Technical Summary

GreenGlass® tile backer, a fiberglass-faced gypsum board, is a strong, water-resistant substrate for the application of tile in high-moisture, high-humidity commercial and residential environments. Superior for walls, ceilings, shower and tub enclosures, countertops and light flooring, GreenGlass tile backer features a built-in moisture-blocking coating over naturally mold- and moisture-resistant fiberglass facers laminated to a specially formulated water-resistant core that includes our TemShield® Mold Protection System. Available in three thicknesses, our 5/8" panel is classified for use anywhere Type X board is generically specified.

INSTALLATION RECOMMENDATIONS:

Applicable Standards and References:

- Product Standards: ASTM C1178 and applicable ASTM C1658, ASTM C1396 requirements as referenced in the IRC and IBC as a code-compliant, fiberglass-faced gypsum substrate for use as a tile backer.
- Installation Standards: GA-216, ASTM C840.
- Tile Council of North America's TCA Handbook for Ceramic Tile Installation.
- ANSI's American National Standard Specifications for the Installation of Ceramic Tile, ANSI A 108.4 or ANSI A 108.5.
- Passed tile bonding tests to standards ASTM C482 and ANSI A 137.1 as required by the Uniform Building Code.

Cutting:

GreenGlass can be cut to size with a standard utility knife. Working from the gray face side, score the board first then snap it on the score line. GreenGlass cuts cleanly and produces less dust than typical cement and fiber cement backer boards. See handling instructions under the *Product Handling and Hygiene Requirements* section.

TYPICAL APPLICATIONS:

Available in 1/4" (6.4 mm), 1/2" (12.7 mm) and 5/8" (15.9 mm) thicknesses, GreenGlass tile backer is approved for use in a variety of applications where it provides excellent dimensional stability and strength.

Bathtub and Shower Walls/Ceilings:

When used as a tile substrate, GreenGlass panels should always be installed so that the tile can be applied to its gray facer. **(FIG. 1)** Cut each panel to size, make any necessary openings for plumbing and electrical, then apply boards so that no gaps are left between panels.

For walls: Minimum 20-gauge (30 mils) steel or 2" (51 mm) x 4" (102 mm) wood framing spaced:

- 16" (406 mm) o.c. without blocking for 1/2" (12.7 mm)
- 24" (610 mm) o.c. with blocking at all joints for 1/2" (12.7 mm)
- 24" (610 mm) o.c. for 5/8" (15.9 mm)
- May be installed either vertically or horizontally
- Furring strips may be applied to the framing members to compensate for the tub flange so tile backer can overlap the tub flange without creating an uneven surface for tile application

For ceilings: Minimum 20-gauge (30 mils) steel or wood framing spaced:

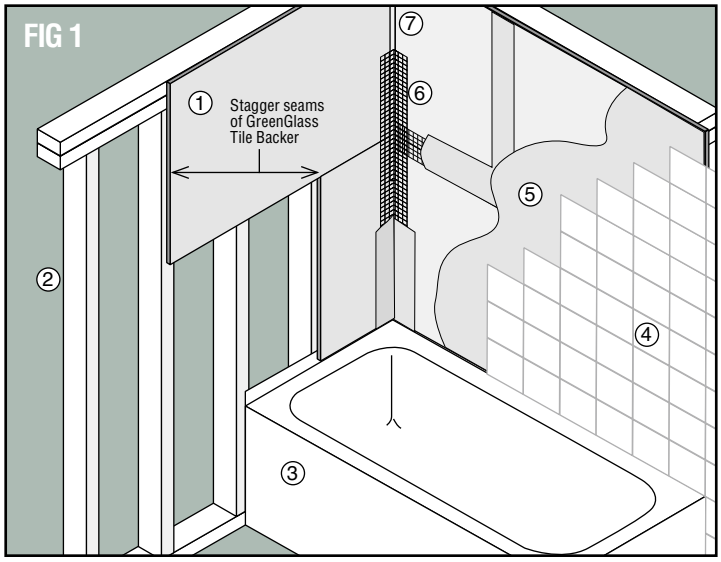
- 12" (305 mm) o.c. for 1/2" (12.7 mm)
- 16" (406 mm) o.c. for 5/8" (15.9 mm)
- Panels should be applied perpendicular to framing

Fastener spacing: Apply every 6" (152 mm) o.c. for both wood and metal framing. Fasteners should be driven flush with backer surface and not countersunk. Refer to fastener chart on next page for best selection.

