

Factory Built Housing Construction Guide



Helping You Build Better

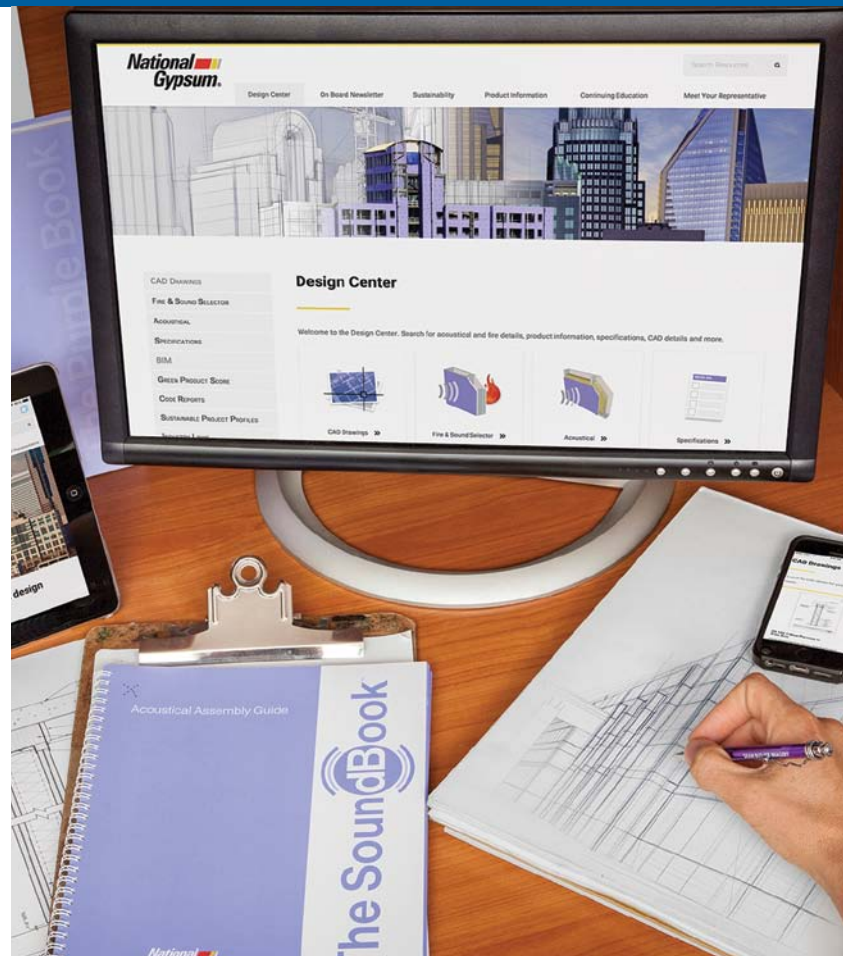
With High-Quality Products And Resources

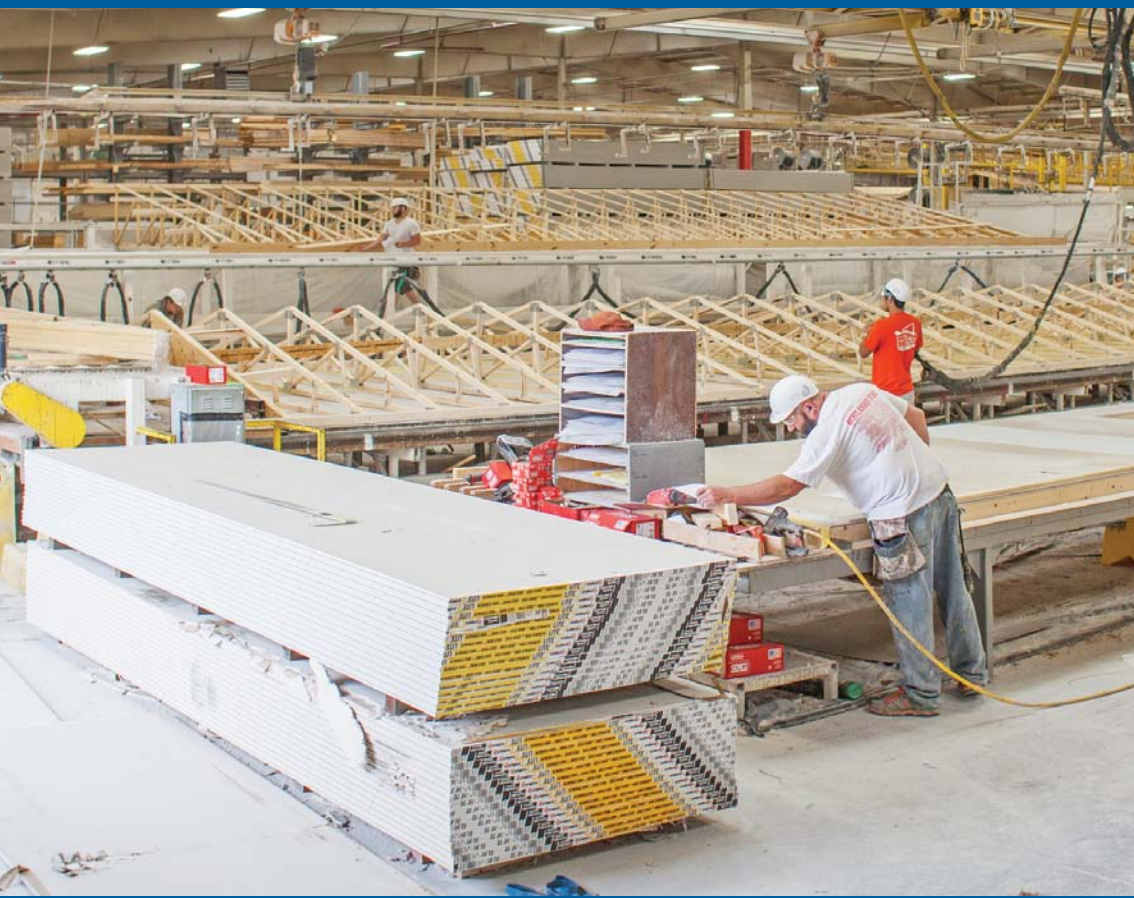
Founded in 1925, National Gypsum is one of the world's largest producers of quality building products. For nearly a century, customers like you have looked to us for the best products, service and technical support. With a focus on sustainability, we strive to bring you the finest in construction products, education and resources to meet and exceed your expectations.



With Technical Support You Can Count On

Tap into technical support with a call to 1-800-NATIONAL®, place an order through our award-winning customer service center, or find the answers you want on our online Design Center, where the doors are always open. Our multi-pronged approach to technical support and customer service has one central focus: Helping you design and build better.





With Design That Considers The Environment

Together, we can attain the highest level of ecological responsibility and resource-efficient technology. National Gypsum is committed to supporting sustainable green building policies, standards and practices. Beyond offering products that can help contribute to healthier environments and have achieved GREENGUARD Certification for indoor air quality, we can help you meet the criteria for green programs and LEED credits.

Everything You Need To Build Better

Meet Our Product Family 4

Gold Bond® BRAND Gypsum Board 6

- 1/2" High Strength Ceiling Board
- 1/2" High Strength LITE® (48", 54")
- 1/2" Gypsum Board (48", 54")
- 5/8" Fire-Shield® (48", 54")
- 1/4" High Flex®
- 1/2" and 5/8" XP®
- Durabase® and Seaspray®

PermaBase® BRAND Cement Board 10

- 1/4" PermaBase®
- 1/2" PermaBase®

ProForm® BRAND Interior Finishing Products 11

- FasTrack® Joint Compound (15, 20, 30, 45, 60, 90)
- FasTrack® Plus Compound (20, 45, 90)

Texture Products 13

- Wall & Ceiling
- Perfect Spray EM
- Perfect Spray II
- Perfect Spray Medium

Ready Mix Products 15

- All Purpose
- Multi-Use
- Topping
- Lite Blue

Joint Tapes 17

- Paper Joint Tape
- Fiberglass Mesh Tape
- Multi-Flex Tape

Technical Overview 18

- Handling And Storage
- Quick Selector For Shear-Tested Systems

Installation Guide How And Where 33

- Gold Bond® Products
- ProForm® Products
- PermaBase® Products
- Frequently Asked Questions And Solutions

Working Wherever Your Project Takes You

National Gypsum can provide all the high-quality products you need to complete your modular construction project, from start to finish. In addition to our full line of gypsum board, cement board and interior finishing products, we offer products specially designed for factory built housing. Take a look at some of our product lines below. At National Gypsum, we support and take pride in your work.



Gold Bond® BRAND offers the industry's most complete line of gypsum board products to meet your project requirements. Whether you want to enhance acoustical performance or need additional abrasion, impact or fire resistance, Gold Bond products deliver with

our mark of excellence. Gold Bond products include gypsum board, ceiling board, sheathing, shaftliner, tile backer, prefinished board and plaster products. Take a look at the complete systems you can assemble with Gold Bond products, including walls, partitions, floors and ceilings. Most products are GREENGUARD Certified for indoor air quality.



PermaBase® BRAND Cement Board is a rigid substrate made of Portland cement, aggregate and glass mesh. It provides an exceptionally hard, durable surface that is able to withstand prolonged exposure to moisture in both interior and exterior applications. PermaBase is ideally suited

as an underlayment or backing surface for tub and shower surrounds, countertops, flooring and a variety of other interior and exterior applications. With four types of PermaBase Cement Board to choose from, you will find a match for most any project. All feature patented EdgeTech® Technology, allowing you to install fasteners closer to the boards' edges, and polystyrene beads, which are embedded in the core to reduce weight. PermaBase is also GREENGUARD Certified for indoor air quality.



ProForm® BRAND Interior Finishing Products provide the right ready mix or setting compounds to finish your complex projects. ProForm offers high-quality, consistent

formulas that are easy to apply, saving you time and effort. Do you need superior bonding, excellent sanding characteristics, lightweight formulas and consistent set times? You can depend on ProForm. Select products even offer added mold resistance or help reduce airborne dust. For your convenience, they are available in various weights and many formulas have achieved GREENGUARD Certification for indoor air quality. There are also ProForm Joint Tapes and ProForm Texture Products, which will help you cover, conceal or create interesting design effects. Use these products for all phases of finishing.





Start With The Best Gypsum Board – Gold Bond® BRAND

Gold Bond® BRAND offers the most complete line of gypsum board products to meet your project requirements. Whether you want to enhance acoustical performance or need additional abrasion/impact or fire resistance, Gold Bond products deliver with our mark of excellence. Specify our signature PURPLE® products when you are looking for the advanced performance of a mold/mildew-resistant substrate.

Gold Bond products include gypsum board, ceiling board, sheathing, shaftliner, exterior soffit board, tile backer, prefinished board and joint treatment compounds. Take a look at the complete systems you can assemble with Gold Bond products, including walls, partitions, floors and ceilings.



Gold Bond® BRAND Gypsum Board



Use Gold Bond® BRAND Gypsum Board for interior, non-fire-rated wall and ceiling applications. It has a fire-resistant gypsum core encased in a heavy, natural finish with 100-percent recycled paper on the face and back sides. The face paper is folded around the long edges to reinforce and protect the core, and the ends are cut square and finished smooth.

- | | |
|--|---|
| Thickness: 1/4" (6.4 mm) / Regular
3/8" (9.5 mm) / Regular
1/2" (12.7 mm) / Regular | ■ Tapered, Square or Sta-Smooth® Edge
■ Features GridMarX® guide marks
■ ASTM C1396 |
| Width: 4' (1,219 mm)
1/2" also available in 54" (1,372 mm) | |
| Length: 8' – 12' (2,438 – 3,658 mm)
1/2" also available in 16' (4,877 mm) | |

Gold Bond® BRAND Fire-Shield® Gypsum Board



Use Gold Bond® BRAND Fire-Shield® for interior, fire-rated wall and ceiling applications. A specially formulated Type C core is also available where required. This gypsum board consists of a fire-resistant gypsum core with a heavy, natural finish and 100-percent recycled paper on the face and back sides. The face paper folds around the long edges to reinforce and protect the core, and the ends are cut square and finished smooth.

- | | |
|--|---|
| Thickness: 1/2" (12.7 mm) / Type C
5/8" (15.9 mm) / Type X or Type C | ■ Tapered, Square or Sta-Smooth® Edge
■ Features GridMarX® guide marks
■ ASTM C1396 |
| Width: 1/2" Type C, 4' (1,219 mm)
5/8" Type X or Type C, 4' (1,219 mm)
and 54" (1,372 mm) | |
| Length: 6' – 16' (1,829 – 4,877 mm) | |

Gold Bond® BRAND High Strength Ceiling Board



Use Gold Bond® BRAND High Strength Ceiling Board for interior, non-fire-rated, single-layer ceiling applications. It is a specialty gypsum board encased in 100-percent recycled paper. The increased uniformity and integrity of its gypsum core makes the sag resistance equivalent to 5/8 in. (15.9 mm) Type X Gypsum Board.

- | | |
|--|----------------------------------|
| Thickness: 1/2" (12.7 mm) / Regular | ■ Tapered Edge |
| Width: 4' (1,219 mm) | ■ Features GridMarX® guide marks |
| Length: 12' (3,658 mm) | ■ ASTM C1396 |

Gold Bond® BRAND High Strength LITE® Ceiling Board



Use Gold Bond® BRAND High Strength LITE® for interior, non-fire-rated, single-layer wall and ceiling applications. It has a fire-resistant gypsum core with a heavy, natural finish and 100-percent recycled paper on the face and back sides. This gypsum board is formulated to be 25 percent lighter in weight than Gold Bond® BRAND 1/2 in. (12.7 mm) Gypsum Board. The result is a superior board that is both sag resistant and easier to handle. The face paper is folded around the long edges to reinforce and protect the core, and the ends are cut square and finished smooth.

- | | |
|--|----------------------------------|
| Thickness: 1/2" (12.7 mm) / Regular | ■ Tapered or Square Edge |
| Width: 4' (1,219 mm),
54" (1,372 mm) | ■ Features GridMarX® guide marks |
| Length: 8' – 14' (2,438 – 4,267 mm) | ■ ASTM C1396 |

Gold Bond® BRAND High Flex® Gypsum Board



Use Gold Bond® BRAND High Flex® for interior, non-fire-rated wall and ceiling applications. High Flex® is ideal for concave and convex surfaces, such as walls, arches and vaulted ceilings. Apply it in double layers. This gypsum board consists of a fire-resistant gypsum core encased in a heavy, natural finish with 100-percent recycled paper on the face and back sides. The face paper is folded around the long edges to reinforce and protect the core, and the ends are cut square and finished smooth.

- | | |
|---|----------------------------------|
| Thickness: 1/4" (6.4 mm) / Regular | ■ Slightly Tapered Edge |
| Width: 4' (1,219 mm) | ■ Features GridMarX® guide marks |
| Length: 8' (2,438 mm) | ■ ASTM C1396 |

Gold Bond® BRAND XP® Gypsum Board



Use Gold Bond® BRAND XP® Gypsum Board on walls and ceilings where framing members are spaced up to 24 in. (610 mm). It is available with either a Regular, Fire-Shield® Type X or Fire-Shield® Type C gypsum core. XP® Gypsum Board consists of a mold-, mildew-, moisture- and fire-resistant core with specially designed PURPLE® paper. The PURPLE face paper is heavy, 100-percent recycled and offers superior mold, mildew and moisture resistance. The 100-percent recycled gray back paper is also mold-, mildew- and moisture-resistant.

- | | |
|---|----------------------------------|
| Thickness: 1/2" (12.7 mm) / Regular, Type C
5/8" (15.9 mm) / Type C, Type X | ■ Tapered or Square Edge |
| Width: 4' (1,219 mm) | ■ Features GridMarX® guide marks |
| Length: 8' – 12' (2,438 – 3,658 mm) | ■ ASTM C1396 |



Durabase® BRAND Prefinished Gypsum Board



Durabase® BRAND Gypsum Board is an excellent substrate for a variety of decorative laminates to use as wall panels in factory built housing. This fire- and impact-resistant gypsum board also creates quieter spaces due to its sound-damping properties.

Features

- UL labeled and meets all HUD manufactured home construction and safety standards, including fire-safety requirements (flame spread not over 25).
- Cuts quickly and installs easily.
- Cost effective and adaptable to paper or vinyl laminates.

Details

- 5/16" (7.9 mm) Durabase weighs about 30% less than standard 1/2" (12.7 mm) gypsum board.
- Available in 5/8" (15.9 mm) for added fire resistance.
- Available in 5/16" (7.9 mm), 3/8" (9.5 mm) and 1/2" (12.7 mm) thickness; 48" (1,219 mm) nominal width; 8' – 10' (2,438 – 3,048 mm) standard length, with a square edge.

Seaspray® BRAND Hi-Strength MVR Ceiling Panels



Seaspray® Hi-Strength MVR is a prefinished decorative ceiling panel designed for factory built housing. It provides an attractive textured ceiling and a code-approved moisture/vapor retarder in one efficient product. Seaspray® is manufactured with a high-strength gypsum core that is more sag resistant.

Features

- Helps hide joints due to heavier texture.
- 5-year limited warranty against visible sag.
- Assures uniform performance (vapor retarder built into the finish).
- Resists surface marking due to durable latex finish.
- Meets code standards of 1 perm or less for vapor retarder characteristics (HUD manufactured home construction and safety standards).

- Fire-resistant gypsum core.

