

GP Georgia-Pacific

DensElement[®]
Barrier System

TECHNICAL GUIDE

DENSELEMENT[®] BARRIER SYSTEM



Product Overview



Table of Contents

<i>Product Overview</i>	2
<i>Architectural Specifications</i>	3
<i>Physical Properties</i>	4
<i>Installing Exterior Wall Cladding Over DensElement Barrier System</i>	4
<i>Wall Applications</i>	5
<i>Fire-Rated Assemblies</i>	7
<i>Delivery, Handling and Storage</i>	10
<i>Recommendations and Limitations for Use</i>	10
<i>Exterior Wall Installation Instructions</i>	11
<i>Fastening and Framing</i>	12
<i>Negative Uniform Wind Load</i>	12
<i>Components and Installation Instructions</i>	13
<i>High-Performance Gypsum Products from Georgia-Pacific</i>	17

The Next Generation of Dens That Is a Water-Resistive Barrier and Air Barrier When Properly Sealed

The DensElement® Barrier System consists of DensElement® Sheathing and Georgia-Pacific's DensDefy® Liquid Flashing. When properly installed, and when the seams, joints, fasteners, penetrations, rough openings and material transitions are properly sealed with DensDefy Liquid Flashing, the DensElement Barrier System is a vapor-permeable water-resistive barrier and air barrier (WRB-AB). This system eliminates the expense of buying and installing building wrap, liquid or self-adhered membranes onto the surface of standard gypsum sheathing.

The DensElement Barrier System meets the WRB-AB requirements of the International Building Code (IBC), International Residential Code (IRC) and the International Energy Conservation Code (IECC).

It holds an ICC-ES ESR-3786 Evaluation Report as a WRB-AB, and has been evaluated as an air barrier by the Air Barrier Association of America (ABAA).

Advantage of Using DensElement Barrier System

DensElement Barrier System is a WRB-AB for use under a variety of claddings, rigid insulations, and Exterior Insulation and Finish Systems (EIFS) when seams, joints, fasteners, penetrations, rough openings and material transitions are properly sealed with DensDefy Liquid Flashing. DensElement Barrier System should be specified when fire resistance and a WRB-AB are required. By installing DensElement Barrier System, the integrated sheathing helps to reduce the time and expense of installing a traditional WRB-AB.

Product Overview *continued*

A Combination Sheathing, WRB-AB

DensElement® Sheathing's fiberglass mat facing and AquaKOR™ technology transform the entire gypsum sheathing into a WRB-AB by integrating the fiberglass mat and gypsum core to form a monolithic, hydrophobic surface that blocks bulk water but allows vapor to pass through. This enables water vapor to dissipate through the system rather than trapping it within the assembly. The bases of recognition for the DensElement® Barrier System to be used as a water-resistive barrier are IBC Section 104 and IRC Section R104 Alternative Materials to the water-resistive barrier requirement defined in IBC Section 1404 and IRC Section R703.

The DensElement Barrier System also serves as a continuous air barrier as prescribed in the IECC, Section C 402 air leakage, for both materials and assemblies provided the seams, joints, fasteners, penetrations, rough openings and material transitions are sealed with DensDefy® Liquid Flashing.

Fire Resistance/NFPA 285

5/8" (15.9 mm) DensElement Sheathing is noncombustible as tested in accordance with ASTM E 136 and CAN/ULC S114, is UL classified as Type DGG and is included in many UL and ULC assemblies. The DensElement Barrier System meets criteria set forth in ICC-ES Acceptance Criteria (AC) 212 for water-resistive barriers and is approved as a component in multiple NFPA 285 compliant assemblies. It has been used as a component in multiple NFPA 285 assemblies that hold an ICC-ES Evaluation Report, including brick, stucco, EIFS and other claddings.

Mold Resistance

When properly used with good design, handling and construction practices, Dens® gypsum products provide increased mold resistance compared to standard paper-faced wallboard. The mold resistance of any building product when used in actual jobsite conditions may not produce the same results achieved in the controlled, laboratory setting. No material can be considered mold proof. For additional information, go to BuildGP.com/SafetyInfo.