Joint treatment: Leave a minimum 1/8" (3 mm) gap in all corners (including wall/ceiling joint) and fill with flexible sealant. Press self-adhesive 2" (51 mm)-wide fiberglass mesh tape into sealant at corners. Apply the same self-adhesive tape to all other joints, then bed corners and joints with tile-setting adhesive.

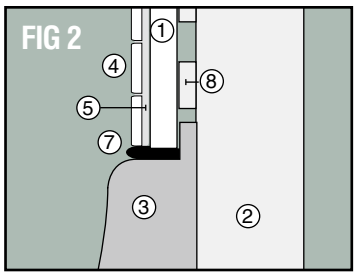
Fill the joint between the tub edge and the bottom of the tile and backer board with a flexible sealant to keep water from penetrating the wall cavity. **(FIG. 2)**

FIG 1



1. GreenGlass Tile Backer
2. Wood / Metal Framing
3. Bathtub
4. Tile
5. Tile Adhesive
6. Fiberglass Mesh Tape
7. Flexible Sealant
8. Firring Strip

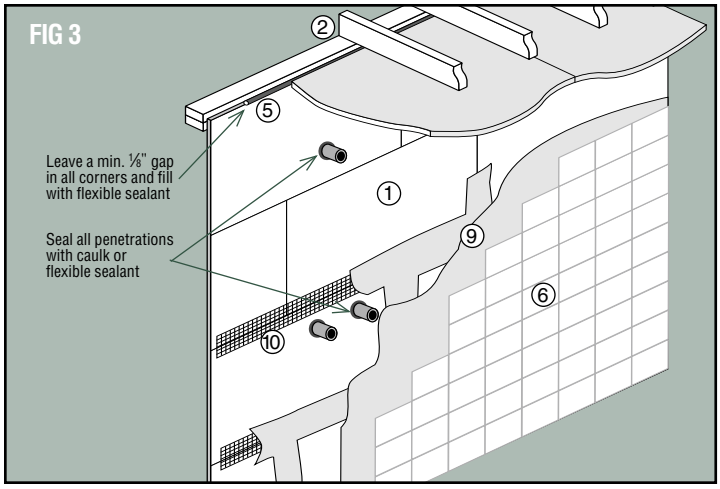
FIG 2



TYPICAL PROPERTIES			
	1/4"	1/2"	5/8"*
Width	48"	48"	48"
Length[1]	8', 10'	8', 10'	8', 10'
Edge	Square	Square	Square
Weight (lbs./sq. ft.)	1.4	1.85	2.3
Textured Face Surface	Acrylic	Acrylic	Acrylic
Water Absorption	≤ 5%	≤ 5%	≤ 5%
Combustibility	Non-combustible	Non-combustible	Non-combustible
Standard Specification	ASTM C1178 ASTM C1658 ASTM C1396	ASTM C1178 ASTM C1658 ASTM C1396	ASTM C1178 ASTM C1658 ASTM C1396

*5/8" complies with UL designs and requirements for Type X products.
[1]Other lengths available. Ask your Temple-Inland representative.

FIG 3



1. GreenGlass Tile Backer
2. Wood / Metal Framing
3. Conventional Shower Pan
4. Preformed Shower Pan
5. Flexible Sealant
6. Tile
7. Waterproof Membrane
8. Drain
9. Tile Adhesive
10. Fiberglass Mesh Tape
11. Firring Strip