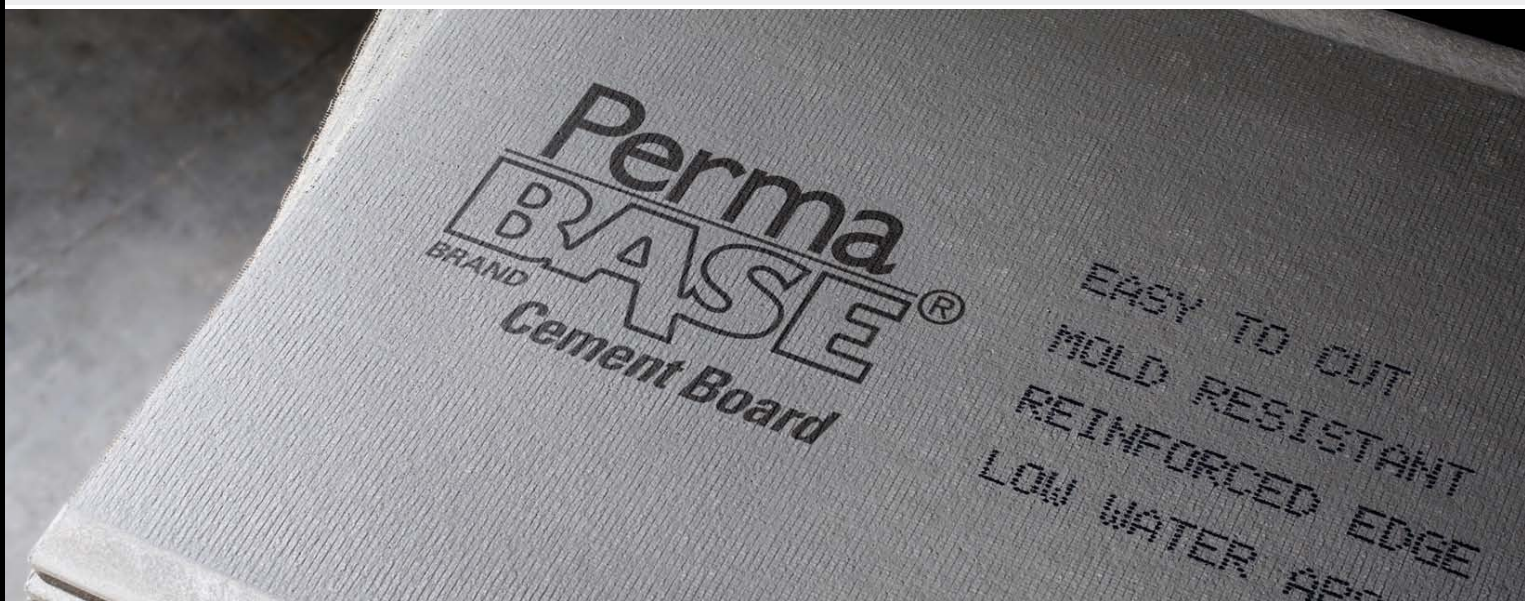
- Can be attached 24" o.c. with foam adhesive.

Details

- Available in 5/16" (7.9 mm) and 1/2" (12.7 mm) thickness; 48" (1,219 mm) nominal width; 7' – 16' (2,134 – 4,877 mm) standard length, with a square edge.

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

PermaBase® BRAND Cement Board is a rigid substrate made of Portland cement, aggregate and glass mesh. It provides an exceptionally hard, durable surface that is able to withstand prolonged exposure to moisture in both interior and exterior applications. PermaBase is ideally suited as an underlayment or backing surface for tub and shower surrounds, countertops, flooring and a variety of other interior and exterior applications. With two types of PermaBase Cement Board to choose from, you will find a match for most any project. All feature patented EdgeTech® Technology, allowing you to install fasteners closer to the boards' edges, and polystyrene beads, which are embedded in the core to reduce weight. PermaBase is also GREENGUARD Certified.



PermaBase® BRAND Cement Board

PermaBase® BRAND Cement Board provides a durable surface to withstand prolonged exposure to moisture. Made with Portland cement, aggregate and fiberglass mesh, it works as an underlayment for tub and shower surrounds, countertops, flooring and other interior and exterior applications.

Features

- Helps inhibit mold growth with the highest possible score on mold tests (ASTM D3273 and ASTM G21).
- Achieves the industry's lowest water-absorption rating (ASTM C473).
- Lightweight and easy to cut – speeding up installation.
- Patented EdgeTech® Technology allows for a closer edge fastening and reduces damage from handling.
- Meets UL Classifications for one- and two-hour fire-rated assemblies.
- Lifetime Limited Warranty for interior applications or 15-Year Limited Warranty for exterior applications.

Details

- Available in 1/2" (12.7 mm) thickness; 32" (813 mm) nominal width with 5' (1,524 mm) standard length; 36" (914 mm) nominal width with 4' – 6' (1,219 – 1,829 mm) standard length; 48" (1,219 mm) nominal width with 8' (2,438 mm) standard length.
- For underlayment, available in 1/4" (6.4 mm) thickness; 36" (914 mm) nominal width with 5' (1,524 mm) standard length or 48" (1,219 mm) nominal width with 4' (1,219 mm) standard length.

Finish Strong With The Right Products **– ProForm® BRAND**

ProForm® BRAND Interior Finishing Products provide the right ready mix or setting compounds to finish your complex projects. ProForm® offers high-quality, consistent formulas that are easy to apply, saving you time and effort. Do you need superior bonding, lightweight formulas and quick set times? You can depend on ProForm. Select products even offer added mold resistance or help reduce airborne dust. For your convenience, they are available in various weights and some formulas have achieved GREENGUARD Certification. There are also ProForm® BRAND Joint Tapes and ProForm® BRAND Texture Products, which will help you cover, conceal or create interesting design effects. Use these products for all phases of finishing.



ProForm® BRAND FasTrack® Joint Compound

Set Times: 15, 20, 30, 45, 60 and 90 minutes



These ProForm® BRAND Joint Compounds were developed for factory built housing, where speed and strength are critical. One coat of FasTrack® Joint Compound and the surface is ready to spray texture. For non-textured ceilings, use FasTrack® Plus Compound as a finishing coat.

Features

- Contains no VOC.
- Eliminates the need for a second coat – when a spray texture is specified.
- Non-combustible.

Package Details

Bag: 30 lbs. (13.6 kg)

Approximate Coverage

45-55 lbs. (22-27 kg)
per 1,000 sq. ft. (93 m²)

ProForm® BRAND FasTrack® Plus Joint Compound

Set Times: 20, 45 and 90 minutes



These ProForm® BRAND Joint Compounds were developed for factory built housing, where speed and strength are critical. One coat of FasTrack® Plus Joint Compound and the surface is ready to spray texture. For non-textured ceilings, use FasTrack® Plus Joint Compound as a finishing coat.

Features

- 30% lighter than conventional FasTrack.
- Recoat as soon as the first coat sets, allowing same-day joint finishing.
- Provides a superior bond with low shrinkage.
- Contains no VOC.
- Hardens quickly to an easy-to-sand finish.

Package Details

Bag: 25 lbs. (11.3 kg)

Approximate Coverage

45-55 lbs. (22-27 kg)
per 1,000 sq. ft. (93 m²)



Texture Products: Create Textured Surfaces

With ProForm® BRAND Texture products, you can cover, conceal or create interesting design effects. Each has its own special features, but they all save time and money over conventional painting.



ProForm® BRAND Wall & Ceiling Spray Non-Aggregated Texture Spray



Use on walls and ceilings. Also use on a wall surface finished with a coat of paint or concrete coated with an alkali-resistant primer/sealer. This applies without overspray impacting the ceiling.

Features

- Pumps easily.
- Creates a variety of textures, including spray spatter, spatter knockdown and orange peel.
- Offers textures in several light-reflecting finishes.

Package Details

Bag: 50 lbs. (22.7 kg)

Approximate Coverage

500-1,500 sq. ft. (46-139 m²) / bag

Mixing

4-5 gal. (15-19 L) clean, room temperature, drinkable water per bag.

ProForm® BRAND Perfect Spray® EM Non-Aggregated Texture Spray



Use for both walls and ceilings.

Features

- Creates a wide range of wall surfaces.
- Achieves an almost endless variety of textures – spray spatter, spatter knockdown and orange peel.
- Sprays quickly.
- Finish surfaces with a coat of paint (optional).

Package Details

Bag: 50 lbs. (22.7 kg)

Approximate Coverage

500-1,500 sq. ft. (46-136 m²)/bag

Mixing

4-5 gal. (15-19 L) clean, room temperature, drinkable water per bag.

ProForm® BRAND Perfect Spray® Medium
Aggregated Texture Spray



Use on interior ceilings with new, primed or previously painted gypsum board or monolithic concrete/plaster. Works with standard spray equipment.

Features

- Mixes easily and provides low fallout.
- Achieves bright white appearance – providing bold accent and hiding minor surface defects.
- Contains shredded polystyrene aggregate – sprays quickly.

Package Details

Bag: 40 lbs. (18.2 kg)

Approximate Coverage

300-400 sq. ft. (27-37 m²) / bag

Mixing

3-4 gal. (11.3-15.1 L) clean, room temperature, drinkable water per bag.



Ready Mix: Open, Mix And Apply

ProForm® BRAND Ready Mix Joint Compounds are fast and easy – ready to use right out of the container. These premixed formulas have all achieved GREENGUARD Certification. Each formula has its own special features and a nine-month shelf life under good storing and application conditions.



ProForm® BRAND All Purpose Standard Weight



Use for taping, finishing joints and cornerbead, spotting fasteners, skimming and textures, and repairing cracks in plaster walls.

Features

- Applies easily and provides excellent bond.
- Stays strong – highly durable surface.
- Lessens pocking and pinholing.
- Works great for first phases of finishing.

Package Details

Pails: 61.7 lbs. (28 kg)
12 lbs. / 1 gal. (5.4 kg)

Cartons: 47 lbs. (21.3 kg)
48 lbs. (21.8 kg)
50 lbs. (22.7 kg)
61.7 lbs. (28 kg)

Approximate Coverage

123-140 lbs. / 9 gal.
per 1,000 sq. ft. (93 m²)

ProForm® BRAND Topping Standard Weight



Use for finishing joints and cornerbead, spotting fasteners and textures.

Features

- Spreads easily.
- Lessens pocking and pinholing.
- Sands easily.

Package Details

Pail: 61.7 lbs. (28 kg)
Carton: 50 lbs. (22.7 kg)

Approximate Coverage

123-140 lbs. / 9 gal.
per 1,000 sq. ft. (93 m²)

ProForm® BRAND Factory Built Housing Texture Grade Mix Compound



Specially formulated for texturing walls and ceilings.

Features

- Ready to use right from the container.
- Excellent bond.
- Provides a light texture.
- Allows great pattern versatility.
- Dries white.
- Conceals minor imperfections.

Package Details

Tote: 275 gal. (1,049 L)

Pail: 61.7 lbs. (28 kg)

Approximate Coverage

50-150 sq. ft. / gal.

Coverage will vary with spray equipment and techniques.

ProForm® BRAND Lite Blue

Lightweight (Weighs up to 30% less than standard ready mix)



Use for finishing joints and cornerbead, spotting fasteners and textures.

Features

- Reduces shrinkage by up to 33%.
- Lessens pocking and pinholing.
- Pulls and sands easily.
- Provides superior finish.
- Covers metal beads in two coats.

Package Details

Pail: 4.5 gal. (17 L)

Cartons: 3.5 gal. (13.2 L)

4.5 gal. (17 L) Midwest only

Approximate Coverage

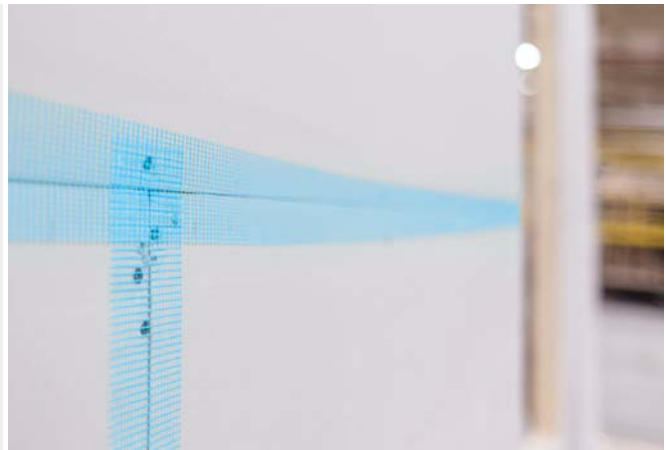
123-140 lbs. / 9 gal.

per 1,000 sq. ft. (93 m²)



Joint Tapes: Stick To Quality

ProForm® BRAND Joint Tapes reinforce and conceal your interior wall and ceiling joints. Each tape has its own special features.



ProForm® BRAND Paper Joint Tape



Use it on gypsum panel joints and interior angles, applying with the crease side in. Use it with ready mix joint compounds and embed it in ProForm® Joint Compound, removing any excess compound.

Features

- Creates added strength in joints.
- Provides superior bond – buffed on both sides.
- Folds at corners easily – due to center crease.
- Resists distortions, such as stretching, wrinkling and tearing.

Package Details

75 ft. (22.9 m) rolls, 20 rolls / carton
250 ft. (76.2 m) rolls, 20 rolls / carton
500 ft. (152.4 m) rolls, 10 rolls / carton

Approximate Coverage

375 ft. (114 m) per 1,000 sq. ft. (93 m²) of gypsum board

ProForm® BRAND Fiberglass Mesh Tape



Use on gypsum panel joints and corners. This is designed to use exclusively with setting compounds. Apply self-adhering fiberglass mesh tape to joints or corners before applying setting compounds.

Features

- Eliminates need for embedding coat.
- Resists mold and mildew.
- Meets ASTM C475.

Package Details

300 ft. (91.4 m) rolls, 12 rolls / carton

Approximate Coverage

375 ft. (114 m) per 1,000 sq. ft. (93 m²) of gypsum board

ProForm® BRAND Multi-Flex Tape



Use for inside and outside corners and vaulted ceilings. Apply with the metal side to the face of the gypsum panels. Embed in joint compounds.

Features

- Applies easily.
- Conceals and reinforces gypsum board joints.
- Works well for hard angles – less than or greater than 90 degrees.

Package Details

Available in:

100 ft. (30.5 m) rolls, 10 rolls / carton

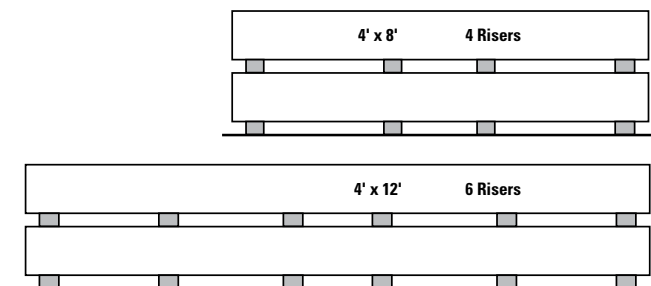
Approximate Coverage

100 linear ft. per roll

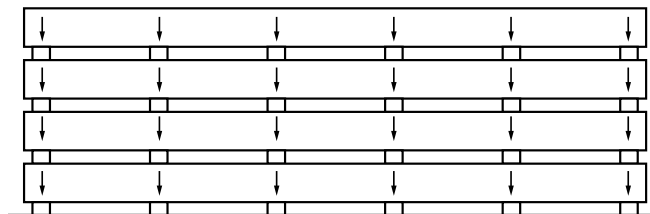
Gypsum Board Handling, Storage And Project Conditions

- Use caution and care when moving gypsum board; the panels are heavy and must be moved using proper lifting techniques or equipment.
- Protect the board edges, corners and ends during transport or in high-traffic areas.
- Storage temperatures should not exceed 125°F (52°C).
- Store panels flat and level. Storing them upright could damage the edges, and creates a danger to employees.
- When storing or stacking multiple layers, use risers or spacers between layers.
- Risers must be vertically aligned from top to bottom to prevent sagging or bowing.

Risers Evenly Spaced

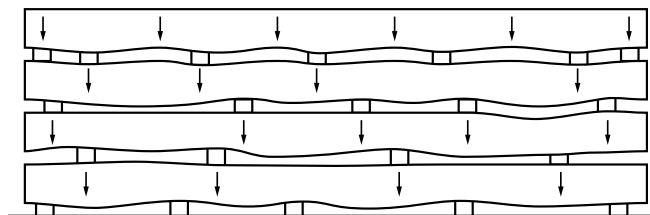


Correct Method of Placing Risers



Note that all risers are placed in proper vertical alignment so each tier is evenly supported. Arrows indicate pressure.

Incorrect Method of Placing Risers



Cumulative pressure on unsupported lower units causes gypsum board to sag. Risers are not spaced evenly or in proper vertical alignment.

Handling And Project Conditions

- Avoid water exposure during shipping, handling, storage, installation and after installation of gypsum board to avoid the formation of mold or mildew.
 - Remove non-breathable shipping wrap material upon receiving and storing gypsum board.
 - Store gypsum board off the ground and under cover. Use sufficient supports extending under the entire length of gypsum board to prevent sagging.
 - Keep gypsum board dry to minimize the potential for mold growth. Take adequate care while transporting, storing, applying and maintaining gypsum board. For additional information, refer to GA-238, which is available at gypsum.org under the "Download Free Gypsum Association Publications" section.
 - Protect gypsum board from the elements and maintain in good condition prior to and following installation. Stack panels flat, with care taken to prevent sagging or damage to edges, ends or surfaces.
 - Reject gypsum board with visible signs of mold growth. Do not apply gypsum board over other building materials where conditions exist that are favorable to mold growth.
 - Do not exceed 95°F (35°C) when a temporary heat source is used.
 - Maintain a room temperature of not less than 40°F (4°C) during application of gypsum board.
 - Refer to GA-801 for complete handling and storage instructions.
- ### Maintenance Following Application
- Maintain essential elements of sound weather-tight building envelope, including roofing, joint sealants, windows and flashings.
 - Take immediate and appropriate remediation measures as soon as water leaks or condensation sources are identified.
 - Perform routine cleaning and maintenance operations using methods that prevent moisture saturation of gypsum board.