Standards and Code Compliance

DensElement Sheathing is manufactured to meet ASTM C 1177. Application standards for DensElement Sheathing, where applicable, are in accordance with Gypsum Association publication GA 253 for gypsum sheathing and ASTM C 1280.

DensElement Barrier System is compliant as a sheathing, and WRB-AB with the codes listed below as documented in ICC-ES ESR-3786 by meeting established WRB-AB acceptance criteria.

2009, 2012, 2015, 2018 IBC

2009, 2012, 2015, 2018 IRC

2009, 2012, 2015, 2018 IECC

2012, 2015, 2018 International Green Construction Code (IGCC)

2020 Florida Building Code – Building

2020 Florida Building Code – Residential

2019 California Building Code (CBC)

2019 California Residential Code (CRC)

2020 City of Los Angeles Building Code (LABC)

2020 City of Los Angeles Residential Building Code (LARC)

Architectural Specifications

A rewritable 3-part guide specifies copy for placement of the DensElement Barrier System in Section 061656 - Gypsum Sheathing - Integrated Vapor-permeable Water-resistive Barrier and Air-barrier or Section 072726 Water-resistive Barrier and Air-barrier Vapor-permeable Integrated Gypsum Sheathing, and downloadable copies of the DensElement Barrier System details may be found at BuildGP.com.

Physical Properties

Product Comparison	5/8" (15.9 mm) DensElement® Sheathing
Width, nominal ⁵	4' (1219 mm) ± 3/32" (2.4 mm)
Length, standard ⁵	8', 9', 10' (2438, 2743, 3048 mm) ± 1/4" (6 mm)
Weight ⁹ nominal, lbs./sq. ft. (Kg/m ²)	2.5 (12)
Bending radius (lengthwise)	8' (2438 mm) ⁶
Racking strength, ⁷ lbs./ft. (dry) (N/m) (Ultimate – not design value)	>654 (9544)
Flexural strength, ² parallel, lbf. (N) (4' weak direction)	≥100 (445)
Compressive strength	min. 500 psi (3445 kPa)
Humidified deflection ^{2,5}	<1/8" (3 mm)
Permeance ³ US perms (grained/ft ² .hr.inHg)	>20 (dry cup) >30 (wet cup)
R Value ⁴ , ft ² •°F•hr/BTU (m ² •K/W)	0.67 (0.118)
Combustibility ⁸	Noncombustible
Linear expansion with moisture change in/ in/%RH (mm/mm %RH) ¹⁰	6.25 x 10 ⁻⁶
Surface burning characteristics ¹ flame spread/smoke developed	0/0
Coefficient of thermal expansion in/in/°F (mm/mm/°C) ¹¹	8.5 x 10 ⁻⁶ (15.3 x 10 ⁻⁶)

¹ Per ASTM E84 or CAN/ULC-S102

² Tested in accordance with ASTM C473

³ Tested in accordance with ASTM E96

⁴ Tested in accordance with ASTM C518 (heat flow meter)

⁵ Specified values per ASTM C1177

⁶ Double fasteners on ends as needed

⁷ Tested in accordance with ASTM E72

⁸ As defined and tested in accordance with ASTM E136 or CAN/ULC S114

⁹ Approximate weight for design and shipping purposes. Actual weight may vary based on manufacturing location and other factors

¹⁰ As stated by Gypsum Association GA-235

¹¹ Tested in accordance with ASTM E228-85

To meet the racking shear strength listed in the physical properties table, fastener spacing is 4" (102 mm) o.c. around the perimeter of each panel and 8" (203 mm) o.c. along vertical framing members.

Installing Exterior Wall Cladding over DensElement Barrier System

Conventional exterior claddings—including wood, vinyl, metal or cement composition, stone, brick, EIFS and rainscreen claddings—may be installed over the DensElement® Barrier System. For cladding that utilizes lath such as stucco or adhered masonry stone veneer, install a vapor-permeable water-resistive barrier that meets or exceeds the performance of one layer of #15 felt complying with ASTM D226, Type 1, or ASTM E2556, Type I or II. Consult the design professional for placement within the assembly and integration with flashing accessories to facilitate drainage.