FIG 4

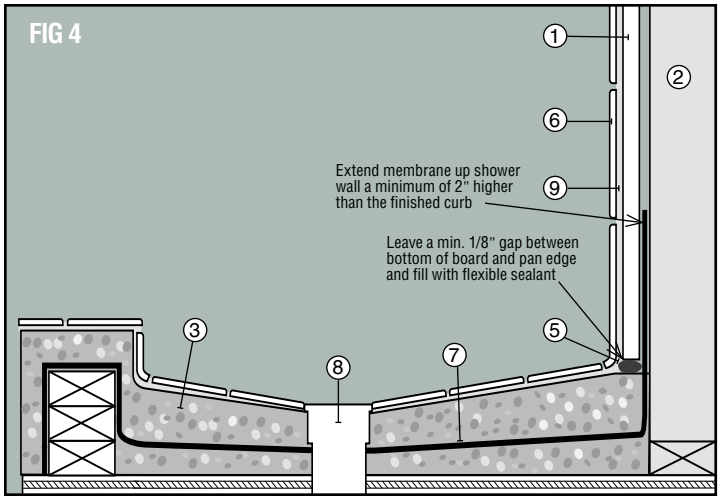
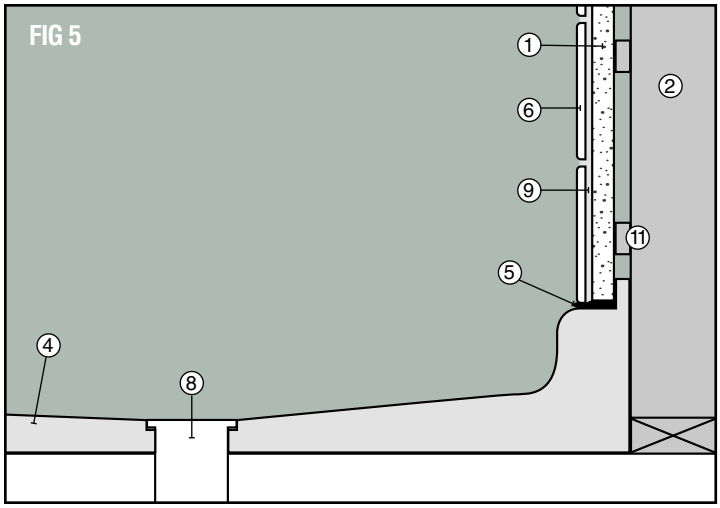


FIG 5



Seal all penetrations and meeting points of dissimilar materials with caulk or flexible sealant.

Special notes:

- Stagger all vertical joints
- A vapor barrier behind GreenGlass® is not required (a moisture seal is already built in)
- Do not use all-purpose joint compound or traditional paper tape in wet areas

Conventional Shower Pan (FIG. 4)

Install GreenGlass tile backer on walls and ceilings as described on the previous page.

Apply sloped mortar bed and embedded rubber membrane according to manufacturer's guidelines so that water flows without restriction toward drain.

For showers with curbs:
The waterproof membrane should extend up shower walls for a minimum of 2" (51 mm) and a maximum of 4" (102 mm) higher than the finished curb.

For showers without curbs:
The waterproof membrane should extend up shower walls for a minimum of 6" (152 mm) and a maximum of 8" (203 mm).

Blocking should be added to framing to provide adequate support for the membrane, shower pan and GreenGlass backer board.

Special notes:

- Do not use GreenGlass in the shower pan or as a shower base
- Do not place GreenGlass panels in contact with the shower mortar bed
- Leave a minimum ⅛" (3 mm) gap between the top of the mortar bed and the bottom of the backerboard and fill the gap with flexible sealant

Preformed Shower Pan (FIG. 5)

Install GreenGlass tile backer on walls and ceilings as described on the previous page.

Fill the joint between the pan edge and the bottom of the tile and backer board with a flexible sealant to keep water from penetrating the wall cavity.

Furring strips may be applied to the framing members to compensate for the pan flange so tile backer can overlap the pan flange without creating an uneven surface for tile application.

Countertops (FIG. 6)

To successfully apply GreenGlass tile backer on countertops follow these guidelines.

Install a flat and level substrate of a minimum ½" (12.7 mm) exposure 1 plywood over framing spaced no wider then 24" (610 mm) o.c.

Be sure that all overhangs are adequately supported to provide maximum stability for tile application.

Apply a leveling layer of latex Portland cement mortar (con-

FASTENER GUIDE CHART: Wood or Metal Framing for Walls & Ceilings
(Spacing for all fastener types to be 6" o.c. along framing. Place no closer than ½" from panel edge.)