Quick Selector For Shear-Tested Systems

WALL ADHESIVES									
Application Ref. Test	Adhesive	Fasteners	Type	Orientation	Center	On Shear	Ultimate Shear	Design Board Size	Report
W001	Tanco XA2600 Swift-49109 National Starch Elixir Instant Bond	2x3, Staples & Adhesive	One Side	Vertical	16"	638		5/16", 3/8", 1/2", 5/8"	UL Project 89NK27074 (Application 1)
W002	Tanco XA2600 Swift-49109 National Starch Elixir Instant Bond	1x3 plates & 2x3 studs	One Side	Vertical	16"	554		5/16", 3/8", 1/2", 5/8"	UL Project 89NK27074 (Application 2)
W003	Tanco XA2600 Swift-49109 National Starch Elixir Instant Bond	1x3 plates & 2x3 studs 1x3 plates & 2x3 studs 1x3 plates & 2x3 studs 1x3 plates & 2x3 studs	One Side	Horizontal	16"	561		5/16", 3/8", 1/2", 5/8"	UL Project 89NK27074 (Application 3)
W006	Foamseal F2100	1x3 plates & 2x3 studs	One Side	Vertical	24"	610	244	5/16"	PE 94-764
W007	Foamseal F2100	1x3 plates & 2x3 studs	One Side	Horizontal	16"	667	266	1/2"	PE 91-1890
W008	Foamseal F2100 & PR-32	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	680	272	5/16"	PE 91-2094
W009	Foamseal Elasto-Bond Urethane	2x3 plates & perimeter studs 1x3 interior studs	Two Sides	Horizontal	16"	756	302	1/2"	PE 93-1494
W010	Foamseal F2100	1x3 T plate 2x3 B plate 2x3 studs	One Side	Vertical	16"	782	313	5/16"	PE 94-388
W011	Foamseal F6000	1x3 plates & 2x3 studs	One Side	Vertical	16"	608	243	5/16"	PE 96-652
W012	Foamseal F6300	2x3 plates & 2x3 studs	One Side	Vertical	16"	642	257	5/16"	PE 97-610
W013	Pemco 5100	1x3 plates & 2x3 studs	One Side	Vertical	16"	747	298	5/16"	PE 95-1344
W014	Pemco 5100	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	747	298	5/16"	PE 95-1345
W015	Pemco 5100	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	538	215	5/16"	NTA96-0529-4
W016	Pemco 5100	1x3 plates & 2x3 studs	One Side	Vertical	16"	819	327	5/16"	NTA96-0212-3
W017	Tacc International Gun 'N Go	2x3 T plates 1x3 B plate and 2x3 studs	One Side	Vertical	16"	506	203	5/16"	NTA96-0105-3
W018	Tacc International Gun 'N Go	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	600	240	5/16"	NTA970115-1
W019	Tacc International Gun 'N Go	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	563	225	5/16"	NTA970154-1
W020	Clayton Touch 'N Seal	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	561	225	5/16"	NTA960715-1
W021	Sun No. 99	1x3 plates & 2x3 studs	One Side	Vertical	16"	382	282	5/16"	UL Project 95NK23891 (Application 5)
W022	Sun No. 99	1x3 plates & 2x3 studs	One Side	Vertical	16"	545	366	5/16"	UL Project 95NK23891 (Application 9)
W023	Sun No. 99	1x3 plates & 2x3 studs	One Side	Vertical	16"	373	324	5/16"	UL Project 95NK23891 (Application 10)
W024	Dow Chem. EnerBond DW	1x3 plates & 2x3 studs	One Side	Vertical	16"	494	197	5/16"	CLT AB96-10
W025	Dow Chem. EnerFoam	1x3 plates & 2x3 studs	One Side	Vertical	16"	486	194	5/16"	BR10585A-06
W026	Dow Chem. EnerFoam	2x3 T plates 1x3 B plate & 2x3 studs	One Side	Vertical	16"	467	186	5/16"	CTL AB95-01
W027	Foamseal F6300 & F6400	1x3 plates & 1x3 & 3x3 studs	One Side	Vertical	16"	388	155	5/16"	PE 97-1388 C
W028	Tacc International Sta Sealed 910	1x3 plates & 2x3 studs	One Side	Vertical	16"	452	181	5/16"	NTA970012-1
W029	Tacc International MH 9000	1x3 plates & 2x3 studs	One Side	Vertical	16"	690	276	5/16"	PE 95-304
W030	Dow Chem. EnerBond MH	1x3 plates & 2x3 studs	One Side	Vertical	16"	649	260	5/16"	CLT FP98-01
W031	Dow Chem. EnerFoam	1x3 plates & 2x3 studs	One Side	Vertical	16"	539	216	5/16"	CLT FP98-02
W032	Dow Chem. EnerBond SF	1x3 plates & 2x3 studs	One Side	Vertical	16"	739	296	5/16"	CLT FP98-03
W033	Dow Chem. EnerFoam	1x3 plates & 2x3 studs	One Side	Vertical	16"	638	255	5/16"	CLT FP98-04
W034	Voramara AA 3022 (Dow)	1x3 plates & 2x3 studs	One Side	Vertical	16"	529	211	5/16"	PE 2001-631
W036	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	One Side	Vertical	16"	454	181	5/16"	PE 2001-710 A

Technical Overview

WALL ADHESIVES (cont.)

Application Ref. Test	Adhesive	Fasteners	Type	Orientation	Center	On Shear	Ultimate Shear	Design Board Size	Report
W036	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	One Side	Vertical	16"	766	306	5/16"	NTA 990011A
W037	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	One Side	Vertical	16"	660	264	5/16"	NTA 200121A
W038	FSI Foamnail	1x3 plates & 2x3 studs	One Side	Horizontal	16"	573	229	1/2"	PE 99-1346 A
W039	FSI Foamnail	2x3 plates & 2x3 studs	One Side	Horizontal	16"	649	259	1/2"	PE 99-1346 B
W040	FSI Foamnail	2x3 plates & 2x3 studs	One Side	Vertical	16"	768	307	5/16"	PE 99-2792 C
W041	FSI Foamnail	1x3 plates & 2x3 studs	One Side	Vertical	16"	560	224	5/16"	PE 99-2462 D
W042	FSI Foamnail	1x3 plates & 2x3 studs	One Side	Vertical	16"	622	248	5/16"	PE 2001-1215 B
W043	Dow Chem. EnerBond BA	1x3 plates & 2x3 studs	One Side	Vertical	16"	526	210	5/16"	CLT FP00-04
W044	Alpha Systems 3100 PVA	1x3 plates & 2x3 studs	One Side	Horizontal	16"	556	222	1/2" LITE	PEI 2013-1370 A
W045	Alpha Systems P5100	1x3 plates & 2x3 studs	One Side	Horizontal	16"	556	238	1/2" LITE	PEI 2013-1370 B
W046	Dow Voramer ME 3513	1x3 plates & 2x3 studs	One Side	Horizontal	16"	685	274	1/2" LITE	PEI 2013-1370 C
W047	FSI FoamNail	1x3 plates & 2x3 studs	One Side	Horizontal	16"	641	256	1/2" LITE	PEI 2013-1370 D
W205	Foamseal F6300 & F6400	1x3 plates & 1x3 & 2x3 studs	Two Sides	Vertical	16"	677	270	5/16"	PE 97-1388 E
W206	Foamseal F2100 & Foamseal F6200	2x3 plates & 2x3 studs	Two Sides	Vertical	16"	847	339	5/16"	PE 9601472 B
W207	Foamseal F6300	2x3 plates & 2x3 studs	Two Sides	Vertical	16"	1170	468	5/16"	PE 97-610 D
W208	Pemco 5100 & 3100	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	1093	437	5/16"	NTA96-0212-4
W209	Pemco 5100 & 3100	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	821	328	5/16"	NTA96-0529-3
W210	Tacc International Gun 'N Go	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	1004	401	5/16"	NTA 970154-2
W211	Tacc International Sta Sealed 910	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	854	342	5/16"	NTA 970012-2
W212	Tacc International Gun 'N Go	2x3 plates & 2x3 studs	Two Sides	Vertical	16"	1004	401	5/16"	NTA 970115-2
W213	Clayton Touch 'N Seal	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	918	—	5/16"	NTA 960715-2
W214	Sun No. 99	1x3 plates & 1x3 & 2x3 studs	Two Sides	Vertical	16"	545	435	5/16", 3/8", 1/2", 5/8"	UL Project 95NK23891 (Application 4)
W215	Sun No. 99	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	539	436	5/16", 3/8", 1/2", 5/8"	UL Project 95NK23891 (Application 6)
W216	Sun No. 99	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	649	548	5/16", 3/8", 1/2", 5/8"	UL Project 95NK23891 (Application 7)
W217	Sun No. 99	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	687	500	5/16", 3/8", 1/2", 5/8"	UL Project 95NK23891 (Application 8)
W218	Dow Chem. EnerFoam	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	738	295	5/16"	CTL AB95-02
W219	Dow Chem. EnerFoam	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	1062	425	5/16"	CTL AB95-03
W220	Dow Chem. EnerFoam	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	982	393	5/16"	CTL FP98-05
W221	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	770	308	5/16"	PE 2001-710 B
W222	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	1047	419	5/16"	NTA 200121
W223	HB Fuller Parr CA-40	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	1062	425	5/16"	NTA 990011
W224	Dow Chem. EnerBond SF & BA	1x3 plates & 2x3 studs	Two Sides	Horizontal	16"	1272	508	5/16"	CLT DCC01-01
W225	Dow Chem. EnerBond SF	2x3 T plates 1x3 B plate & 2x3 studs	Two Sides	Vertical	16"	1097	438	5/16"	CLT FP98-08
W226	Dow Chem. EnerBond SF	1x3 plates & 2x3 studs	Two Sides	Vertical	16"	1013	405	5/16"	CLT FP98-06
W227	Alpha Systems P5100	1x3 plates & 2x3 studs	Two Sides	Horizontal	16"	1052	421	1/2" LITE	PEI 2013-1370 E
W228	Dow Voramer ME 3515	1x3 plates & 2x3 studs	Two Sides	Horizontal	16"	1082	433	1/2" LITE	PEI 2013-1370 F
W229	FSI FoamNail	1x3 plates & 2x3 studs	Two Sides	Horizontal	16"	1035	414	1/2" LITE	PEI 2013-1370 G

CEILING ADHESIVES									
Application Ref. Test	Adhesive	Fasteners	Width Size	On Center	Span	Ultimate Shear	12-Hour Shear	Board Size	Report
M001	N/A	Staples & Rosettes or Staples	11' 8-1/4"	16"	28'	367	—	5/16", 3/8"	UL Project 76NK3479 (Application A)
M002	N/A	Staples & Rosettes or Screws	11' 8-1/4"	16"	28'	367	—	1/2", 5/8"	UL Project 87NK4541 (Application B)
M003	N/A	Staples & Rosettes	11' 8-1/4"	16"	28'	303	—	5/16", 3/8"	UL Project 77NK158 (Application C)
M004	N/A	Staples & Rosettes	11' 8-1/4"	16"	28'	303	—	1/2", 5/8"	UL Project 77NK158 (Application D)
M007	N/A	Staples & Rosettes	11' 9"	24"	28'	287	—	5/16"	PTL-Report 5-79CS-1
M010	N/A	Staples & Rosettes or Staples & Screws	11' 9"	24"	40'	—	260	5/16", 3/8", 1/2", 5/8"	UL Project 89NK18380 (Application N)
M013	N/A	Screws or Screws & Staples	13' 8"	24"	40'	—	249	5/16", 3/8", 1/2", 5/8"	UL Project 88NK3278 (Application H)
M015	N/A	Staples or Staples & Rosettes or Staples & Foamseal F2100	13' 8"	24"	40'	—	251	5/16", 3/8", 1/2", 5/8"	UL Project 88NK21384 (Application J)
M016	N/A	Staples, Staples & Rosettes or Staples & Screws	13' 8"	24"	40'	384	—	5/16", 3/8", 1/2", 5/8"	PE 90-1598
M019	N/A	Staples & Rosettes or Staples & Screws or Staples & Staples	15' 6"	24"	40'	—	218	5/16", 3/8", 1/2", 5/8"	UL Project 89NK27074 (Application O)
F001	Foamseal F2100	—	11' 8"	16"	28'	348	—	5/16", 3/8", 1/2", 5/8"	UL Project 77NK158 (Application E)
F002	Foamseal F2100	—	11' 8"	16"	28'	383	—	5/16", 3/8", 1/2", 5/8"	UL Project 82NK9974 (Application F)
F003	FSI Foamnail	—	9' 6"	24"	52'	550	—	5/16"	PE 99-1348 Addendum A
F005	Foamseal F2100	—	11' 8"	24"	32'	344	—	5/16", 3/8", 1/2", 5/8"	UL Project 82NK9974 (Application G)
F006	Foamseal F2100	—	11' 0"	24"	44'	655	—	5/16"	PE 95-1920
F007	Dow Voramer	—	11' 8"	24"	44'	641	—	5/16"	PE 97-1206 Addendum A
F008	Foamseal F2100	—	11' 9"	24"	44'	392	—	5/16", 3/8", 1/2", 5/8"	UL Project 89NK3257 (Application K)
F009	FSI Foamnail	—	11' 9"	24"	44'	567	—	5/16"	PE 97-1906 Addendum A
F011	Foamseal F2100	—	11' 9"	24"	48'	452	—	5/16"	PE 93-1066
F014	Foamseal F2100	—	11' 9"	24"	48'	429	—	5/16"	PE 93-1068
F015	Dow Voramer	—	11' 8"	24"	52'	430	—	5/16"	PE 2000-886 Addendum A
F017	Foamseal F2100	—	13' 8"	24"	36'	324	—	5/16", 3/8", 1/2", 5/8"	NAHB Hud Contract HC-14362
F023	Foamseal F2100	—	13' 9"	24"	44'	392	—	5/16", 3/8", 1/2", 5/8"	UL Project 89NK5259 (Application M)
F026	Foamseal F2100	—	15' 5"	24"	44'	430	—	5/16", 3/8", 1/2", 5/8"	UL Project 89NK5259 (Application L)
F029	Foamseal F2100	—	15' 6"	24"	48'	462	—	5/16"	PE 93-1070
F032	Foamseal F2100	—	15' 6"	24"	48'	382	—	5/16"	PE 93-1072
F033	Alphaseal 5200	—	11' 9"	24"	48'	569	—	5/16"	PEI 1998-1028 Addendum A
F034	Alphaseal 5200	—	11' 8"	24"	48'	535	—	1/2" LITE	PEI 1998-1028 Addendum K
F035	Dow Voramer	—	11' 8"	24"	52'	694	—	5/16"	PEI 2001-1505 Addendum A
F033	Dow Voramer	—	11' 8"	24"	52'	562	—	1/2" LITE	PEI 2001-1505 Addendum H

Quick Selector For Factory Built Housing Shear-Tested Systems

I. Ceiling Mechanical Fastener Applications

Ceiling Application - M001

Staples and Rosettes or Staples
Minimum Ceiling Width: 11' 8-1/4"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
367 lbs./lin. ft. of Ceiling Width
(UL Application A)*

Ceiling Application - M002

Staples and Rosettes or Screws
Minimum Ceiling Width: 11' 8-1/4"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
367 lbs./lin. ft. of Ceiling Width
(UL Application B)*

Ceiling Application - M003

Staples and Rosettes
Minimum Ceiling Width: 11' 8 1/4"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
303 lbs./lin. ft. of Ceiling Width
(UL Application C)*

Ceiling Application - M004

Staples and Rosettes
Minimum Ceiling Width: 11' 8-1/4"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
303 lbs./lin. ft. of Ceiling Width
(UL Application D)*

Ceiling Application - M007

Staples and Rosettes
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
287 lbs./lin. ft. of Ceiling Width
(PTL Report 5-79CS-1)

Ceiling Application - M010

Staples and Rosettes or Staples
and Screws
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 40' 0"
12-Hour Shear Resistance:
260 lbs./lin. ft. of Ceiling Width
(UL Application N)*

Ceiling Application - M013

Screw or Screws and Staples
Minimum Ceiling Width: 13' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 40' 0"
12-Hour Shear Resistance:
249 lbs./lin. ft. of Ceiling Width
(UL Application H)*

Ceiling Application - M015

Staples or Staples and Rosettes
or Staples and Foamseal F2100
Minimum Ceiling Width: 13' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 40' 0"
12-Hour Shear Resistance:
251 lbs./lin. ft. of Ceiling Width
(UL Application J)*

Ceiling Application -

(Cathedral) - M016

Staples, Staples and Rosettes
or Staples and Screws
Minimum Ceiling Width: 13' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 40' 0"
Ultimate Shear Resistance:
384 lbs./lin. ft. of Ceiling Width
(PE 90-1598)

Ceiling Application - M019

Staples and Rosettes
or Staples and Screws
or Staples and Staples
Minimum Ceiling Width: 15' 6"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 40' 0"
12-Hour Shear Resistance:
218 lbs./lin. ft. of Ceiling Width
(UL Application O)*

II. Ceiling Foam Applications

Ceiling Application - F001

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
348 lbs./lin. ft. of Ceiling Width
(UL Project 77NK158)

Ceiling Application - F002

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 28' 0"
Ultimate Shear Resistance:
383 lbs./lin. ft. of Ceiling Width
(UL Project 82NK9974)

Ceiling Application -

(Cathedral) - F003

FSI Foamnail Polyurethane
Adhesive
Minimum Ceiling Width: 9' 6"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 52' 0"
Ultimate Shear Resistance:
550.3 lbs./lin.ft. of Ceiling Width
(PE 99-1348 Addendum A)