Wall Applications

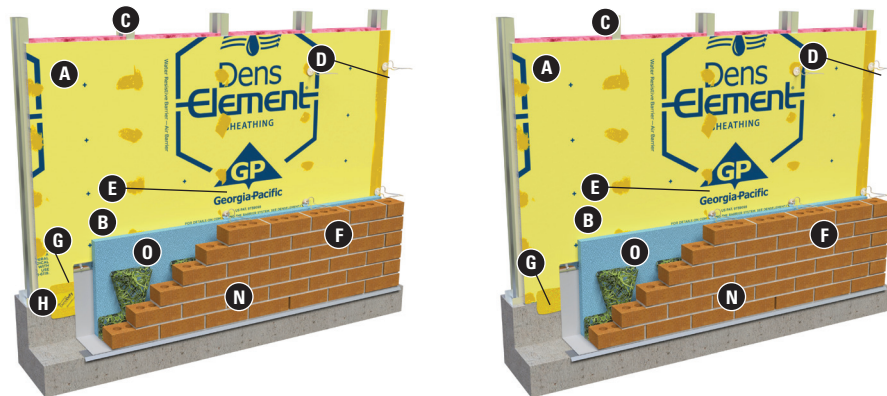
Cladding Installation over DensElement® Barrier System

- | | | |
|--|----------------------------------|--------------------------------------|
| A. DensElement Barrier System | F. Brick | K. Fiber Cement Cladding |
| B. Insulation | G. DensDefy® Liquid Flashing | L. Rainscreen Sub-Framing |
| C. Framing Member | H. DensDefy® Transition Membrane | M. Z-Furring Channels |
| D. Brick Tie | I. Metal Cladding | N. Stainless Steel Drip Edge |
| E. 1" (25 mm) Min.
Air space per local code | J. Through-wall Flashing | O. Mortar Dropping Collection Device |

Important: Illustrations not intended for design or specification purposes.

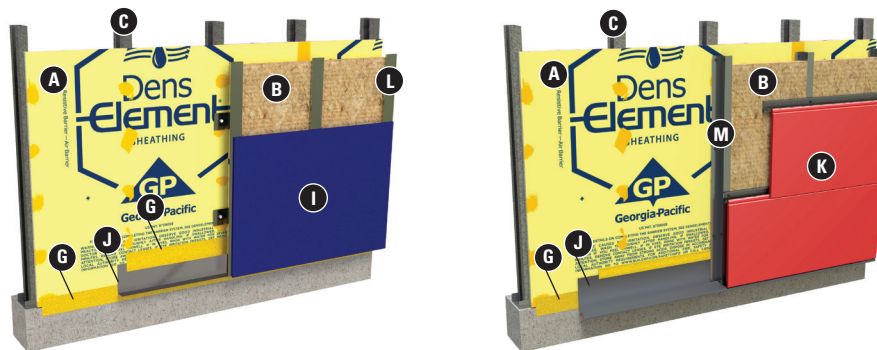
Brick Cavity Wall

Brick can be applied over DensElement® Barrier System just as it would over any other type of sheathing. Attach the masonry ties securely through DensElement Barrier System and into the steel or wood framing members. Space the ties as required by masonry courses. Ensure assembly is properly designed to facilitate drainage.



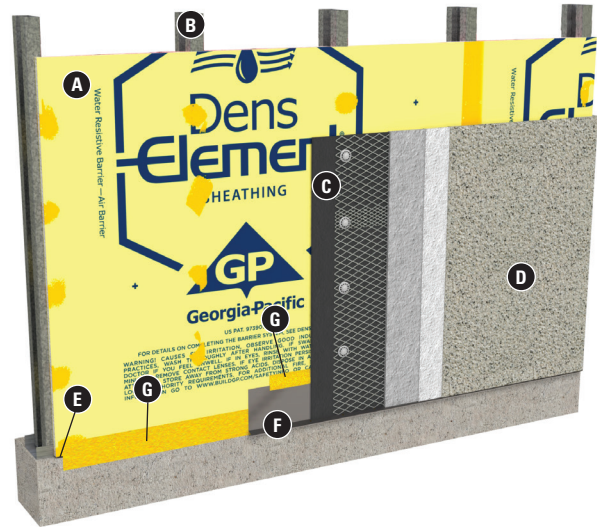
Rainscreen, Fiber Cement and Metal Panel

DensElement® Barrier System can be used in applications behind a variety of rainscreen assemblies. Attach the rainscreen subframing through the DensElement Barrier System and into the framing members. Ensure assembly is properly designed to facilitate drainage.



