of PermaBase in actual installations may not produce the same results as were achieved in controlled laboratory conditions. No material can be considered "mold-proof," nor is it

National Gypsum Company will not be liable for products claimed to be defective where the defect resulted from causes not within National Gypsum's control, or which arose or occurred after shipment, including but not limited to accidents, misuse, mishandling, improper installation, contamination or adulteration by other materials or goods, or abnormal conditions of temperature, moisture, dirt or corrosive matter.

Any claim that products sold by National Gypsum Company were defective or otherwise did not conform to the contract of sale is waived unless the customer submits it in writing to National Gypsum within thirty (30) days from the date the customer discovered or should have discovered the defect or non-conformance. No legal action or proceeding complaining of goods sold by National Gypsum may be brought by the customer more than one year after the date the customer discovered or should have discovered the defect or problem of which it complains.

certain that any material will resist mold or mildew indefinitely. When used in conjunction with good design, handling and construction practices, PermaBase can provide increased mold resistance. As with any building material, avoiding water exposure during handling, storage and installation, and after installation is complete, is the best way to avoid the formation of mold or mildew.

CUSTOMER SERVICE SALES AREAS



Atlantic Area

Phone: (800) 237-9167
Fax: (877) 252-0430

Central Area

Phone: (800) 252-1065
Fax: (866) 232-0440

Gulf Area

Phone: (800) 343-4893
Fax: (866) 482-8940

Midwest Area

Phone: (800) 323-1447
Fax: (866) 692-8590

Northeast Area

Phone: (800) 253-3161
Fax: (866) 632-1480

Southeast Area

Phone: (800) 548-9394
Fax: (866) 732-1990

Southwest Area

Phone: (800) 548-9396
Fax: (866) 792-7520

Western Area

Phone: (800) 824-4227
Fax: (800) 438-6266

National Accounts

Phone: (800) 440-1230
Fax: (866) 622-3590

Manufactured Housing

Phone: (800) 455-3185
Fax: (800) 639-1714



Perma
BASE[®]
BRAND
Cement Board

permabase.info



PRODUCT
CERTIFIED FOR
LOW CHEMICAL
EMISSIONS:
UL.COM/GG
UL 2818

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National
Gypsum[®]