Ceiling Application - F005

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 32' 0"
Ultimate Shear Resistance:
344 lbs./lin. ft. of Ceiling Width
(UL Project 82NK9974)

Ceiling Application - F006

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 0"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
655.3 lbs./lin. ft. of Ceiling Width
(PE 95-1920)

Ceiling Application - (Cathedral) - F007

Dow Chemical Voramer AA
3022 Polyurethane Adhesive
Minimum Ceiling Width: 11' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
641 lbs./lin.ft. of Ceiling Width
(PE 97-1206 Addendum A)

Ceiling Application - F008

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
392 lbs./lin. ft. of Ceiling Width
(UL Project 89NK3257)

Ceiling Application -

(Cathedral) - F009

FSI Foamnail Polyurethane
Adhesive
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
567.8 lbs./lin.ft. of Ceiling Width
(PE 97-1906 Addendum A)

Ceiling Application - F011

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' 0"
Ultimate Shear Resistance:
452 lbs./lin. ft. of Ceiling Width
(PE 93-1066)

Ceiling Application -

(Cathedral) - F014

Foamseal F2100 Polyurethane
Adhesive
Minimum Ceiling Width: 11' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' 0"
Ultimate Shear Resistance:
429 lbs./lin. ft. of Ceiling Width
(PE 93-1068)

**Ceiling Application -
(Cathedral) - F015**

Dow Chemical Voramer AA
3022 Polyurethane Adhesive
Minimum Ceiling Width: 11' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 52' 0"
Ultimate Shear Resistance:
430 lbs./lin. ft. of Ceiling Width
(PE 2000-886 Addendum A)

Ceiling Application - F017
Foamseal F2100 Polyurethane
Adhesive

Minimum Ceiling Width: 13' 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 36' 0"
Ultimate Shear Resistance:
324 lbs./lin. ft. of Ceiling Width
(NAHB HUD Contract
HC-14362)

Ceiling Application - F023
Foamseal F2100 Polyurethane
Adhesive

Minimum Ceiling Width: 13' 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
392 lbs./lin. ft. of Ceiling Width
(UL Project 89NK5259)

Ceiling Application - F026
Foamseal F2100 Polyurethane
Adhesive

Minimum Ceiling Width: 15' 5"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 44' 0"
Ultimate Shear Resistance:
430 lbs./lin. ft. of Ceiling Width
(UL Project 89NK5259)

Ceiling Application - F029
Foamseal F2100 Polyurethane
Adhesive

Minimum Ceiling Width: 15' 6"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' 0"
Ultimate Shear Resistance:
462 lbs./lin. ft. of Ceiling Width
(PE 93-1070)

**Ceiling Application
(Cathedral) - F032**
Foamseal F2100 Polyurethane
Adhesive

Minimum Ceiling Width: 15' 6"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' 0"
Ultimate Shear Resistance:
382 lbs./lin. ft. of Ceiling Width
(PE 93-1072)

**Ceiling Application
(Cathedral) – F033**
Alphaseal 5200 Polyurethane
Adhesive

Minimum Ceiling Width: 11' – 9"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' – 0"
Ultimate Shear Resistance:
569 lbs./lin. ft. of ceiling Width
(PEI 1998-1028 A)

**Ceiling Application
(Cathedral) – F034**
Alphaseal 5200 Polyurethane
Adhesive

Minimum Ceiling Width: 11' – 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 48' – 0"
Ultimate Shear Resistance:
535 lbs./lin. ft. of ceiling Width
(PEI 1998-1028 K)

**Ceiling Application
(Cathedral) – F035**
DOW Chemical Voramer MB
3099/Voramer ME 3044
Two-Part Polyurethane Adhesive

Minimum Ceiling Width: 11' – 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 52' – 0"
Ultimate Shear Resistance:
694 lbs./lin. ft. of ceiling Width
(PEI 2001-1505 A)

**Ceiling Application
(Cathedral) – F036**
DOW Chemical Voramer MB
3099/Voramer ME 3044
Two-Part Polyurethane Adhesive

Minimum Ceiling Width: 11' – 8"
Maximum Ceiling Diaphragm Span
Between Shear Walls: 52' – 0"
Ultimate Shear Resistance:
562 lbs./lin. ft. of ceiling Width
(PEI 2001-1505 H)

III. Wall Applications

Wall Application - W001
One Side 2x3 Studs 16" o.c.
Staples and White Glue

Ultimate Shear Resistance:
638 lbs./lin. ft.
Load at 1/8" Deflection:
410 lbs./lin. ft.
(UL Application 1)*

Wall Application - W002
One Side 2x3 Studs 16" o.c.
Staples and White Glue

Ultimate Shear Resistance:
554 lbs./lin. ft.
Load at 1/8" Deflection:
312 lbs./lin. ft.
(UL Application 2)*

Wall Application - W003
One Side 2x3 Studs 16" o.c.
(Horizontal Application)
Staples and White Glue

Ultimate Shear Resistance:
561 lbs./lin. ft.
Load at 1/8" Deflection:
341 lbs./lin. ft.
(UL Application 3)*

Wall Application - W006
One Side 2x3 Studs 24" o.c.
Foamseal F2100 Polyurethane
Adhesive

Ultimate Shear Resistance:
610 lbs./lin. ft.
Design Shear/2.5 safety factor:
244 lbs./lin. ft.
(PE 94-764)

Wall Application - W007
One Side 2x3 Studs 16" o.c.
Foamseal F2100 Polyurethane
Adhesive

Ultimate Shear Resistance:
667 lbs./lin. ft.
Design Shear/2.5 safety factor:
266.8 lbs./lin. ft.
(PE 91-1890 E)

Wall Application - W008
Two Sides 2x3 Studs 16" o.c.
Foamseal F2100 and PR-32
Polyurethane Adhesive

Ultimate Shear Resistance:
680 lbs./lin. ft.
Design Shear/2.5 safety factor:
272 lbs./lin. ft.
(PE 91-2094 A)

Wall Application - W009
Two Sides 2x3 and 1x3 Studs
16" o.c.
Foamseal Elasto-Bond
Polyurethane Adhesive

Ultimate Shear Resistance:
756 lbs./lin. ft.
Design Shear/2.5 safety factor:
302.4 lbs./lin. ft.
(PE 93-1494)

Wall Application - W010
One Side 2x3 Studs 24" o.c.
Foamseal F2100 Polyurethane
Adhesive

Ultimate Shear Resistance:
782.6 lbs./lin. ft.
Design Shear/2.5 safety factor:
313.0 lbs./lin. ft.
(PE 94-388)

Wall Application - W011
One Side 2x3 Studs 16" o.c.
Staples and Foamseal F6000
Urethane Adhesive

Ultimate Shear Resistance:
608.7 lbs./lin. ft.
Design Shear/2.5 safety factor:
243.5 lbs./lin. ft.
(PE 96-652)

Wall Application - W012
One Side 2x3 Studs 16" o.c.
Staples and Foamseal F6300
Polyurethane Adhesive

Ultimate Shear Resistance:
642.9 lbs./lin. ft.
Design Shear/2.5 safety factor:
257.1 lbs./lin. ft.
(PE 97-610 A)

Wall Application - W013
One Side 2x3 Studs 16" o.c.
Staples and Pemco 5100
Polyurethane Adhesive

Ultimate Shear Resistance:
747.0 lbs./lin. ft.
Design Shear/2.5 safety factor:
298.8 lbs./lin. ft.
(PE 95-1344 C)

Wall Application - W014

One Side 2x3 Studs 16" o.c.
Staples and Pemco 5100
Polyurethane Adhesive

Ultimate Shear Resistance:
568.5 lbs./lin. ft.

Design Shear/2.5 safety factor:
227.4 lbs./lin. ft.

(PE 95-1344 A)

Wall Application - W015

One Side 2x3 and 1x3 studs
24" o.c.
Staples and Pemco 5100
Polyurethane Adhesive

Ultimate Shear Resistance:
537.6 lbs./lin. ft.

Design Shear/2.5 safety factor:
215.0 lbs./lin. ft.

(NTA96-0529-4)

Wall Application - W016

One Side 2x3 Studs 16" o.c.
Staples and Pemco 5100
Polyurethane Adhesive

Ultimate Shear Resistance:
819.6 lbs./lin. ft.

Design Shear/2.5 safety factor:
327.8 lbs./lin. ft.

(NTA96-0212-3)

Wall Application - W017

One Side 2x3 Studs 16" o.c.
Staples and Tacc International
Gun'n Go Adhesive

Ultimate Shear Resistance:
506.8 lbs./lin. ft.

Design Shear/2.5 safety factor:
203.0 lbs./lin. ft.

(NTA96-0105-3)

Wall Application - W018

One Side 2x3 Studs 16" o.c.
Staples and Tacc International
Gun'n Go Adhesive

Ultimate Shear Resistance:
600.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
240.0 lbs./lin. ft.

(NTA970115-1)

Wall Application - W019

One Side 2x3 Studs 16" o.c.
Staples and Tacc International
Gun'n Go Adhesive

Ultimate Shear Resistance:
563.7 lbs./lin. ft.

Design Shear/2.5 safety factor:
225.1 lbs./lin. ft.

(NTA970154-1)

Wall Application - W020

One Side 2x3 Studs 16" o.c.
Staples and Clayton Corp.
Touch'n Seal Adhesive

Ultimate Shear Resistance:
561.8 lbs./lin. ft.

Design Shear/2.5 safety factor:
225.0 lbs./lin. ft.

(NTA960715-1)

Wall Application - W021

One Side 2x3 Studs 24" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
382 lbs./lin. ft.

Load at 1/8" Deflection:
282 lbs./lin. ft.

(UL Application 5)*

Wall Application - W022

One Side 2x3 Studs 16" o.c.
Staples and Sun No. 99
Adhesive

Ultimate Shear Resistance:
545 lbs./lin. ft.

Load at 1/8" Deflection:
366 lbs./lin. ft.

(UL Application 9)*

Wall Application - W023

One Side 2x3 Studs 16" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
373 lbs./lin. ft.

Load at 1/8" Deflection:
324 lbs./lin. ft.

(UL Application 10)*

Wall Application - W024

One Side 2x3 Studs 16" o.c.
Staples and EnerBond DW
Adhesive

Ultimate Shear Resistance:
494.3 lbs./lin. ft.

Design Shear/2.5 safety factor:
197.7 lbs./lin. ft.

(CTL AB96-10)

Wall Application - W025

One Side 2x3 Studs 16" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
486.7 lbs./lin. ft.

Design Shear/2.5 safety factor:
194.7 lbs./lin. ft.

(BR10585A-06)

Wall Application - W026

One Side 2x3 Studs 24" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
467.2 lbs./lin. ft.

Design Shear/2.5 safety factor:
186.9 lbs./lin. ft.

(CTL AB95-01)

Wall Application - W027

One Side 2x3 and 1x3 Studs
24" o.c.
Staples and Foamseal F6300 or
F6400 Polyurethane Adhesive

Ultimate Shear Resistance:
388.4 lbs./lin. ft.

Design Shear/2.5 safety factor:
155.3 lbs./lin. ft.

(PE 97-1388 C)

Wall Application - W028

One Side 2x3 Studs 16" o.c.
Staples and Tacc International
Sta Sealed 910 Adhesive

Ultimate Shear Resistance:
452.8 lbs./lin. ft.

Design Shear/2.5 safety factor:
181.1 lbs./lin. ft.

(NTA970012-1)

Wall Application - W029

One Side 2x3 Studs 16" o.c.
Staples and Tacc International
Sta Sealed 9000 Adhesive

Ultimate Shear Resistance:
690.6 lbs./lin. ft.

Design Shear/2.5 safety factor:
276.2 lbs./lin. ft.

(PE 95-304)

Wall Application - W030

One Side 2x3 Studs 16" o.c.
Staples and EnerBond MH
Polyurethane Adhesive

Ultimate Shear Resistance:
649.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
260.0 lbs./lin. ft.

(CTL FP98-01)

Wall Application - W031

One Side 2x3 Studs 16" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
539.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
216.0 lbs./lin. ft.

(CTL FP98-02)

Wall Application - W032

One Side 2x3 Studs 16" o.c.
Staples and EnerBond SF
Polyurethane Adhesive

Ultimate Shear Resistance:
739.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
296.0 lbs./lin. ft.

(CTL FP98-03)

Wall Application - W033

One Side 2x3 Studs 16" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
638.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
255.0 lbs./lin. ft.

(CTL FP98-04)

Wall Application - W034

One side 2x3 Studs 16" o.c.
Dow Chemical Voramer AA
3022 Polyurethane Adhesive

Ultimate Shear Resistance:
529.4 lbs./lin. ft.

Design Shear/2.5 safety factor:
211.7 lbs./lin. ft.

(PE 2001-631)

Wall Application - W035

One Side 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
454.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
181.6 lbs./lin. ft.

(PE 2001-710 A)

Wall Application - W036

One Side 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
766.9 lbs./lin. ft.

Design Shear/2.5 safety factor:
306.7 lbs./lin. ft.

(NTA990011A)

*UL Shear Resistance Classification MH 10176

Wall Application - W037

One Side 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
660.2 lbs./lin. ft.

Design Shear/2.5 safety factor:
264.0 lbs./lin. ft.

(NTA200121A)

Wall Application - W038

One Side 2x3 Studs 16" o.c.
FSI FoamNail Polyurethane
Adhesive

Ultimate Shear Resistance:
573.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
229.2 lbs./lin. ft.

(PE 99-1346 A)

Wall Application - W039

One Side 2x3 Studs 16" o.c.
FSI FoamNail Polyurethane
Adhesive

Ultimate Shear Resistance:
649.1 lbs./lin. ft.

Design Shear/2.5 safety factor:
259.6 lbs./lin. ft.

(PE 99-1346 B)

Wall Application - W040

One Side 2x3 Studs 16" o.c.
FSI FoamNail Polyurethane
Adhesive

Ultimate Shear Resistance:
768.3 lbs./lin. ft.

Design Shear/2.5 safety factor:
307.3 lbs./lin. ft.

(PE 99-2792 C)

Wall Application - W041

One Side 2x3 Studs 16" o.c.
FSI FoamNail Polyurethane
Adhesive

Ultimate Shear Resistance:
560.8 lbs./lin. ft.

Design Shear/2.5 safety factor:
224.3 lbs./lin. ft.

(PE 99-2462 D)

Wall Application - W042

One Side 2x3 Studs 16" o.c.
FSI FoamNail Polyurethane
Adhesive

Ultimate Shear Resistance:
622.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
248.8 lbs./lin. ft.

(PE 2001-1215 B)

Wall Application - W043

One Side 2x3 Studs 16" o.c.
Staples and EnerBond BA
Polyurethane Adhesive

Ultimate Shear Resistance:
526.7 lbs./lin. ft.

Design Shear/2.5 safety factor:
210.7 lbs./lin. ft.

(CTL PF00-04)

Wall Application - W044

One side 2x3 Studs 16" o.c.
Staples and Alpha Systems
3100 PVA Adhesive

Ultimate Shear Resistance:
556 lbs./lin. ft.

Design Shear/ 2.5 safety factor:
222 lbs./lin. ft.

(PEI 2013-1370 A)

Wall Application - W045

One side 2x3 Studs 16" o.c.
Staples and Alpha Systems
P5100 Polyurethane Adhesive

Ultimate Shear Resistance:
596 lbs./lin. ft.

Design Shear/2.5 safety factor:
238 lbs./lin. ft.

(PEI 2013-1370 B)

Wall Application - W046

One side 2x3 Studs 16" o.c.
Staples and DOW Chemical
Voramer ME 3513 Polyurethane
Adhesive

Ultimate Shear Resistance:
685 lbs./lin. ft.

Design Shear/ 2.5 safety factor:
274 lbs./lin. ft.

(PEI 2013-1370 C)

Wall Application - W047

One side 2x3 Studs 16" o.c.
Staples and FSI FoamNail
Polyurethane Adhesive

Ultimate Shear Resistance:
641 lbs./lin. ft.

Design Shear/ 2.5 safety factor:
256 lbs./lin. ft.

(PEI 2013-1370 D)

Wall Application - W205

Two Sides 2x3 and 1x3 Studs
24" o.c.
Staples and Foamseal F6300 or
F6400 Polyurethane Adhesive

Ultimate Shear Resistance:
677.4 lbs./lin. ft.

Design Shear/2.5 safety factor:
270.9 lbs./lin. ft.

(PE 97-1388 E)

Wall Application - W206

Two Sides 2x3 Studs 16" o.c.
Staples and Foamseal F2100 or
F6200 Polyurethane Adhesive

Ultimate Shear Resistance:
847.5 lbs./lin.ft.

Design Shear/2.5 safety factor:
339.0 lbs./lin. ft.

(PE 96-1472 B)

Wall Application - W207

Two Sides 2x3 Studs 16" o.c.
Staples and Foamseal F6300
Polyurethane Adhesive

Ultimate Shear Resistance:
1170.6 lbs./lin. ft.

Design Shear/2.5 safety factor
468.2 lbs./lin. ft.

(PE 97-610 D)

Wall Application - W208

Two Sides 2x3 Studs 16" o.c.
Staples and Pemco 5100 and
3100 Polyurethane Adhesive

Ultimate Shear Resistance:
1093.7 lbs./lin. ft.

Design Shear/2.5 safety factor:
437.5 lbs./lin. ft.

(NTA96-0212-4)

Wall Application - W209

Two Sides 2x3 and 1x3 Studs
24" o.c.
Staples and Pemco 5100 and
3100 Polyurethane Adhesive

Ultimate Shear Resistance:
821.2 lbs./lin. ft.

Design Shear/2.5 safety factor:
328.0 lbs./lin. ft.