Product	Fastener
GreenGlass® Tile Backer *1/2" (12.7 mm)*	Screws - 1½" (38.1 mm) corrosion resistant, backerboard screws with coarse threads Nails - hot dip 7/16" (11 mm) head, galvanized roofing nail, 1½" (38.1 mm) minimum length
GreenGlass® Tile Backer *5/8" (15.9 mm) Type X*	Screws - 1⅝" (41.3 mm) corrosion resistant, backerboard screws with coarse threads Nails - hot dip 7/16" (11 mm) head, galvanized roofing nail, 1¾" (44.5 mm) minimum length

Note: Fastening patterns and other detailed information for recommended installation and application of coated glass-mat, water-resistant gypsum backerboard (ASTM C 1178) can be found in the Tile Council of North America, Inc.'s "2007 TCA Handbook for Ceramic Tile Installation".

forming to ANSI A118.4) to the plywood substrate with a ¼" x ¼" x ¼" (6.4 mm x 6.4 mm x 6.4 mm) notched trowel.

While mortar is still pliable, lay ¼" (6.4 mm) minimum thickness GreenGlass into the leveling bed gray face up and fasten it to the plywood base every 6" (152 mm) to 8" (203 mm) o.c. in both directions using 1¼" (32 mm) galvanized roofing nails or 1¼" (32 mm) rust-resistant drywall screws.

Be sure to fit GreenGlass joints together tightly and tape all corners and joints with alkaline-resistant 2" (51mm)-wide fiberglass mesh tape which should be embedded in a layer of latex Portland cement mortar conforming to ANSI A118.4.

Special notes:

- Stagger GreenGlass joints with those of the plywood substrate
- See ANSI A108 for tile, grout, expansion and control joint installation standards
- A waterproof membrane compliant with ANSI A118.10 is recommended to protect exposed wood on the bottom side of the counter overhang and all other wood edges and surfaces exposed to moisture in areas like those surrounding automatic dishwashers

Residential and Light Commercial Floors (FIG. 4)

Both ¼" (6.4 mm) and ½" (12.7 mm) GreenGlass tile backer panels are compliant with the product standard ASTM C1178 as referenced in the Tile Council of North America's Handbook for Ceramic Tile Installation describing acceptable tile substrates for residential and light commercial floor tile applications.

Apply a liberal layer of latex Portland cement mortar that conforms to ANSI A118.4 to the subfloor with a ¼" x ¼" x ¼" (6.4 mm x 6.4 mm x 6.4 mm) square-tooth notched trowel.

While mortar is still pliable, lay GreenGlass into the mortar bed gray face up, snuggly fitting panels together with no gaps in between. Do not exceed mortar open time.

Fasten each panel in the center first and work out toward the edges, spacing fasteners no wider than 8" (203 mm) o.c. in both directions.

Use either 1¼" (32 mm) galvanized roofing nails or rust-resistant drywall screws driven flush with board surface. Do not countersink fasteners or nail into floor joists to avoid nail pops.

For ¼" (6.4 mm) panels only, the use of ¼" (6.4 mm) or larger crown rust-resistant chisel-point staples is acceptable. They should be no longer than the combined thickness of the GreenGlass panel and the subfloor and be spaced 2" (51 mm) o.c. around the perimeter and 4" (102 mm) o.c. within the field. Maintain a spacing between ⅜" (10 mm) and ½" (13 mm) from ends and edges.

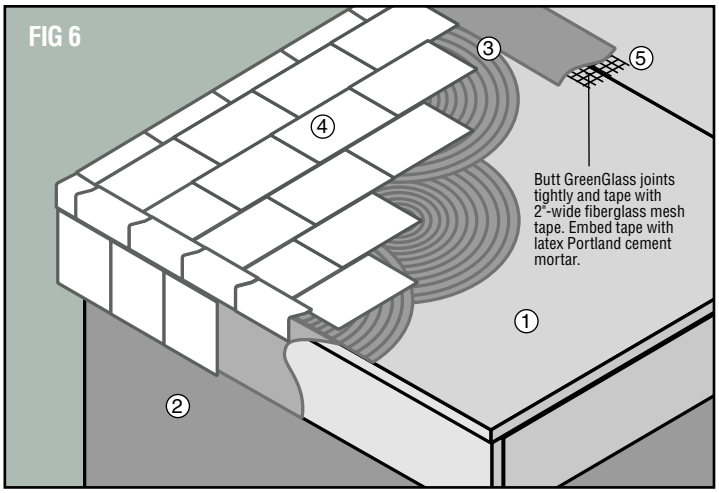
Tape all joints with alkaline-resistant 2" (51 mm)-wide fiberglass mesh tape and embed tape in a layer of setting compound.