Wall Applications *continued*

- A. DensElement® Barrier System
- B. Framing
- C. Min. #15 Felt Complying with ASTM D226, Type I and Lath
- D. Conventional Stucco System
- E. Minimum 1/4" (6 mm) Gap
- F. Flashing and Weeps
- G. DensDefy® Liquid Flashing



Conventional Stucco

Stucco systems may be applied over DensElement® Barrier System using one layer of #15 felt complying with ASTM D226 and metal lath. For best practice, system should be properly designed and installed to promote drainage. Lath must be mechanically attached through the DensElement Barrier System into the steel or wood framing. Install stucco system in accordance with the manufacturer's instructions and local building-code requirements. Ensure assembly is properly designed to facilitate drainage.

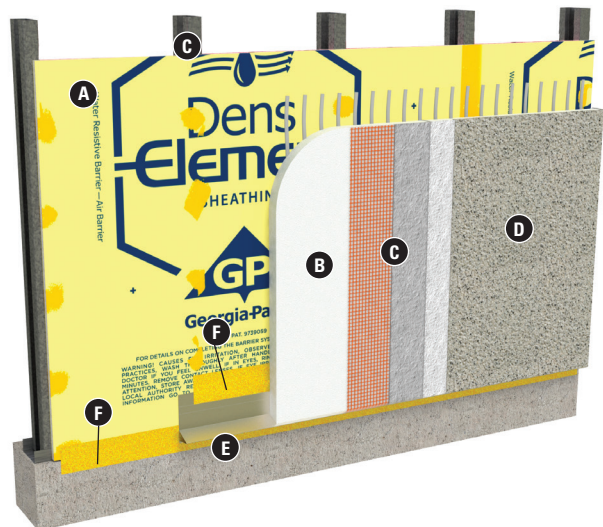
Exterior Insulation and Finish Systems (EIFS)

DensElement® Barrier System is an ideal substrate for EIFS applications.

- Eliminates the need for EIFS manufacturer's WRB-AB coatings.
- Maximum framing spacing 24" (610 mm) o.c. for 5/8" (15.9 mm) DensElement® Sheathing.

Ensure assembly is properly designed to facilitate drainage.

- A. DensElement Barrier System
- B. Insulation
- C. Reinforcing Mesh Embedded in Base Coat
- D. Finish Coat
- E. Through-wall Flashing
- F. DensDefy® Liquid Flashing



Fire-Rated Assemblies

5/8" DensElement® Sheathing is listed in UL fire-rated assemblies under the **Type DGG** designation under Georgia-Pacific Gypsum LLC.

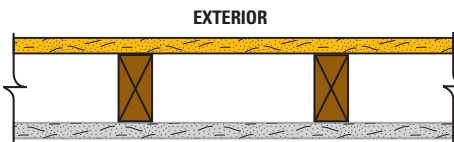
In addition, 5/8" DensElement Sheathing is certified as "Type X" in accordance with ASTM C1177 and may replace 5/8" gypsum sheathing specified as Type X in generic fire-rated wall assemblies. Generic systems in the GA-600 Fire Resistance Design Manual are applicable to the products of any manufacturer, including Georgia-Pacific Gypsum, provided they meet certain standards set forth in such manual, such as Type X gypsum board per applicable ASTM standard with specified thickness and size described in the design. "Type X" as used in this technical guide designates gypsum board manufactured and tested in accordance with specific ASTM standards for increased fire resistance beyond regular gypsum board. Please consult the ASTM standard for the specific product (for example, ASTM C1177 for glass mat gypsum substrate for use as sheathing) for further information and significance of use.