(NTA96-0529-3)

Wall Application - W210

Two Sides 2x3 Studs 16" o.c.
Staples and Tacc International
Gun'n Go Adhesive

Ultimate Shear Resistance:
1004.8 lbs./lin. ft.

Design Shear/2.5 safety factor:
401.9 lbs./lin. ft.

(NTA970154-2)

Wall Application - W211

Two Sides 2x3 Studs 16" o.c.
Staples and Tacc International
Sta Sealed 910 Adhesive

Ultimate Shear Resistance:
854.4 lbs./lin. ft.

Design Shear/2.5 safety factor:
342.0 lbs./lin. ft.

(NTA970012-2)

Wall Application - W212

Two Sides 2x3 Studs 16" o.c.
Staples and Tacc International
Gun'n Go Adhesive

Ultimate Shear Resistance:
1004.4 lbs./lin. ft.

Design Shear/2.5 safety factor
401.8 lbs./lin. ft.

(NTA970115-2)

Wall Application - W213

Two Sides 2x3 Studs 16" o.c.
Staples and Clayton Corp.
Touch'n Seal Adhesive

Ultimate Shear Resistance:
918.9 lbs./lin. ft.

Design Shear/2.5 safety factor:
368.0 lbs./lin. ft.

(NTA960715-2)

Wall Application - W214

Two Sides 2x3 Studs 24" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
545 lbs./lin. ft.

Load at 1/8" Deflection:
435 lbs./lin. ft.

(UL Application 4)*

Wall Application - W215

Two Sides 2x3 Studs 24" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
539 lbs./lin. ft.

Load at 1/8" Deflection:
436 lbs./lin. ft.

(UL Application 6)*

Wall Application - W216

Two Sides 2x3 Studs 16" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
649 lbs./lin. ft.

Load at 1/8" Deflection:
548 lbs./lin. ft.

(UL Application 7)*

Wall Application - W217

Two Sides 2x3 Studs 16" o.c.
Staples and Sun No. 99 Adhesive

Ultimate Shear Resistance:
687 lbs./lin. ft.

Load at 1/8" Deflection:
500 lbs./lin. ft.

(UL Application 8)*

Wall Application - W218

Two Sides 2x3 Studs 24" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
738.4 lbs./lin. ft.

Design Shear/2.5 safety factor:
295.4 lbs./lin. ft.

(CTL AB95-02)

Wall Application - W219

Two Sides 2x3 Studs 24" o.c.
Staples and EnerFoam
Polyurethane Adhesive and Sun
No. 99 Adhesive

Ultimate Shear Resistance:
661.6 lbs./lin. ft.

Design Shear/2.5 safety factor:
264.6 lbs./lin. ft.

(CTL AB95-03)

Wall Application - W220

Two Sides 2x3 Studs 16" o.c.
Staples and EnerFoam
Polyurethane Adhesive

Ultimate Shear Resistance:
982.0 lbs./lin. ft.

Design Shear/2.5 safety factor:
393.0 lbs./lin. ft.

(CTL FP98-05)

Wall Application - W221

Two Sides 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
770.2 lbs./lin. ft.

Design Shear/2.5 safety factor:
308.0 lbs./lin. ft.

(PE 2001-710 B)

Wall Application - W222

Two Sides 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
1047.5 lbs./lin. ft.

Design Shear/2.5 safety factor:
419.0 lbs./lin. ft.

(NTA200121)

Wall Application - W223

Two Sides 2x3 Studs 16" o.c.
Staples and Parr CA-40
Construction Adhesive

Ultimate Shear Resistance:
1062.7 lbs./lin. ft.

Design Shear/2.5 safety factor:
425.1 lbs./lin. ft.

(NTA200121)

Wall Application - W224

Two Sides 2x3 Studs 16" o.c.
Staples and EnerBond SF and
BA polyurethane Adhesives

Ultimate Shear Resistance:
1272 lbs./lin. ft.

Design Shear/2.5 safety factor:
508.8 lbs./lin. ft.

(CTL DCC01-01)

Wall Application - W225

Two Sides 2x3 Studs 16" o.c.
Staples and EnerBond SF
Polyurethane Adhesive

Ultimate Shear Resistance:
1097 lbs./lin. ft.

Design Shear/2.5 safety factor:
438.8 lbs./lin. ft.

(CTL PF98-08)

Wall Application - W226

Two Sides 2x3 Studs 16" o.c.
Staples and EnerBond SF
Polyurethane Adhesive

Ultimate Shear Resistance:
1013.3 lbs./lin. ft.

Design Shear/2.5 safety factor:
405.3 lbs./lin. ft.

(CTL PF98-06)

Wall Application - W227

Two Sides 2x3 studs 16"
Staples and Alpha Systems
P5100 Polyurethane Adhesive

Ultimate Shear Resistance:
1052 lbs./lin. ft.

Design Shear / 2.5 safety factor:
421 lbs./lin. ft.

(PEI 2013-1370 E)

Wall Application - W228

Two Sides 2x3 studs 16"
Staples and DOW Chemical
Voramer ME 3513 Polyurethane
Adhesive

Ultimate Shear Resistance:
1082 lbs./lin. ft.

Design Shear / 2.5 safety factor:
433 lbs./lin. ft.

(PEI 2013-1370 F)

Wall Application - W229

Two Sides 2x3 studs 16"
Staples and FSI FoamNail
Polyurethane Adhesive

Ultimate Shear Resistance:
1035 lbs./lin. ft.

Design Shear / 2.5 safety factor:
414 lbs./lin. ft.

(PEI 2013-1370 G)

Note: These test reports refer to maximum spans between shear walls which were based on the 25 psf wind pressure. The design wind pressures since July 13, 1994 are much higher in Wind Zones 2 and 3. The allowable ceiling diaphragm spans now are less due to these increased wind pressures. The ultimate shear resistance is still a valid number. The reader is cautioned not to use the allowable ceiling diaphragm spans in Wind Zones 2 and 3.

Gold Bond® BRAND Gypsum Board

PHYSICAL PROPERTIES			
	1/4" Gold Bond Gypsum Board	3/8" Gold Bond Gypsum Board	1/2" Gold Bond Gypsum Board
Thickness¹, Nominal	1/4" (6.4 mm)	3/8" (9.5 mm)	1/2" (12.7 mm)
Width¹, Nominal	4' (1,219 mm)	4' (1,219 mm)	4' (1,219 mm), 54" (1,372 mm)
Length^{1,4}, Standard	8' – 12' (2,438 – 3,658 mm)	8' – 12' (2,438 – 3,658 mm)	8' – 16' (2,438 – 4,877 mm)
Weight, Nominal	1.1 lbs. / sq. ft. (5.37 k/m ²)	1.3 lbs. / sq. ft. (6.35 k/m ²)	1.6 lbs. / sq. ft. (7.81 k/m ²)
Edges¹	Tapered or Square	Tapered or Square	Tapered or Square
Flexural Strength¹, Perpendicular	≥ 46 lbf. (205 N)	≥ 77 lbf. (343 N)	≥ 107 lbf. (476 N)
Flexural Strength¹, Parallel	≥ 16 lbf. (71 N)	≥ 26 lbf. (116 N)	≥ 36 lbf. (160 N)
Humidified Deflection¹	N/A	≤ 15/8" (47.6 mm)	≤ 10/8" (31.8 mm)
Nail Pull Resistance¹	≥ 36 lbf. (160 N)	≥ 56 lbf. (249 N)	≥ 77 lbf. (343 N)
Hardness¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)
Bending Radius	5' (1,524 mm)	7'6" (2,286 mm)	10' (3,048 mm)
Thermal Resistance⁵	N/A	R = .33	R = .45
Product Standard Compliance	ASTM C1396	ASTM C1396	ASTM C1396
Fire-Resistance Characteristics			
Core Type	Regular	Regular	Regular
UL Type Designation	N/A	N/A	N/A
Combustibility²	Non-combustible Core	Non-combustible Core	Non-combustible Core
Surface Burning Characteristics³	Class A	Class A	Class A
Flame Spread³	15	15	15
Smoke Development³	0	0	0
Applicable Standards and References			
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products			
ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus			
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board			
ASTM C1396 Standard Specification for Gypsum Board			
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials			
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C			
Gypsum Association, GA-214, <i>Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels</i>			
Gypsum Association, GA-216, <i>Application and Finishing of Gypsum Panel Products</i>			
Gypsum Association, GA-238, <i>Guidelines for Prevention of Mold Growth on Gypsum Board</i>			
National Gypsum Company, <i>NGC Construction Guide</i>			

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

4. Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

5. Tested in accordance with ASTM C518.

Gold Bond® BRAND High Strength LITE® Gypsum Board

PHYSICAL PROPERTIES

	High Strength LITE Gypsum Board	
Thickness ¹ , Nominal	1/2" (12.7 mm)	
Width ¹ , Nominal	4' (1,219 mm)	54" (1,372 mm)
Length ^{1,4} , Standard	8' – 14' (2,438 – 4,267 mm)	12' – 14' (3,657 – 4,267 mm)
Weight, Nominal	1.3 – 1.4 lbs. / sq. ft. (6.35 – 6.84 k/m²)	
Edges ¹	Tapered or Square	
Flexural Strength ¹ , Perpendicular	≥ 107 lbf. (476 N)	
Flexural Strength ¹ , Parallel	≥ 36 lbf. (160 N)	
Humidified Deflection ¹	≤ 10/8" (31.8 mm)	
Nail Pull Resistance ¹	≥ 77 lbf. (343 N)	
Hardness ¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)	
Bending Radius	10' (3,048 mm)	
Thermal Resistance ⁵	R = .45	
Product Standard Compliance	ASTM C1396	
Fire-Resistance Characteristics		
Core Type	Regular	
UL Type Designation	N/A	
Combustibility ²	Non-combustible Core	
Surface Burning Characteristics ³	Class A	
Flame Spread ³	15	
Smoke Development ³	0	
Applicable Standards and References		
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products		
ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus		
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board		
ASTM C1396 Standard Specification for Gypsum Board		
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials		
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C		
Gypsum Association, GA-214, <i>Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels</i>		
Gypsum Association, GA-216, <i>Application and Finishing of Gypsum Panel Products</i>		
Gypsum Association, GA-238, <i>Guidelines for Prevention of Mold Growth on Gypsum Board</i>		
National Gypsum Company, <i>NGC Construction Guide</i>		

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

4. Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

5. Tested in accordance with ASTM C518.

Gold Bond® BRAND High Strength Ceiling Board

PHYSICAL PROPERTIES	
	High Strength Ceiling Board
Thickness ¹ , Nominal	1/2" (12.7 mm)
Width ¹ , Nominal	4' (1,219 mm)
Length ¹ , Standard	12' (3,658 mm)
Weight, Nominal	1.8 lbs. / sq. ft. (8.79 k/m ²)
Edges ¹	Tapered
Flexural Strength ¹ , Perpendicular	≥ 107 lbf. (476 N)
Flexural Strength ¹ , Parallel	≥ 36 lbf. (160 N)
Humidified Deflection ¹	≤ 10/8" (31.8 mm)
Nail Pull Resistance ¹	≥ 77 lbf. (343 N)
Hardness ¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)
Bending Radius	10' (3,048 mm)
Product Standard Compliance	ASTM C1396
Fire-Resistance Characteristics	
Core Type	Regular
UL Type Designation	N/A
Combustibility ²	Non-combustible Core
Surface Burning Characteristics ³	Class A
Flame Spread ³	15
Smoke Development ³	0
Applicable Standards and References	
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products	
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board	
ASTM C1396 Standard Specification for Gypsum Board	
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials	
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C	
Gypsum Association, GA-214, <i>Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels</i>	
Gypsum Association, GA-216, <i>Application and Finishing of Gypsum Panel Products</i>	
Gypsum Association, GA-238, <i>Guidelines for Prevention of Mold Growth on Gypsum Board</i>	
National Gypsum Company, <i>NGC Construction Guide</i>	

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

Gold Bond® BRAND Fire-Shield® Gypsum Board

PHYSICAL PROPERTIES			
	1/2" Fire-Shield C Gypsum Board	5/8" Fire-Shield Gypsum Board	5/8" Fire-Shield C Gypsum Board
Thickness¹, Nominal	1/2" (12.7 mm)	5/8" (15.9 mm)	5/8" (15.9 mm)
Width¹, Nominal	4' (1,219 mm)	4' (1,219 mm), 54" (1,372 mm)	4' (1,219 mm), 54" (1,372 mm)
Length^{1,4}, Standard	6' – 16' (1,829 – 4,877 mm)	6' – 16' (1,829 – 4,877 mm)	6' – 16' (1,829 – 4,877 mm)
Weight, Nominal	1.9 lbs. / sq. ft. (9.28 k/m ²)	2.2 lbs. / sq. ft. (10.74 k/m ²)	2.3 lbs. / sq. ft. (11.23 k/m ²)
Edges¹	Tapered or Square	Tapered or Square	Tapered or Square
Flexural Strength¹, Perpendicular	≥ 107 lbf. (476 N)	≥ 147 lbf. (654 N)	≥ 147 lbf. (654 N)
Flexural Strength¹, Parallel	≥ 36 lbf. (160 N)	≥ 46 lbf. (205 N)	≥ 46 lbf. (205 N)
Humidified Deflection¹	≤ 10/8" (31.8 mm)	≤ 5/8" (15.9 mm)	≤ 5/8" (15.9 mm)
Nail Pull Resistance¹	≥ 77 lbf. (343 N)	≥ 87 lbf. (387 N)	≥ 87 lbf. (387 N)
Hardness¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)
Bending Radius	10' (3,048 mm)	15' (4,572 mm)	15' (4,572 mm)
Thermal Resistance⁵	N/A	R = .56	R = .56
Product Standard Compliance	ASTM C1396	ASTM C1396	ASTM C1396
Fire-Resistance Characteristics			
Core Type	Type C	Type X	Type C
UL Type Designation	FSW-C	FSW	FSW-C
Combustibility²	Non-combustible Core	Non-combustible Core	Non-combustible Core
Surface Burning Characteristics³	Class A	Class A	Class A
Flame Spread³	15	15	15
Smoke Development³	0	0	0
Applicable Standards and References			
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products			
ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus			
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board			
ASTM C1396 Standard Specification for Gypsum Board			
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials			
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C			
Gypsum Association, GA-214, <i>Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels</i>			
Gypsum Association, GA-216, <i>Application and Finishing of Gypsum Panel Products</i>			
Gypsum Association, GA-238, <i>Guidelines for Prevention of Mold Growth on Gypsum Board</i>			
National Gypsum Company, <i>NGC Construction Guide</i>			

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

4. Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

5. Tested in accordance with ASTM C518.

Gold Bond® BRAND High Flex® Gypsum Board

PHYSICAL PROPERTIES

	High Flex Gypsum Board
Thickness¹, Nominal	1/4" (6.4 mm)
Width¹, Nominal	4' (1,219 mm)
Length^{1,4}, Standard	8' (2,438 mm)
Weight, Nominal	0.95 lbs. / sq. ft. (4.64 k/m ²)
Edges¹	Slightly Tapered
Flexural Strength¹, Perpendicular	≥ 46 lbf. (205 N)
Flexural Strength¹, Parallel	≥ 16 lbf. (71 N)
Humidified Deflection¹	N/A
Nail Pull Resistance¹	≥ 36 lbf. (160 N)
Hardness¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)
Bending Radius	Refer to chart on page 33.
Thermal Resistance⁵	N/A
Product Standard Compliance	ASTM C1396
Fire-Resistance Characteristics	
Core Type	Regular
UL Type Designation	N/A
Combustibility²	Non-combustible Core
Surface Burning Characteristics³	Class A
Flame Spread³	15
Smoke Development³	0
Applicable Standards and References	
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products	
ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus	
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board	
ASTM C1396 Standard Specification for Gypsum Board	
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials	
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C	
Gypsum Association, GA-214, <i>Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels</i>	
Gypsum Association, GA-216, <i>Application and Finishing of Gypsum Panel Products</i>	
Gypsum Association, GA-238, <i>Guidelines for Prevention of Mold Growth on Gypsum Board</i>	
National Gypsum Company, <i>NGC Construction Guide</i>	

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

4. Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

5. Tested in accordance with ASTM C518.

Gold Bond® BRAND XP® Gypsum Board

PHYSICAL PROPERTIES

	XP Gypsum Board	1/2" XP Fire-Shield C Gypsum Board	5/8" XP Fire-Shield Gypsum Board	5/8" XP Fire-Shield C Gypsum Board
Thickness¹, Nominal	1/2" (12.7 mm)	1/2" (12.7 mm)	5/8" (15.9 mm)	5/8" (15.9 mm)
Width¹, Nominal	4' (1,219 mm)	4' (1,219 mm)	4' (1,219 mm)	4' (1,219 mm)
Length^{1,4}, Standard	8' – 12' (2,438 mm – 3,658 mm)	8' – 12' (2,438 mm – 3,658 mm)	8' – 12' (2,438 mm – 3,658 mm)	8' – 12' (2,438 mm – 3,658 mm)
Weight, Nominal	1.5 – 1.6 lbs. / sq. ft. (7.32 – 7.81 k/m ²)	1.9 lbs. / sq. ft. (9.28 k/m ²)	2.2 lbs. / sq. ft. (10.74 k/m ²)	2.3 lbs. / sq. ft. (11.23 k/m ²)
Edges¹	Tapered or Square	Tapered or Square	Tapered or Square	Tapered or Square
Flexural Strength¹, Perpendicular	≥ 107 lbf. (476 N)	≥ 107 lbf. (476 N)	≥ 147 lbf. (654 N)	≥ 147 lbf. (654 N)
Flexural Strength¹, Parallel	≥ 36 lbf. (160 N)	≥ 36 lbf. (160 N)	≥ 46 lbf. (205 N)	≥ 46 lbf. (205 N)
Humidified Deflection¹	≤ 10/8" (31.8 mm)	≤ 10/8" (31.8 mm)	≤ 5/8" (15.9 mm)	≤ 5/8" (15.9 mm)
Nail Pull Resistance¹	≥ 77 lbf. (343 N)	≥ 77 lbf. (343 N)	≥ 87 lbf. (387 N)	≥ 87 lbf. (387 N)
Hardness¹ – Core, Edges and Ends	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)	≥ 11 lbf. (49 N)
Bending Radius	10' (3,048 mm)	10' (3,048 mm)	15' (4,572 mm)	15' (4,572 mm)
Thermal Resistance⁵	R = .45	R = .45	R = .56	R = .56
Permeance⁶	37 perms	37 perms	37 perms	37 perms
Water Absorption¹ (% of Weight)	< 5%	< 5%	< 5%	< 5%
Mold Resistance⁷, ASTM D3273	Score of 10	Score of 10	Score of 10	Score of 10
Mold Resistance⁸, ASTM G21	Score of 0	Score of 0	Score of 0	Score of 0
Product Standard Compliance	ASTM C1396	ASTM C1396	ASTM C1396	ASTM C1396
Fire-Resistance Characteristics				
Core Type	Regular	Type C	Type X	Type C
UL Type Designation	N/A	FSMR-C	FSW	FSW-C
Combustibility²	Non-combustible Core	Non-combustible Core	Non-combustible Core	Non-combustible Core
Surface Burning Characteristics³	Class A	Class A	Class A	Class A
Flame Spread³	15	15	15	15
Smoke Development³	0	0	0	0
Applicable Standards and References				
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products				
ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus				
ASTM C840 Standard Specification for Application and Finishing of Gypsum Board				
ASTM C1396 Standard Specification for Gypsum Board				
ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber				
ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials				
ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials				
ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C				
ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi				
Gypsum Association, GA-214, Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels				
Gypsum Association, GA-216, Application and Finishing of Gypsum Panel Products				
Gypsum Association, GA-238, Guidelines for Prevention of Mold Growth on Gypsum Board				
National Gypsum Company, NGC Construction Guide				

1. Specified values per ASTM C1396, tested in accordance with ASTM C473.

2. Tested in accordance with ASTM E136.

3. Tested in accordance with ASTM E84.

4. Please consult your local sales representative for all non-standard lengths and widths. Minimum order requirements may apply.