Flooring grade tile should be applied with latex Portland cement mortar and grouted with either standard floor grout conforming to ANSI A118.6 or polymer-modified grout conforming to ANSI A118.7.

Special notes:

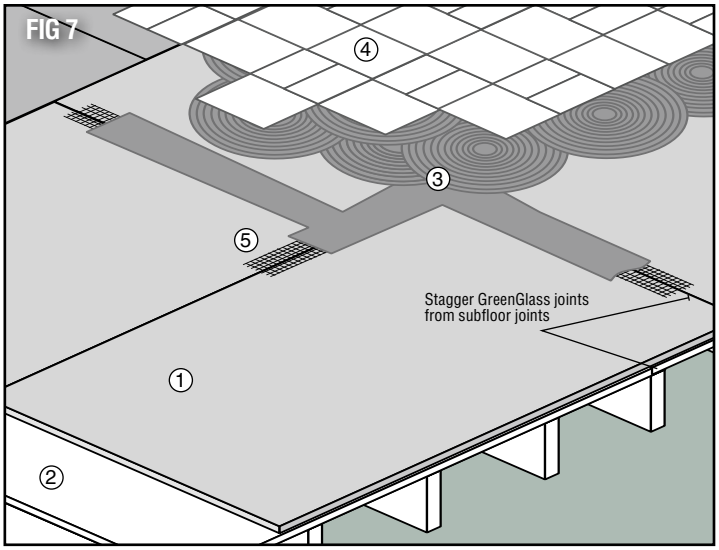
- Stagger GreenGlass joints with those of the subfloor
- Use full-thickness thresholds butted tightly to the edge of GreenGlass and installed so it will be flush with the tile surface
- GreenGlass is not designed for use with heated flooring systems that maintain a continuous temperature over 125° F (52° C)

FIG 6



1. GreenGlass Tile Backer
2. Plywood Substrate
3. Tile Adhesive
4. Tile
5. Fiberglass Mesh Tape

FIG 7



1. GreenGlass Tile Backer
2. Plywood Subfloor
3. Tile Adhesive
4. Tile
5. Fiberglass Mesh Tape

FASTENER GUIDE CHART : Residential And Light Commercial Floors	
Minimum Subfloor Thickness	**Maximum Joist Spacing**
5/8" (15.9 mm) Plywood*	16" (406 mm) o.c. joists
3/4" (19 mm) Plywood*	19.2" (488 mm) o.c. engineered lumber
7/8" (22.2 mm) Plywood	24" (610 mm) o.c. engineered lumber

*3/4" (19 mm) OSB is acceptable

NOTE: Maximum tile substrate deflection not to exceed L/360 of the span when measured under 300 lb. (136 kg) concentrated load (see ASTM C627) or as specified by code or tile manufacturer. Maximum subfloor surface variation not to exceed 1/2" (13 mm) in 10'-0" (3084 mm) from the plane specified in plans or code.

- GreenGlass tile backer is not for exterior use

Dry Non-Tile, Non-Wet Areas

GreenGlass may also be used in interior non-tile areas without exposure to direct water contact but with possible occasional short-term exposure to elevated levels of humidity such as walls and ceilings near tubs or showers in residential construction.

Cut each panel to size, make any necessary openings, then apply boards gray side facing into the room so that no gaps are left between panels. **(FIG. 8)**

For walls: Minimum 25-gauge (.0188) steel or 2" x 4" wood framing spaced no greater than:

- 16" (406 mm) o.c. for ½" (12.7 mm)
- 24" (610 mm) o.c. for ⅝" (15.9 mm)

For ceilings: Framing should be spaced no greater than:

- 16" (406 mm) o.c. for ½" (12.7 mm)
- 24" (610 mm) o.c. for ⅝" (15.9 mm)

Tape all joints with self-adhesive 2" (51 mm)-wide fiberglass mesh tape and embed tape in a layer of setting material.