Proprietary GA-600 Designs: Assemblies listed as proprietary in the GA-600 Fire Resistance Design Manual only list one product per manufacturer and may not include all products referenced in the illustrations below. Please consult the specified UL, ULC, cUL or other fire listing or test for a complete list of approved products.

The following designs are for fire rating only. For DensElement® Barrier System WRB-AB performance, the exterior wall joints will need to be flashed as described in this guide. For additional fire safety information concerning DensElement Sheathing, visit BuildGP.com/SafetyInfo.

1-Hour Fire Rating

Design Reference: UL U305, U337, GA WP 8130



Wall Thickness: 4-3/4" (121 mm)

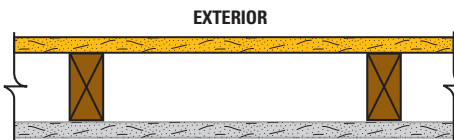
Weight Per Sq. Ft.: 5.5 psf (27 Kg/m²)

Exterior: 5/8" (15.9 mm) DensElement Sheathing applied vertically (U337, U305) or horizontally (U305) to 2" (51 mm) x 4" (102 mm) wood studs 16" (406 mm) o.c. with 1-3/4" (45 mm) galvanized roofing nails 7" (178 mm) o.c. for all framing members. Exterior surface covered with weather-exposed cladding or finish system.

Interior: 5/8" (15.9 mm) DensArmor Plus® Fireguard® interior panels or 5/8" (15.9 mm) ToughRock® Fireguard X® gypsum board applied vertically (U337, U305) or horizontally (U305) to studs with 1-7/8" (48 mm) 6d coated nails 7" (178 mm) o.c. Stagger joints on each side.

1-Hour Fire Rating

Design Reference: UL U309, UL U314, GA WP 8105



Wall Thickness: 4-3/4" (121 mm)

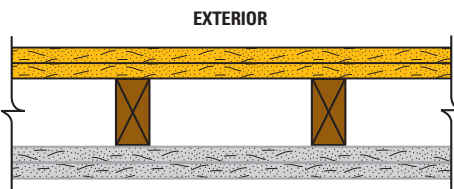
Weight Per Sq. Ft.: 6.0 psf (29 Kg/m²)

Exterior: 5/8" (15.9 mm) DensElement Sheathing applied vertically or horizontally to 2" (51 mm) x 4" (102 mm) wood studs spaced 24" (610 mm) o.c. with 1-3/4" (45 mm) galvanized roofing nails 7" (178 mm) o.c.

Interior: 5/8" (15.9 mm) DensArmor Plus Fireguard interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically or horizontally to framing with 1-7/8" (48 mm) 6d coated nails 7" (178 mm) o.c.

2-Hour Fire Rating

Design Reference: UL U301, GA WP 8416



Wall Thickness: 6-1/8" (156 mm)

Weight Per Sq. Ft.: 9.4 psf (46 Kg/m²)

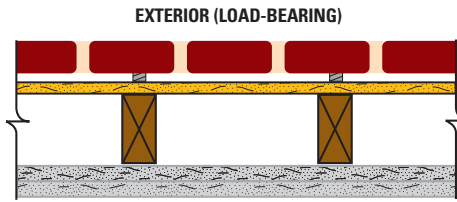
Exterior: Two layers 5/8" (15.9 mm) DensElement Sheathing applied vertically or horizontally to 2" (51 mm) x 4" (102 mm) wood studs 16" (406 mm) o.c. Base layer attached with 1-7/8" (48 mm) galvanized roofing nails 6" (152 mm) o.c. Face layer attached with 2-3/8" (60 mm) galvanized roofing nails 8" (203 mm) o.c. Stagger joints between layers and on base layer of both sides.

Interior: Two layers 5/8" (15.9 mm) DensArmor Plus Fireguard interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied horizontally or vertically to framing. Base layer attached with 1-7/8" (48 mm) 6d cement coated nails 6" (152 mm) o.c. Face layer attached with 2-3/8" (60 mm) 6d cement coated nails 8" (203 mm) o.c. Stagger joints between layers and on base layer of both sides. Sound tested with studs 16" (406 mm) o.c. and nails for base layer spaced 6" (152 mm) o.c.