5. Tested in accordance with ASTM C518.

6. Tested in accordance with ASTM E96.

7. Tested in accordance with ASTM D3273.

8. Tested in accordance with ASTM G21.

Installation Guide

Gypsum Board Installation

Installation Recommendations

General

- Install gypsum board in accordance with methods described in ASTM C840 and GA-216.
- Examine and inspect framing materials to which gypsum board is to be applied. Remedy all defects prior to installation of the gypsum board.
- GridMarX® provides quick identification and uniform nail/screw patterns. Use GridMarX to make accurate cuts without drawing lines. GridMarX guide marks run the length of the board at five points in 4 in. (102 mm) increments. Marks run along the edge in both tapers and at 16 in. (406 mm), 24 in. (610 mm) and 32 in. (813 mm) in the field of the board. The marks cover easily with no bleed-through using standard paint products.
- Apply gypsum board first to ceilings at right angles to framing members, then to walls. Use boards of maximum practical length so that the minimum number of end joints occur. Bring board edges into contact with each other but do not force into place.
- Install batt or blanket ceiling insulation BEFORE the gypsum board on ceilings when installing a vapor retarder behind the gypsum board. Install the insulation IMMEDIATELY after the gypsum board when using loose fill insulation. Avoid installation practices that might allow condensation to form behind boards.
- Cut gypsum board to allow for a minimum 1/4 in. (6.4 mm) gap between gypsum board and floor to prevent potential wicking.
- Locate gypsum board joints at openings so that no joint will occur within 12 in. (305 mm) of the edges of the opening unless installing control joints at these locations. Stagger vertical end joints. Joints on opposite sides of a partition should not occur on the same stud.
- Hold gypsum board in firm contact with the framing member while driving fasteners. Fastening should proceed from center portion of the board toward the edges and ends. Set fasteners with heads slightly below the surface of the board. Take care to avoid breaking the face paper of the gypsum board. Remove improperly driven nails or screws.
- Provide minimum 1/4 in. (6.4 mm) clearance between boards and adjacent concrete or masonry to minimize wicking of moisture.
- Maintain a room temperature of not less than 40°F (4°C) during application of gypsum board.
- Maintain a room temperature of not less than 50°F (10°C) when using adhesive to attach the gypsum board and during joint treatment, texturing and decoration, beginning 48 hours prior to application and continuously thereafter until completely dry. Maintain adequate ventilation in the working area during installation and curing period.
- Double nailing is an alternate method of attachment devised to minimize nail pops. This system requires doubling up on the field nails. The total quantity of nails used does not double, however, since maximum nail spacing is increased to 12 in. (305 mm) o.c. and conventional nailing is used on the perimeter. Application is accomplished by first single nailing the field of the board, starting at the center and working toward ends and edges. Another nail is then driven in close proximity (2 in. [50.8 mm] to 2-1/2 in. [63.6 mm]) to each of the first nails. The first series of nails are then struck again to ensure the board is drawn tightly to the framing member.
- When using adhesive to attach gypsum board, apply drywall adhesive to the face of studs or joists in continuous beads. Reference ASTM C840 Section 10.

Curved Surfaces

To apply gypsum board over a curved surface, place a stop at one end of the board and then gently and gradually push on the other end, forcing the center against the framing until the curve is complete. Shorter radii than shown in the accompanying table may be obtained by moistening the face and back papers of the board with water and allowing the water to soak into the core. When the board is dry, it will regain its original hardness.

Apply gypsum board to curved surfaces in accordance with the Gypsum Board Bending Radii chart below.

To achieve tighter bending radii, use Gold Bond® BRAND 1/4 in. High Flex® Gypsum Board.

GYPSUM BOARD BENDING RADII

Gypsum Panel	Bending Lengthwise	Bending Widthwise
1/4" (6.4 mm)	5'0" (1,524 mm)	15'0" (4,572 mm)
3/8" (9.5 mm)	7'6" (2,286 mm)	25'0" (7,620 mm)
1/2" (12.7 mm)	10'0" (3,048 mm)	—

Installation Guide

Finishing

Refer to GA-214, *Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels*, to determine the level of finishing needed to assure a surface properly prepared to accept the desired decoration.

Decoration

Ensure gypsum board surfaces, including finished joints, are clean, dust-free and gloss-free to achieve best painting results. Apply a coat of a quality drywall primer to equalize the porosities between surface paper and joint compound, improving fastener and joint concealment.

Selection of a paint to provide desired finish characteristics is the responsibility of the architect or contractor.

Critical Lighting Areas

Wall and ceiling areas abutting window mullions or skylights, long hallways, and atriums with large surface areas washed with artificial or natural lighting are a few examples of critical lighting areas. Strong side lighting from windows or surface-mounted light fixtures may reveal minor surface imperfections. Light striking the surface obliquely, at a slight angle, exaggerates surface irregularities. If you cannot avoid critical lighting, minimize the effects by skim coating the gypsum board surfaces, by decorating the surface with medium to heavy textures, or by the use of draperies and blinds, which soften shadows. In general, paints with sheen levels other than flat, enamel paints and dark-toned paint finishes highlight surface defects; consider the use of textures to hide these minor visual imperfections.

Limitations

- Avoid exposure to excessive or continuous moisture and extreme temperatures. Do not expose gypsum board to temperatures exceeding 125°F (52°C) for extended periods of time.
- Properly ventilate or condition attic spaces to remove moisture buildup above gypsum board ceilings. If required, a vapor retarder may be installed in exterior ceilings behind gypsum board.
- Avoid installing gypsum board directly over insulation blankets with facer flanges placed continuously across the face of the framing members; recess insulation blankets and attach flanges to the sides of framing.
- Isolate gypsum board from contact with building structure in locations where structural movement may impose direct loads on gypsum board assemblies.
- Provide control joints spaced not more than 30 ft. (9,144 mm) where employing long continuous runs of walls, partitions or ceilings without perimeter relief.
- Avoid gypsum board joints within 12 in. (305 mm) of the corners of window or door frames unless installing control joints at these locations.
- Apply 1/4 in. (6.4 mm) gypsum board only to existing surfaces and do not apply directly to framing members, except when used with other thicknesses in double-layer systems tested for specific purposes. Existing walls and ceilings should be sound, flat, level and without void spaces. Apply 1/4 in. (6.4 mm) thick gypsum board with a combination of nails or screws and adhesive that will bond to the substrate surface covering. Framing spacing should not exceed 24 in. (610 mm) o.c. Apply adhesive to the substrate between framing members to bond the gypsum board.
- All ends and edges of gypsum board should occur over framing members or other solid backing except where treated joints occur at right angles to framing or furring members.
- Apply 1/2 in. (12.7 mm) gypsum board ceilings to be decorated with water-based spray texture perpendicular to the framing, spaced a maximum of 16 in. (406 mm) o.c.
- Space supporting framing for single-layer application of 1/2 in. (12.7 mm) gypsum board a maximum of 24 in. (610 mm) o.c. Space framing for single-layer application of 3/8 in. (9.5 mm) gypsum board a maximum of 16 in. (406 mm) o.c.
- To prevent objectionable sag in gypsum board ceilings, the weight of overlaid unsupported insulation should not exceed the recommendations provided in the Ceiling-Supported Insulation chart below.

CEILING-SUPPORTED INSULATION

	Regular	Regular	Regular	High Strength Ceiling Board
Thickness, Nominal	3/8" (9.5 mm)	1/2" (12.7 mm)	1/2" (12.7 mm)	1/2" (12.7 mm)
Framing Spacing	16" (406 mm) o.c.	16" (406 mm) o.c.	24" (610 mm) o.c.	24" (610 mm) o.c.
Weight of Ceiling – Supported Insulation	None Allowed	2.2 psf (10.7 kg/m ²)	1.6 psf (7.8 kg/m ²)	2.2 psf (10.7 kg/m ²)

Seaspray® BRAND Hi-Strength MVR Ceiling Panels

General Application

Note: If blown-in cellulose insulation is used, take care to follow insulation manufacturer's specifications on addition of water. Excess moisture in this insulation can cause Seaspray® Hi-Strength MVR to sag.

Foam Method: Make sure trusses are 24" o.c. or less. After ceiling trusses are placed on gypsum board, apply foam adhesive per the manufacturer's instructions.

For a finished look, use either a vinyl spline or a flat wood batten over board joints.

Staple Method: Make sure trusses are 24" o.c. or less. Staples are spaced 4" o.c. around the perimeter with the crown 1/4" from and parallel to board edge. Rosette placement should not exceed 24" o.c. in the field of the board. No vapor barrier is needed with Seaspray Hi-Strength MVR Ceiling Panels. Staple panel ends to the sideboards (rails). Lay out rafters (trusses) and nail sideboards to them. Then, staple panel edges to the framing. Staples must be driven flush with the Seaspray Hi-Strength MVR Ceiling Panel surface – either parallel or perpendicular (stitched) to adjoining edges. Drive screws through rosettes into the framing member. Be careful not to overdrive screws as it could result in stripped threads or broken board.

For specific applications and shear values, please refer to section titled "Shear Tests."

Note: Figure No. 1 (right) illustrates how to repair small holes in Seaspray Hi-Strength MVR Panels.

Seaspray Hi-Strength MVR Ceiling Panels, like any other prefinished product, can be scuffed or damaged during handling and installation. Most touch-ups can be avoided with close supervision and constant focus on minimizing damage through correct handling and installation.

In-Plant Procedures To Reduce Damage To Seaspray Hi-Strength MVR Ceiling Panels:

- Use forklift extenders to unload trucks and move Seaspray units into the plant.
- Do not drag one board over another or down the ceiling jig.
- Do not drop one board over another unless both are aligned like pages in a book.
- Care must be taken by plant personnel while bringing items into the home.

Where Seaspray® MVR Touch-Up Is Needed:

- There are two types of Seaspray MVR Touch-Up paint available: aggregate and non-aggregate. Each is tinted to match the board produced at that particular manufacturing plant.
- For best results, keep paint and board manufacturing dates within three months of each other. Stir the touch-up paint thoroughly before use.
- Before use of either paint, look at the damage and decide which paint would work best. If only a small scratch is involved, the non-aggregate paint will work well. If major scrapes or damage is involved, the aggregate paint is normally needed. With textured paint, the foam covered roller (such as Hyde Tools part #30430) or a small brush will apply the paint satisfactorily.

- Best results are achieved by covering only the damaged area. Do not repaint major areas of the panel unless necessary. For very small scratches, use the corner of the foam roller or a small artist's paintbrush. For larger areas, use only as much paint as is needed. If care is taken to only touch-up the affected area, normally it is not necessary to scrape off additional texture around the damaged area. If all texture is gone from an area, two or possibly three light coats will produce the best results. Do not try to apply one heavy coat, as this will be readily visible after drying.

Repair Procedures

Minor Cracks With No Texture

Loss: Using a small brush and brushing perpendicular to the crack, force the coating into the opening. Dabbing the coating with a fingertip is an acceptable alternative.

Minor Scratches With Minimal

Texture Loss: Lightly dab the coating on the scratch with a small brush.

Major Cracks Aligned To The

Linear Texture: Scrape off a nominal 1" wide path of the texture the length of the crack. Fill the crack with a setting compound or a putty-type caulking compound. Allow to dry. Loose board at the

crack may require backing up and refastening to a framing member. Reapply the texture as needed with Seaspray MVR Touch-Up and roller.

Major Cracks Perpendicular

To The Linear Texture: Same as above. You may use a brush if texture loss is not very wide.

Major Texture Loss/Paper And Core Not Damaged:

Reapply the texture to the damaged area using the rubber roller. Roll out the coating in the machine direction to align the new texture in the same direction as the original.

Major Panel Damage/Surface Paper Torn, Exposed Gypsum Core, Holes Through Entire

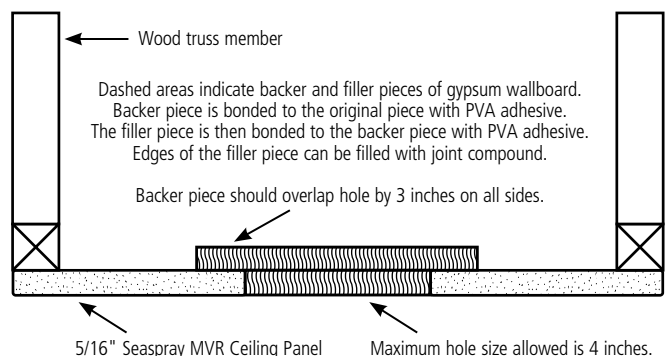
Panel: Fill the area with a setting type compound and smooth the surface with a putty knife. Scrape the texture off the panel in the area immediately around the defect. Allow to set before topcoating with Seaspray MVR Touch-Up paint. Use a roller or a brush as needed. An alternate method is to fill with caulking compound. Allow to dry before coating.

Note: Very deep gouges or holes may require multiple coats of filler to reduce shrinkage or cracking. Allow to dry between coats.

Clean Up

Tools may be cleaned with ordinary tap water. Use a mild soap solution to clean hands, brushes and rollers.

Figure 1.



Patch in Seaspray ceiling assembly when back of ceiling is accessible.

Maximum size of hole to be repaired cannot exceed 4" in diameter. Backing material can be wood or gypsum. It is there to provide a backer to fasten the patch.

Installation Guide

Ready Mix Compounds

Environmental Conditions

Varying weather conditions can impact both the quality and appearance of taped drywall joints. Relative humidity, plus temperature, will affect the working characteristics of all joint compounds.

The potential for finishing and decorating problems are minimized when temperature, humidity and airflow remain constant and as close to occupancy environmental conditions as possible. A minimum temperature of 50°F (10°C) should be maintained continuously for 48 hours prior to and throughout the finishing process until applied materials are thoroughly dry.

For example, cool wet weather will slow down the drying process while hot, dry weather hastens the drying process. Exposure to winds, breezes or drafts while drying can also affect the performance of joint compounds. Typical problems from improper drying can be cracking, excessive shrinkage, ridging and beading, banding or bond failure. A further

explanation of these conditions is outlined in the "Frequently Asked Questions and Solutions" section of this guide.

Proper precautions at the jobsite should always be taken to minimize the adverse effects of weather on drying. These precautions will ultimately reduce the application time and expense from call backs and rework.

Storage

Shelf-life up to 9 months under good storage conditions. See production date code. To prevent spoilage and freezing, maintain temperature at a minimum 50°F (10°C) and protect container from exposure to extreme heat and sunlight.

Frozen Ready Mix. Allow material to thaw at room temperature for at least 24 hours. When thawed, turn the container upside-down for at least 15 minutes. Turn pail right side up, remove lid and immediately remix with an electric drill. Ready Mix should be lump free and ready to use within 1 minute. Discard all Ready Mix that does not remix to a lump-free consistency.

Joint Compound Drying Times

Approximate Drying Times: All Purpose/Lite Ready Mix Joint Compound

Relative Humidity	Temperature						
	32°	40°	50°	60°	70°	80°	100°
0%	38/H	28/H	19/H	13/H	9/H	6/H	3/H
20%	2/D	34/H	23/H	16/H	11/H	8/H	4/H
40%	2.5/D	44/H	29/H	20/H	14/H	10/H	5/H
50%	3/D	2/D	36/H	24/H	17/H	12/H	6/H
60%	3.5/D	2.5/D	42/H	29/H	20/H	13.5/H	8/H
70%	4.5/D	3.5/D	2.25/D	38/H	26/H	19.5/H	10/H
80%	7/D	4.5/D	3.25/D	2.25/D	38/H	27/H	14/H
90%	13/D	9/D	6/D	4.5/D	3/D	49/H	26/H
98%	53/D	37/D	26/D	18/D	12/D	9/D	5/D

Note: D = Days (24 hour period) H = Hours

The chart above is a helpful guide in determining approximate drying times for joint compounds under a variety of humidity/temperature conditions. Shaded area is below the minimum application temperature requirement of 50°F and is not recommended for the application of joint compound.