Before applying paint or wallpaper, prime the surface with a primer suitable for high-moisture areas following paint manufacturer's recommendations.

High-Humidity Non-Tile Areas (FIG. 1)

When applying GreenGlass in areas subject to continuously elevated levels of moisture such as around enclosed swimming pools, garden rooms, locker rooms, therapy rooms, operating rooms, laboratory white rooms or commercial or institutional kitchens, etc., finish only with materials that are highly water resistant to produce a moisture barrier, in combination with GreenGlass, of less than 0.5 perms.

Cut each panel to size, make any necessary openings, then apply boards gray side facing into the room so that no gaps are left between panels.

For walls: Steel or wood framing should be spaced no wider than:

- 16" (406 mm) o.c. for ½" (12.7 mm)
- 24" (610 mm) o.c. for ⅝" (15.9 mm)

For ceilings: Framing should be spaced no wider than:

- 12" (305 mm) o.c. for ½" (12.7 mm)
- 16" (406 mm) o.c. for ⅝" (15.9 mm)

Special notes:

- A finishing method must never be used in a more severe environment than described.

Wet Non-Tile Areas

GreenGlass can be used reliably in non-tile areas such as laboratories, clean rooms, gang showers and processing plants that are exposed to water or condensation for extended periods of time by following these instructions.

Cut each panel to size, make any necessary openings, then apply boards gray side facing into the room so that no gaps are left between panels.

For walls: Steel or wood framing should be spaced no greater than:

- 16" (406 mm) o.c. for ½" (12.7 mm)
- 24" (610 mm) o.c. for ⅝" (15.9 mm)

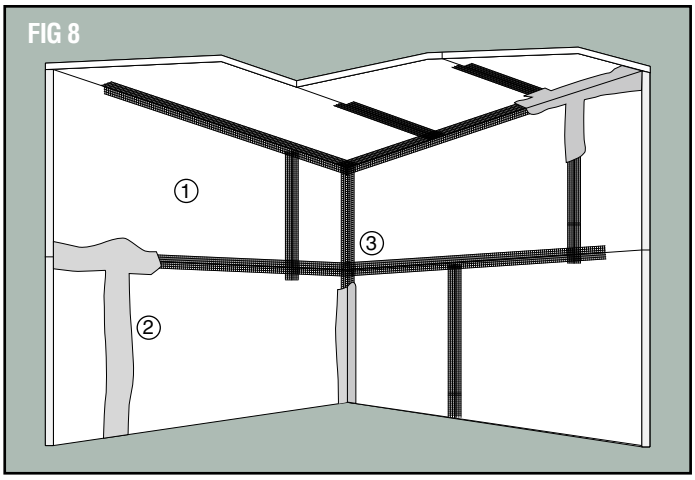
For ceilings: Framing should be spaced no greater than:

- 12" (305 mm) o.c. for ½" (12.7 mm)
- 16" (406 mm) o.c. for ⅝" (15.9 mm)

Apply a 6" (152 mm)-wide strip of glass fiber reinforcing mesh to all angles and embed the strips in a layer of acrylic-based, fiber-reinforced waterproof adhesive.

Prime the surface with a primer suitable for high-moisture areas, then apply a two-part or one-part water-reducible epoxy coating to achieve the desired water vapor transmission rate, being careful to follow manufacturer's specifications for both coatings.

FIG 8



1. GreenGlass Tile Backer 2. Setting Compound 3. Fiberglass Mesh Tape

Residential Steam Rooms

GreenGlass may be installed in residential steam rooms with a floor area no larger than 48 square feet (15 sq. meters) by following these instructions.

For walls: Steel or wood framing should be spaced no wider than:

- 16" (406 mm) o.c. for ½" (12.7 mm)
- 24" (610 mm) o.c. for ⅝" (15.9 mm)

For ceilings: Framing should be spaced no wider than:

- 12" (305 mm) o.c. for ½" (12.7 mm)
- 16" (406 mm) o.c. for ⅝" (15.9 mm)

Fastener spacing: Apply rust-resistant nails or screws every 6" (152 mm) o.c. along all framing members whether wood or metal. Fasteners should be driven flush with backer surface and not countersunk.

Tape all joints with self-adhesive 2" (51 mm)-wide fiberglass mesh tape and embed tape in a layer of latex-modified, thin-set mortar. Or finish all joints and corners with a liquid membrane following the manufacturer's recommended taping directions.