Note: To ensure best results, only National Gypsum products should be used together in construction systems. Mixing with other brands is not recommended.

All National Gypsum joint compounds are formulated without asbestos and therefore comply with Consumer Product Safety Standards.

Stacking

Ready Mix pails or cartons should not be stacked more than two pallets in height.

Mold And Mildew Growth

ProForm® BRAND XP® Ready Mix with Dust-Tech®

ProForm® BRAND XP® Ready Mix with Dust-Tech® was designed to provide extra protection against mold and mildew compared to standard ready mix compound. When tested by an independent lab per ASTM D3273 ("Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"), XP Ready Mix with Dust-Tech achieved a score of 10, the best possible score for this test.

ProForm XP with Dust-Tech also resists the growth of mold per ASTM G21 ("Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi") with a score of 0, the best possible score.

When tested in a system with ProForm® BRAND Paper Joint Tape, Gold Bond® BRAND XP® Gypsum Board or Gold Bond® BRAND EXP® Interior Extreme® Gypsum Panels, the XP® system achieves a score of "10" for ASTM D3273 and a score of "0" for ASTM G21. These are the best possible mold-resistant scores for these tests.

Planning And Prevention: Mold And Mildew Resistance

Planning and prevention is the most effective way to avert the growth of mold or mildew. Gypsum board and finishing products should be delivered to projects as near to the time it will be used as possible. Gypsum board delivered to a jobsite must be placed under cover immediately, properly protected and not exposed to outside elements, such as rain, snow or other high moisture conditions.

If building materials get wet from any moisture source, that source must first be identified and corrected. If mold or mildew growth occurs, or if you suspect it might occur due to environmental conditions and moisture, a determination must be made to either attempt to dry and clean the affected areas or to replace the affected materials. Care must be taken in this evaluation, and if you do not have the training or experience to recognize and to make proper decisions about repair or removal, you should consult a professional.

No material can be considered "mold proof," nor is it certain that any material will resist mold or mildew indefinitely. When used in conjunction with good design, handling and construction practices, XP Ready Mix with Dust-Tech can provide increased mold resistance versus standard ready mix compounds. As with any building material, avoiding water exposure during handling, storage, installation and after installation is complete is the best way to avoid the formation of mold or mildew.

Setting Compounds

Mixing

Mix no more compound than can be applied in the designated set time. Place the amount of water recommended, (see mixing ratio) on compound packaging in a clean mixing container. Add the compound gradually to clean, drinkable water while stirring. Mix the compound free of lumps with a mechanical mixer or by hand. Allow standing (soak) for 1 minute, and then remix until consistency is smooth and creamy. If a thinner or thicker mix is desired, add water or powder sparingly. Careful not to overmix as it could lead to shortened working times. DO NOT mix with any other joint compounds (wet or dry) and not recommended for use in automatic tools. Prior to application, surface areas should be clean and free of dust and debris.

Estimated Working And Setting Times

One of the most crucial things for selecting the proper ProForm® Quick Set™ Joint Compound is matching its working time and setting time ranges to the project.

It should be noted that working time and setting time are not the same.

Working Time

Working time refers to the period during which the ProForm Quick Set is usable for application. At the end of this time, the material begins to stiffen and can no longer be spread easily. Working time should correspond to the required time for actual application.

Setting Time

Setting time refers to the time after which the applied ProForm Quick Set Compound will become adequately

hardened so that another layer can be applied. For manufactured or modular builders, the setting time should match your timetable for moving a floor along the line.

Limitations

- Do not apply over moist surfaces or surfaces subject to direct moisture.
- Do not mix with any other material. Use only clean, room temperature, drinkable water.
- Mixing equipment and tools must be thoroughly cleaned between batches.
- Each fresh batch of compound must be kept free of previous batches; otherwise the working time will be shortened.
- High-speed mixing or excessive mixing will shorten the working time of the ProForm Quick Set Compounds.
- Do not add water or remix after compound begins to thicken and harden.
- Not recommended for use in automatic taping tools.
- Close opened bag as tight as possible for storage or setting time may be affected.
- Shelf life up to 6 months in high humidity areas and 12 months under good storage conditions. See production date code. To prevent spoilage and freezing, maintain temperature at a minimum 50°F (10°C) and protect container from exposure to extreme heat, sunlight and water.
- The potential for finishing and decorating problems are minimized when temperature, humidity and airflow remain constant and as close to occupancy environmental conditions as possible. A minimum temperature of 50°F

(10°C) should be maintained continuously for 48 hours prior to and throughout the finishing process until applied materials are thoroughly dry.

Frequently Asked Questions

1. Why is the product lumpy after mixing?

- Water was added to the ProForm Quick Set, rather than the compound being added to the water.
- ProForm Quick Set was not allowed to soak (for approximately 1 minute) after initial mix before remixing was initiated.

2. Why is the product setting much faster than the advertised range?

- Dirty mixing water and/or application tools.
- Excessive mixing of the compound.
- Foreign material (accidentally or deliberately) added to the mixture.
- Mixing water too hot.

3. Why is the product setting much slower than the advertised range?

- Too much water was used.
- Impure water source (dissolved organics in the water generally retard the set time).
- Foreign material (accidentally or deliberately) added to the mixture.
- Water too cold.
- Product was remixed after initial stiffening began.

4. Why does the product display weak strength?

- Too much water was used.
- Foreign material (accidentally or deliberately) added to the mixture.

Joint And Corner Finishing Application

1. ProForm BRAND Quick Set compounds should be mixed in accordance with the printed instructions on the package.
2. A uniformly thin layer of joint compound should be applied over the joint approximately 4" wide. Tape should be centered over the joint and embedded into the

compound leaving sufficient joint compound under the tape for proper bond. Ceiling and wall angles plus all inside corner angles should be reinforced with tape folded to conform to angles and embedded into the compound.

3. After compound is thoroughly dry or hard (approximately 24 hours for Regular compound or 2 hours for Quick Set), joint tape should be covered with a coat of joint or topping compound. The compound should be spread over the tape approximately 3" on each side and feathered out at edges. After thoroughly dry, another coat of joint or topping compound should be applied with a slight uniform crown over the joint. This coat should be smoothed and feathered approximately 3" beyond the preceding coat.

4. All inside corners should be coated with at least one coat of joint or topping compound and the edges feathered out.

5. All nail or screw head dimples should receive three coats. This may be applied along with each joint coat.

6. Flanges of gypsum board cornerbead should be concealed by at least two coats of compound. The second coat should be feathered out approximately 9" on both sides of the exposed metal nose.

7. For joint and corner treatment with Quick Set Compound, fill joint and bed tape simultaneously. After Quick Set Compound has hardened, apply any ProForm Joint Compound.

8. For wet sanding, allow each application of compound to dry or harden. If dry sanding is performed, ventilate work area and/or use a NIOSH/MSHA-approved respirator. Safety glasses are also recommended. Caution should be used to avoid roughing the wallboard paper. All gypsum board and treated areas should be smooth and ready for decoration.

APPROXIMATE WORKING TIME VS. SET/HARDENING TIME

Quick Set/ Quick Set Lite	Working Time (Minutes)	Set/Hardening Time (Minutes)
5	3–5	10–20
20	15–20	20–40
45	35–45	45–70
90	70–90	90–125
210	180–210	210–280

Installation Guide

Spray Textures

Recommended Application Practices

Gypsum Board:

Surfaces, including joint-treated areas, must be smooth, clean and dry. First apply a coat of sealing primer. Allow primer to dry thoroughly, and maintain adequate drying conditions after application. Primer is to minimize sagging of gypsum board and discoloration or difference in sheen on ceiling surface. Add dry texture to water. Use a piston pump or Mono-type pump with a texture gun. Minimum 3/4" I.D. material hose. A hopper-type gun with adequate air supply is also suitable. Typical coverage is 8-10 sq. ft. per lb. for aggregated and 10-30 sq. ft. per lb. for nonaggregated textures. Mask appropriate areas before spraying and promptly remove overspray from unprotected surfaces afterward. Follow the instructions of the spray equipment manufacturer for adjusting controls and cleaning.

If a second coat is desired, allow the first coat to dry thoroughly.

Note: Gypsum board ceiling surfaces to be decorated with water-thinned spray texture shall be 1/2" or 5/8" thick and applied perpendicular to the framing. Framing shall not exceed 16" o.c. for Gold Bond® BRAND 1/2" Regular Gypsum Board and 24" o.c. for 1/2" High Strength Ceiling Board and Gold Bond® BRAND 5/8" Gypsum Board.

Concrete:

Allow concrete to cure for at least 28 days. Clip protruding wire ends and spot with rust-inhibitive primer. Remove all form oil, grease and dirt, or any loose or water-soluble material. Grind down any form ridges, and level any remaining unevenness with ProForm® BRAND Quick Set™ Joint Compound. Apply a coat of alkali-resistant sealing primer over the entire surface to be textured.

Materials Estimating And Coverage

INSTALLATION MATERIALS								
Sq Ft of Wall/Ceiling	Gypsum Board Size			All Purpose/Lite Blue	Joint Tape/ft	Quick Set/lb	Nails/ct	Screws/ct
	4'x8'	4'x10'	4'x12'					
100	4	3	3	12-14 lbs/1.0 gal	35	6	168	90
200	7	5	5	25-28 lbs/1.8 gal	70	11	294	150
300	10	8	7	37-42 lbs/2.7 gal	105	17	420	240
400	13	10	9	49-56 lbs/3.6 gal	140	22	546	300
500	16	13	11	62-70 lbs/4.5 gal	175	28	672	390
600	19	15	13	73-84 lbs/5.4 gal	210	33	798	456
700	22	18	15	86-98 lbs/6.3 gal	245	39	924	528
800	25	20	17	98-112 lbs/7.2 gal	280	44	1050	600
900	29	23	19	110-126 lbs/8.1 gal	315	50	1218	696
1000	32	25	21	123-140 lbs/9.0 gal	350	55	1344	768
1100	35	28	23	135-154 lbs/9.9 gal	385	61	1470	840
1200	38	30	25	148-168 lbs/10.8 gal	420	66	1596	912
1300	41	33	28	160-182 lbs/11.7 gal	455	72	1722	984
1400	44	35	30	172-196 lbs/12.6 gal	490	77	1848	1056
1500	47	38	32	184-210 lbs/13.5 gal	525	83	1974	1128

FINISHING MATERIALS					
	All Purpose/Lite Blue	Quick Set	Perfect Spray	Wall And Ceiling Spray	Joint Tape
Quantity per 1,000 sq ft of Gypsum Board	123-140 lbs/9.0 gal	55 lbs	120 lbs	50-100 lbs	350 ft

Five Levels Of Finish For Gypsum Board

Level 0

Typically specified in temporary construction or whenever the final decoration has not been determined.

No taping, finishing or accessories required.

Level 1

Typically specified joint treatment in smoke barrier applications and areas not normally open to public view, such as plenum areas above ceilings, attics, and other areas where the assembly would generally be concealed.

All joints and interior angles shall have tape embedded in joint compound. Excess joint compound, tool marks and ridges are acceptable.

Accessories are optional unless specified in the project documents.

Level 2

Typically specified where gypsum panel products are used as a substrate for tile; may be used in garages, warehouse storage or other similar areas where surface appearance is not a concern.

All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife, leaving a thin coating of joint compound over all joints and interior angles. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.

Fastener heads and accessories shall be covered with one (1) coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

Level 3

Typically specified in appearance areas which are to receive heavy- or medium-texture finishes (spray or hand applied) before final painting, or where heavy-duty/commercial-grade wallcoverings are to be applied as the final decoration. The design professional shall specify the mock-up procedure and mock-up construction details within the project documents. This level of finish is not recommended for smooth wall designs or applications where light textures, non-continuous textures or light-weight wallcoverings are applied.

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife, leaving a thin coating of joint compound over all joints and interior angles. One (1) separate coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two (2) separate coats of joint compound. The surface shall be smooth and free of tool marks and ridges.

Jobsite mock-up(s) shall be used to determine acceptance of the finish within the building.

Note: It is recommended that the final decoration specification (e.g., painting specification) include the application of a priming material prior to the decoration.

Level 4

Typically specified in appearance areas where smooth wall designs are decorated with flat paints, light textures, non-continuous textures or wallcoverings are to be applied. The design professional shall specify the mock-up procedure and mock-up construction details within the project documents. This level of finish is not recommended where non-flat or dark/deep tone paints are applied.

In critical lighting areas, flat paints applied over light continuous textures tend to reduce joint photographing.



①

No taping, finishing or accessories required.

①

All joints and interior angles have tape set in compound.

②

Thin coating of compound over all joints and interior angles.

③

Additional coating of compound over joints and interior angles. Smooth and free of tool marks and ridges.

④

Another coating of compound over flat joints, smooth and free of tool marks or ridges.

⑤

Skim coat applied over entire surface. Surface smooth and free of tool marks or ridges.

Installation Guide

The weight, texture and sheen of wallcoverings applied over this level of finish should be carefully evaluated. Joints and fasteners must be adequately concealed if the wallcovering used is of lightweight construction, contains limited pattern, has a sheen level other than flat, or any combination thereof. Unbacked vinyl wallcoverings are not recommended over this level of finish.

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife, leaving a thin coating of joint compound over all joints and interior angles. Two (2) separate coats of joint compound shall be applied over all flat joints and one (1) separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. The surface shall be smooth and free of tool marks and ridges.

Where glass mat and/or fiber-reinforced gypsum panels are installed, refer to the gypsum panel manufacturer for specific finishing recommendations.

Jobsite mock-up(s) shall be used to determine the acceptance of the finish within the building.

Note: It is recommended that the final decoration specification (e.g., painting specification) include the application of a priming material prior to the decoration.

Level 5

Typically specified in appearance areas where smooth wall designs are decorated with non-flat paints (i.e., sheen/gloss) or other glossy decorative finishes, dark/deep tone paints are applied, or critical lighting conditions occur. The design professional shall specify the mock-up procedure and mock-up construction details within the project documents. This level of finish is the most effective method to provide a uniform surface and minimize the possibility of joint photographing and/or fasteners showing through the final decoration.

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife, leaving a thin consistent coating of joint compound over all joints and interior angles. Two (2) separate coats of joint compound shall be applied over all flat joints and one (1) separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. A thin skim coat of joint compound (see "Skim Coat" in Comments) or a material manufactured especially for this purpose shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

Where glass mat and/or fiber-reinforced gypsum panels are installed, refer to the gypsum panel manufacturer for specific finishing recommendations.

Jobsite mock-up(s) shall be used to determine acceptance of the finish within the building.

Note: It is recommended that the final decoration specification (e.g., painting specification) include the application of a priming material prior to the decoration.

For more information, refer to the Gypsum Association document, GA-214.



PermaBase® Installation

An ideal substrate for interior applications, such as:

- Shower and tub enclosures
- Garden/whirlpool tubs
- Countertops
- Backsplashes
- Steamrooms and saunas
- Swimming pool and whirlpool decks and enclosures
- Floor underlayment
 - Entryways
 - Kitchens
 - Bathrooms
 - Foyers
 - Laundry rooms

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 loads. Framing members should be spaced a maximum of 16" o.c.

Cut or score PermaBase® on printed side of panel. Use a straightedge and pencil to mark line. Use utility knife to score/cut the glass mesh. Snap the board and cut through the now visible glass mesh on the other side. Install tile and tile setting materials in accordance with current ANSI specifications and Tile Council of North America (TCNA) guidelines.

Control Joints: For interior installations, allow a maximum of 30 lineal feet between control joints. 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: Edges 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 and fastener heads. Studs above a shower floor should either be notched or furred to accommodate the thickness of the waterproof membrane or pan. The surround opening for a tub or precast shower receptor should not be more than 1/4" longer than unit to be installed.

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.

PermaBase Cement Board: Apply PermaBase with ends and edges closely butted but not forced together. Stagger ends 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. Ensure PermaBase is tight to framing.

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, approx. 1/16" thick coat of bonding material over entire joint. For all joints, immediately embed 2" alkali-resistant fiberglass mesh tape fully into applied bonding material and allow it to cure. For outside corners, 4" wide mesh tape is recommended. Same bonding material should be applied to corners, control joints, trims and other accessories. Feather bonding material over fasteners to fully conceal.

Floors And Counters

Subfloor Or Base: For flooring applications with 16" o.c. floor joists, 5/8" tongue and groove exterior grade plywood or 3/4" tongue and groove exterior grade OSB may be used. For 19.2" o.c. and 24" o.c. floor joists, 3/4" tongue and groove exterior grade plywood or OSB must be used. Tile size for floors with 24" o.c. floor joists must be 12" x 12" or larger. The joist and subfloor assembly must meet L/360 as well as the appropriate code tables for live and dead loads.

Underlayment: Using a 1/4" square-notched trowel, apply a setting bed of polymer-modified mortar (or thin-set mortar) to the subfloor or counter base. Immediately laminate PermaBase® to subfloor or base leaving a 1/8" space between boards at all joints and corners. Leave a 1/4" gap along walls. Stagger all joints so that they do not line up with underlying substrate joints. Fasten PermaBase 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 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, immediately embed 2" 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 to cure.