Seal all penetrations and meeting points of dissimilar materials with a flexible silicone sealant, taking care not to get the sealant on the surface of GreenGlass.

Apply a waterproofing system approved for steam rooms over the entire surface of GreenGlass tile backer, covering fasteners, joints and corners.

Apply tile with a modified dry-set mortar according to the manufacturer's instructions.

Grout all corners with a flexible silicone caulk.

Special notes:

- All steam room parts should be tiled
- Leaving untiled GreenGlass backer board, drywall, joint compound or wallpaper exposed may result in a performance failure of these materials
- Use unfaced fiberglass insulation in the wall cavity to reduce heat transfer
- Do not install an additional vapor barrier behind GreenGlass (a moisture seal is already built in)
- Periodic maintenance of grout and caulking on corners should be performed as required
- Steam generation unit should be timer-controlled to prevent prolonged exposure

FIRE-RATED ASSEMBLIES:

GreenGlass® tile backer is approved for use in a number of fire-rated assemblies. Tested in accordance with ASTM E119, GreenGlass 5/8" (15.9 mm) Type X tile backer with acrylic coating is non-combustible, offers superior fire performance and may provide a fire-resistance rating of one or more hours depending upon the assembly in which it is applied. Tile installation is not required to achieve the fire-resistance rating. GreenGlass is a U.L.-classified substrate and can replace a 5/8" (15.9 mm) Type X gypsum board in most fire-rated assemblies. Please visit our website for a listing of U.L.-approved assemblies and design details or contact your Temple-Inland representative for details.

Note: Because ASTM procedures require that fire tests be conducted on complete building assemblies/systems and not just on the gypsum board itself, the ability of any particular gypsum board to pass a specific ASTM fire test may well depend on factors other than the fire resistance of the gypsum board being tested. These factors include the other components used to construct the building system being tested, the manner in which the system is constructed and the inherent variability of ASTM fire tests.

LIMITATIONS:

- For interior use only
- Minimum 1/2" (12.7 mm) or 5/8" (15.9 mm) thickness for wall or ceiling applications
- Should not be used as a shower pan base or in shower floors or curbs
- Should not be used as a base for nailing and mechanical fastening
- Should not be used in areas where there is a continuous exposure to extreme conditions such as in saunas, commercial steam rooms or as a radiant barrier in fireplace applications
- Should not be used as a substrate for resilient flooring
- Should not be used as a component of a passive solar heating system
- Do not use GreenGlass as a tile backer on tile with face dimensions smaller than 2" x 2" (51 mm x 51mm)
- Do not apply GreenGlass directly to masonry or concrete. Wall framing or furring is required
- Avoid exposure to prolonged, extreme temperatures: 125°F (52° C)
- Do not use Type 1 organic mastics for floor applications
- Do not install a vapor barrier directly behind GreenGlass. Use of a #15 felt behind GreenGlass is acceptable if required by local code officials
- Always apply tile to the gray side of GreenGlass

MOLD AND MOISTURE RESISTANCE:

Produced with the TemShield Mold Protection System engineered into its gypsum core, GreenGlass tile backer is faced on both sides with naturally mold-resistant fiberglass mats. This combination has been shown to be highly mold resistant when tested as per ASTM D3273.

In addition, the water-resistant core of GreenGlass combined with its acrylic surface coating is designed to dramatically reduce wicking and moisture pass-through compared to cementitious backer panels. Moisture is stopped at the surface to resist buildup and damage within the wall cavity.

In fact, thanks to its bonded acrylic-coated surface that acts as a built-in moisture barrier, the Tile Council of North America does not require the installation of a separate water-proof membrane behind GreenGlass as it does when cement backer boards are specified for wet area tile application.

Note: The ASTM D3273 lab test may not be applicable to the actual performance of building materials. No material may be labeled mold proof, and resistance to mold growth depends on many factors. Prolonged exposure to moisture may cause mold and mildew to grow on any surface. Therefore, in order to maximize the mold and mildew resistance of a material, it is essential that good design, handling and construction practices be implemented. This involves avoiding water exposure during all phases of storage, handling, shipping, installation and after installation is complete. See GA-238 for more information.