Limitations

- Joints should be treated with alkali-resistant fiberglass mesh tape set in a polymer-modified mortar.
- Conventional paper drywall tape, joint compound and drywall nails or screws should not be used.
- Maximum wall framing spacing should not exceed 16" o.c. and must be designed to limit deflection to L/360 under all live and dead loads.
- Steel framing must be 20 gauge (galvanized) or heavier – 16" o.c.
- 1/4" PermaBase® and 1/4" UltraBacker should not be used on walls or ceilings.
- PermaBase is not a water barrier. Consult local building code for moisture barrier requirements.
- Not recommended for use with vinyl flooring.
- For exterior and interior finishes applied directly to PermaBase, reinforcing mesh must be embedded in basecoat. Consult finish manufacturer for additional requirements.
- PermaBase should not be exposed to temperatures over 220°F (105°C).
- PermaBase is not a nailing base for other finishes.

Installation Guide

Divider Wall Installation



1. PermaBase Cement Board
2. Membrane
3. Latex-Portland Cement Mortar
4. Alkali-Resistant Mesh Tape

Shower Installation



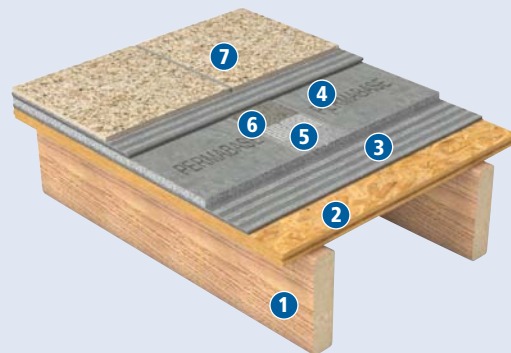
1. Support Framing
1/4" / 12" slope toward drain
2. Plywood, Min. 1/2"
3. PermaBase Cement Board
4. Membrane
5. Latex-Portland Cement Mortar
6. Alkali-Resistant Mesh Tape
7. Sealant
8. Tile and Grout

Countertop Installation



1. Plywood
2. Latex-Portland Cement Mortar
3. PermaBase Cement Board
4. Fiberglass Mesh Tape (Alkali-Resistant)
Embedded in Mortar
5. Latex-Portland Cement Mortar
6. Tile and Grout

Floor Underlayment



1. I-Joists
2. Plywood
3. Latex-Portland Cement Mortar
4. PermaBase Cement Board
5. Fiberglass Mesh Tape (Alkali-Resistant)
6. Latex-Portland Cement Mortar
7. Tile

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.

Conditions	Probable Cause	Preventive Action	Corrective Action
Gypsum Board Problems			
Wavy board	Improper storage/slow stock rotation (less than 3 months).	Be sure gypsum board is stored indoors, and kept dry. Risers must be spaced properly, and be vertically aligned.	If using foam adhesive application, store the gypsum on a flat surface, possibly on long length wood pallets. Keep on this surface for several days prior to using. If a mechanical attachment is used, simply decrease fastener spacing to "pull" gypsum to rafters, thereby flattening gypsum board.
Uneven joints	Debris on the ceiling jig. Unlevel ceiling jig. Wavy board.	Keep ceiling jig clean and free of debris. Re-level and resurface as needed.	Store board properly. Tape joints on the back side to minimize foam adhesive leaking through to the ceiling jig.
Foam adhesive leakage between gypsum boards	Warped rafters, or rafters with excess camber. Unlevel or unclean ceiling jig.	Apply 3/4" masking tape over joints on back side of board prior to laying rafters on them. "Stitch stapling" of joints on back side helps to keep boards in position while rafters are positioned. Check rafters regularly – bottom chords should be flat and straight, with the least camber possible.	Clean leakage off front of board, taking extra care not to damage paint/texture finish when using Seaspray MVR.
Wet board	Poor storage area that is not protected from weather.	Store gypsum board in covered, dry area.	Gypsum board may be used if it is only damp, and is allowed to dry completely. If board exhibits any of the following qualities, do not use it: board is wet with stains on face; mildew is present; gypsum core is separating from paper.
Gypsum core fracture	Rough handling. Dropped board on its edge, or dropping one board across another.	Do not allow board to be dropped on ceiling jig. Lay out panels with care. Avoid walking on back of board while on ceiling jig unless jig has a solid, flat surface.	Cracks less than 12" in length can be finished with joint compound. Small Seaspray Hi-Strength MVR cracks can be filled with DAP tub and tile caulk and covered with touch-up paint. Cracks greater than 12" in board should result in board replacement.
Cracks in field of board created during ceiling movement in plant	Ceiling hoists not picking up tops uniformly. Inadequate support of top. Excess flexing due to lightweight side or edge rail. Inadequate or incorrectly positioned splice blocks.	Provide an adequate number of pick-up points in the hoist. Synchronize hoist motors. Use 2"x3" or 2"x4" instead of 1"x3" or 1"x4" for side or edge rail. Splice blocks should not be positioned at the same place on opposite sides of the top, or at the transition areas between vaulted and flat ceilings.	Small cracks (less than 12" in length) can be finished with joint compound. Small Seaspray Hi-Strength MVR cracks can be filled with DAP tub and tile caulk and covered with touch-up paint. Large cracks (greater than 12") in board should result in board replacement.

Frequently Asked Questions And Solutions

Conditions	Probable Cause	Preventive Action	Corrective Action
Gypsum Board Problems (cont.)			
Seaspray texture “skips” (no paint/texture in areas of the board)	Manufacturing defect.	Immediately notify National Gypsum, or its distributor. It will be necessary to communicate the manufacturing code (on the back of the board), and save a sample showing the problem.	If ceiling is already up, use touch-up paint on all spots. If areas requiring touch-up are excessive, it may be necessary to paint entire ceiling. If problem is noticed prior to laying board on jig, do not use.
Seaspray texture appears “scuffed” or nonexistent on areas of board (board is totally covered with paint, but texture is not evident in areas)	Rough handling of board. Dragging face of Seaspray Hi-Strength MVR across ceiling jig.	Handle board carefully when laying out on ceiling jig.	Use Seaspray MVR touch-up paint on affected areas.
Seaspray touch-up paint not matching board finish	Old touch-up inventory. Paint is not properly mixed.	Turn inventory – if paint is older than 3 months, it should not be sold. Prior to use, shake and stir paint thoroughly to mix pigment.	Mix paint thoroughly. If it does not match, contact local distributor or National Gypsum immediately for fresh paint.
Sag	Failure to prime prior to texturing allowing board to absorb excess moisture. Excess insulation weight. Condensation in roof cavity.	Prime ceiling prior to texturing. Use a HUD-approved vapor barrier. Support insulation weight independent of gypsum. Use framing 16" o.c., or 1/2" High Strength Ceiling Board where 24" o.c. rafter spacing is desired.	Replace ceiling board and employ preventive actions.
Sag	The addition of excessive water to blown-in cellulose insulation.	Care must be taken to follow the insulation manufacturer’s specifications on addition of water.	Replace ceiling board and employ preventive actions.
Joint Problems			
Tape Photographing	Slow drying of finishing coats. Too much compound under tape. Joint compound too thin.	Correct drying conditions. Embed tape properly. Use joint compound thicker. Use ProForm® BRAND Joint Tape.	Sand down the tape outline and seal. Refloat if necessary before decoration. Prevent finish coat moisture from re-wetting the tape by applying a thinner coat for fast drying.
Starved Joint	Compound applied too thin in viscosity and thickness. Too little compound over joint. Excessive sanding.	Use finishing compound at heavier viscosity and proper thickness of coats. Do not over-sand.	Allow to thoroughly dry, then apply an additional coat of topping or joint compound.
High Joint	Excess joint compound under the tape. Excess joint compound over the tape and improper feathering. Poor framing. Improper gypsum board application. Improper sanding. Use of compound too heavy.	Proper thickness of compounds for taping and finishing. Feather finishing coats wider than previous coats. Correct poor framing and improper gypsum board application to ensure proper alignment. Sand properly.	Sand joint to near flush without sanding into tape. Apply a wider finishing coat properly feathered, if necessary. Apply a second finishing coat or skim coat.
Beading/Ridging	Lumber expansion and contraction. Improper heating and ventilation. Cold weather with high humidity. Improper application of gypsum board. Excess compound over joints and needless wide joints. Rough or poorly cut butt joint.	Use ProForm® BRAND Quick Set™ Setting Compound to minimize beading or ridging. Alternatives include: double-layer lamination system.	Allow one full heating cycle – six months to one year – before repairing, then sand ridge flush and apply one or more finishing coats of joint or topping compound. Use critical lighting to determine if bead is eliminated prior to decoration.

Conditions	Probable Cause	Preventive Action	Corrective Action
Nail Problems			
Nail Pops	Framing out of alignment. Lumber shrinkage. Improper gypsum board application. Improper heating and ventilation.	Provide heat and ventilation to dry framing lumber. Align framing lumber. Nail center of gypsum board first. Hold gypsum board firm to nailing member when nailing. Use proper nails. Check all nails before nail spotting. Systems recommended to reduce or eliminate nail pops include: double-layer lamination, double nailing system, floating angle system, adhesive nail-on system and screw application.	When nail pops occur before decoration, repair immediately. If problem occurs after decoration, repair after framing lumber is dry (usually one heating cycle). To repair, drive a GWB-54 nail 1-1/2" from each side of popped nail while holding gypsum board firm to the nailing member. Countersink popped nail, remove loose joint compound, then apply finishing coats of joint or topping compound.
Depressed Nails	Framing out of alignment. Lumber expansion due to moisture absorption. Improper Gypsum Board application. Too few nails, improper furring, structural movement. Nails dimpled too deeply.	Align framing lumber. Allow dry lumber to become acclimated. Correct gypsum board application as described for nail pops. Use proper nail spacing. When furring, use no less than 2x2. Use systems recommended to reduce or eliminate nail pops. Avoid fracturing paper when driving nails.	Repair as described for nail pops, unless most nails are depressed and gypsum board is loose (usually ceilings). Re-nail entire surface using proper spacing. Dimple depressed nails and apply finishing coats of joint or topping compound.
Texturing Problems			
Lumping	Too much water added to initial mix. Adding water to powder.	Add powder to water using less water than initially specified. After mix is smooth and lump-free, add remaining water to adjust mix to a workable viscosity.	Add powder until mix thickens. Continue mixing until lumps disappear.
Mix Too Thin	Too much water added in initial mix or inadequate soaking time in cold water.	Use recommended water requirements in initial mix. Allow mixed ingredients to soak for several minutes, when necessary, if using cold water.	Add powder until mix thickens.
Aggregate Fallout (During Spraying)	Spray gun too close to surface and/or excessive air pressure at nozzle.	Hold spray gun at proper distance and angle from surface to prevent aggregate fallout.	Lower air pressure. Hold spray gun at proper distance and angle from surface to prevent excessive fallout.
Aggregate Floatout	Too much water added during initial mix and/or inadequate mixing after initial water is added.	Use recommended water requirements and make sure water is properly blended into mix.	Add powder until mix thickens.
Poor Coverage	Mix too thick for proper spray viscosity and/or improper application such as spraying too slow, overloading surface with spray material and using incorrect spray pressures.	Use recommended water volume for mixing to ensure sprayable viscosity. Use proper spray application to ensure uniform dispersion of aggregate and proper coverage.	Carefully add water to mix. Use proper spray techniques. Adjust spray pressure.
Poor Hide	Over-thinned mix causing a reduction in both wet and dry hide. Mix too thick causing poor atomization resulting in surface show-through. Improper application/over-extending spray. Selecting improper spray pressures. No primer used prior to texturing.	Use recommended water volume for mixing to ensure sprayable viscosity. Use proper spray application to ensure uniform dispersion of aggregate and proper coverage. Use a good quality drywall primer.	Add powder or water depending on mix consistency. Adjust spray pressure. Use proper spray technique. Apply finished paint over textured surface.

Frequently Asked Questions And Solutions

Conditions	Probable Cause	Preventive Action	Corrective Action
Texturing Problems (cont.)			
Poor Bond Or Hardness	Over-thinned mix results in over-dilution of latex binder in spray texture. Improper surface preparation. Contamination with other materials.	Use recommended water volume for mixing. Remove all loose material, dust, grease, oil and prime surface with a quality drywall primer. Do not intermix with other products. Always use a clean mixing container and clean water.	Scrape down surface and repeat application following recommendations under "Preventive Action."
Clogged Spray Equipment	Contamination of mix with oversized particles can sometimes clog spray nozzle orifice.	Prevent contamination during mixing and spraying. Use correct nozzle size for aggregate being sprayed.	Check mix for contamination and/or oversized particles. If contaminated, screen out contaminants or discard and remix new batch.
Material Pumping Problems	Mixed spray material too heavy. Pump equipment old and worn. Equipment improper size for spray product.	Use recommended water volume for mixing. Make sure proper equipment is being used and that spray machine is in good repair.	Thin mix if too heavy for pumping.
Unsatisfactory Spray Pattern	Worn spray equipment (either fluid or spray nozzle) and/or improper air pressure. Improper spray technique and/or poor spray mix consistency.	Inspect spray nozzles to ensure good working condition. Replace any worn parts.	Improve spraying technique. Add recommended water volume to ensure proper spraying consistency.
Texture Buildup	Spraying or texturing over surfaces with major differences in surface porosity or suction (improperly primed). Thin texture will tend to build up over high suction surfaces.	Prime entire surface with a good quality drywall primer. Follow mixing instructions.	Remove all texture from sprayed surface and re-apply following instructions under "Preventive Action."
Joint Show-Through	Over-extended and over-thinned primer won't adequately hide the contrast between finished joints and gypsum board paper.	Use recommended water volume when mixing texture and apply at recommended coverage rates. Prime surface with a good quality drywall primer prior to application of spray texture.	Allow spray to thoroughly dry, then prime with a quality drywall primer and re-spray or paint textured surface.
Joint Shows Through As White Band	Spraying over unprimed surfaces during cool, humid, slow drying conditions. Joint stays white, water solubles in gypsum board paper bleed through.	Prime surface with a good quality drywall primer before applying texture.	Allow spray to thoroughly dry, then paint textured surface.

Conditions	Probable Cause	Preventive Action	Corrective Action
Shrinkage Problems			
Shrinkage	Compound used too thin or watery. Applied too soon after mixing. Improper drying between coats. Painting before joints are thoroughly dry. Too deep fills in one coat. Slow drying.	Use compound at heaviest workable consistency. Allow to stand before using. Allow thorough drying of compound between coats and prior to painting. Apply additional coats on deep fills. Provide proper drying.	Allow to thoroughly dry and re-coat. Provide proper drying.
Delayed Shrinkage	Improper drying conditions. Painting before compound and gypsum board are thoroughly dry. Under high humidity, slow drying conditions, joints and gypsum board may hold moisture for weeks.	Provide proper drying conditions. Allow complete drying before each coat of joint treatment and before repainting.	Allow to thoroughly dry and re-coat affected joints.
Misinterpreted Shrinkage	Improper gypsum board application, including: nails dimpled too deep, fractured core of gypsum board, fractured face paper, corner bead applied improperly, tape photographing.	Less dimple of nails. Press gypsum board snug to nailing member before dimpling nail. Use Gold Bond® BRAND Gypsum Board. Re-nail where necessary. Use ProForm® BRAND Quick Set™ Compound for at least the first coat on nails and corner bead. (See Tape Photographing.)	Nails: re-nail where necessary. Cut out any loose areas and fill with two or more coats of ProForm® BRAND Quick Set™ or regular joint compound. Re-coat corner bead.
Miscellaneous Problems			
Pock Marking	Entrapment of air in the mixed compound and in application. Over-mixing of compound. Compound mixed too thin. Heavy fills. Improper application technique. Compound applied too loosely.	Mix compound as quickly as possible and let stand until binder is in solution before remixing. Mechanical mixers should have 500 RPM maximum. Use heavier mix. Make additional passes over joints and bead with hand or mechanical tools. File trowel edges square regularly to avoid entrapment in application. Apply compound thinly and use more pressure on finish coat.	Remove sanding dust that may collect in "pocks" prior to painting and refloat joint as necessary. When condition exists after painting, float with compound and repaint.

LIMITED WARRANTY AND REMEDIES

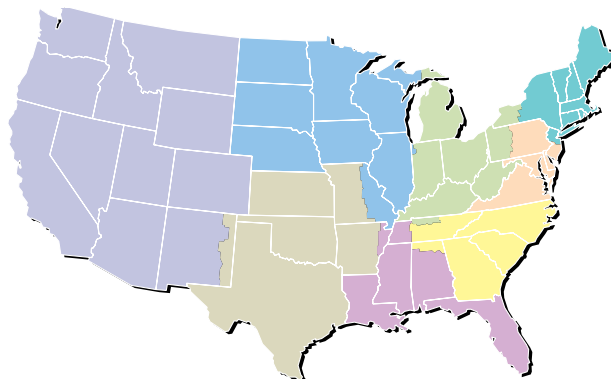
Products manufactured and sold by National Gypsum Company are warranted by National Gypsum Company to its customers to be free from defects in the materials and workmanship at the time of shipment. This express warranty is the only warranty applicable to such products and is in lieu of and excludes all 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 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 Company's option, to a payment or credit not greater than the original purchase price of the products.

National Gypsum Company will not be liable for products claimed to be defective where the defect resulted from causes not within National Gypsum Company'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 Company within thirty (30) days from the date the customer discovered or should have discovered the defect or nonconformance. No legal action or proceeding complaining of goods sold by National Gypsum Company 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.

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

Factory Built Housing

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



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

Corporate Headquarters

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
Phone: (704) 365-7300
Web: nationalgypsum.com

Technical Information

Phone: (800) NATIONAL
(800) 628-4662
Fax: (800) FAX-NGC1
(800) 329-6421

National 
Gypsum®