RECYCLED CONTENT CERTIFICATION:

GreenGlass is SCS-certified in accordance with ISO 14021 standards to have at least 90% recycled content on a dry-weight basis. This certified material composition contributes toward recycled material credits in the LEED rating system as well as other rating systems.

LEED

The use of GreenGlass tile backer can contribute greatly toward LEED credits in these two LEED certification categories:

MR credit 4
Recycled Content
Awards 1 or 2 points for using products with recycled content that constitute at least 10% or 20%, based on cost, of the total value of project materials.

MR credit 5
Locally Produced Materials
Awards 1 or 2 points for using materials that are extracted and manufactured within 500 miles that constitute at least 10% or 20%, based on cost, of the total value of project materials.

NAHB Green Building Standards

GreenGlass can also contribute toward N.A.H.B. Green Building Standard credits in this category:

NAHB 604.1 (2)
Pre-consumer Recycled Content
Specifies the use of recycled content products in major areas such as walls, floors, insulation and roofing.

To find out more about Temple-Inland's gypsum board contribution to green building credits, visit our website.

LOW VOC EMISSIONS

Collaborative for High Performance Schools (CHPS) Program

GreenGlass tile backer is third-party certified by Materials Analytical Services, LLC (MAS) to meet the performance standard established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) program. Projects using GreenGlass are eligible for contribution toward credit IEQ 4.6 in the 2009 LEED for Schools rating system and CHPS credit EQ 2.3.6, encouraging the use of gypsum board with low Volatile Organic Compounds (VOCs) emissions.

Sulfur Emissions

Emissions testing was also conducted by MAS for corrosive carbon disulfide and carbonyl sulfide off-gassing and results confirmed GreenGlass is not a problematic drywall type.

TILE BOND TESTING

GreenGlass® passed ceramic tile bond-strength testing conducted by the Tile Institute of America according to test standards ASTM C482 and ANSI A 137.1. Tests were performed on tile attached to a GreenGlass substrate using dry set (ANSI A 118.1) and polymer-modified (ANSI A 118.4) mortar to verify compliance with the Uniform Building Code.

CODE COMPLIANCE

GreenGlass is IRC and IBC code compliant in ¼" (6.4 mm), ½" (12.7 mm) and ⅝" (15.9 mm) thicknesses and meets ASTM C1178 and appropriate sections of ASTM C1658 and ASTM C1396 as a fiberglass mat water-resistant gypsum substrate for use as a tile backer, as recognized by the Tile Council of North America (TCNA).

CAUTION:

Contains Glass Fibers:
See our website for more important details on handling to avoid contact and inhalation of these fibers. Glass fibers are contained within GreenGlass gypsum tile backer and in the glass facers.

Handling may cause skin irritation. Cutting and handling may release glass fibers. Do not use a power saw. Avoid inhalation of these fibers as they may cause respiratory irritation or even aggravated medical conditions.

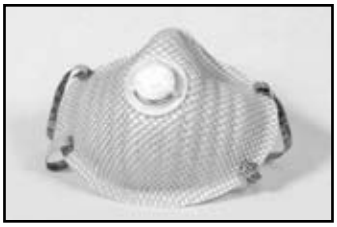
- Skin: If skin contact causes irritation, wash the area with soap and water.
- Eyes: If contact with eyes, flush the eye with clean water for 15 minutes.

PRODUCT HANDLING AND HYGIENE REQUIREMENTS:

Care should be used in handling GreenGlass tile backer to ensure worker comfort and safety.

- Avoid breathing dust-glass fibers by using a NIOSH-approved dust mask when cutting or sanding.
- Gloves and loose fitting long-sleeved clothing should be worn to avoid contact of the GreenGlass with bare skin.
- Eye protection with side protection should be worn. Use either safety glasses with side shields or goggles.
- Skin should be washed after contact with GreenGlass. Wash exposed skin with soap and water.
- Clothing may entangle glass fibers. Clothing which has glass fibers entangled should be washed separately from other clothing.

See MSDS for more information at: www.templeinland.com.



GreenGlass: Tough as expected. Green as it gets.

ISO 14021 SCS CERTIFIED SCS-MC-002033 MEMBER CERTIFIED GREEN