Fire-Rated Assemblies *continued*

2-Hour Fire Rating

Design Reference: UL U302, GA WP 8187



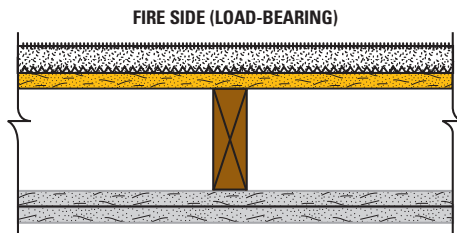
Wall Thickness: 10-1/2" (267 mm)

Exterior: One layer 5/8" (15.9 mm) DensElement® Sheathing applied vertically or horizontally to studs 16" (406 mm) o.c. with 1-3/4" (45 mm) galvanized roofing nails 6" (152 mm) o.c. Face layer is 2" (51 mm) x 4" (102 mm) x 8" (51 mm x 102 mm x 203 mm) clay brick with 1" (25 mm) air space between brick and exterior sheathing. 20-gauge (30 mils) galvanized wire ties attached to each stud with 8d coated nails 2-3/8" (60 mm) as described above, located at every sixth course of bricks.

Interior: Two layers 5/8" (15.9 mm) DensArmor Plus® Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock® Fireguard X® gypsum board applied vertically or horizontally to 2" (51 mm) x 4" (102 mm) wood studs 16" (406 mm) o.c. Base layer attached with 1-7/8" (48 mm) 6d coated nails 8" (203 mm) o.c. Face layer attached with 2-3/8" (60 mm) coated nails 8" (203 mm) o.c.

Generic 2-Hour Fire Rating

Design Reference: GA WP 8192



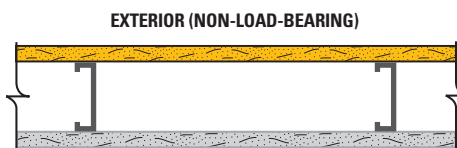
Wall Thickness: 8-5/8" (219 mm)

Exterior: Base layer 5/8" (15.9 mm) DensElement Sheathing retardant treated 2" (51 mm) x 6" (152 mm) wood studs 16" (406 mm) o.c. with 6d coated nails, 1-7/8" (48 mm) long, 0.0915" (2 mm) shank, 1/4" (6 mm) heads, 12" (305 mm) o.c. and covered with a single-layer fire-resistant protective weather retarder paper stapled along each edge at 16" (406 mm) o.c. Galvanized self-furring wire mesh applied over sheathing with 8d galvanized roofing nails, 2-3/8" (60 mm) long, 0.113" (3 mm) shank, 9/32" (7 mm) heads, 6" (152 mm) o.c. Cement stucco applied over wire mesh in two 1/2" (12.7 mm) thick coats with bonding agent applied between coats.

Interior: Base layer 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically to studs with 6d coated nails, 1-7/8" (48 mm) long, 0.0915" (2 mm) shank, 1/4" (6 mm) heads, 12" (305 mm) o.c. Face layer 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied horizontally to studs with 8d coated nails, 2-3/8" (60 mm) long, 0.113" (3 mm) shank, 9/32" (7 mm) heads, 8" (203 mm) o.c. at edges and 12" (305 mm) o.c. at intermediate studs.

1-Hour Fire Rating

Design Reference: UL U465, GA WP 8007



Wall Thickness: 4-7/8" (124 mm)

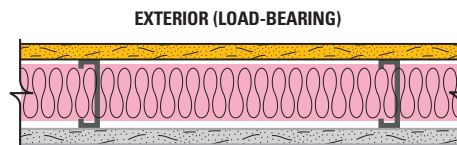
Weight Per Sq. Ft.: 4.6 psf (19 Kg/m²)

Exterior: 5/8" (15.9 mm) DensElement Sheathing applied vertically or horizontally to min. 3-5/8" (92 mm) corrosion-resistant, 25-gauge (18 mils) steel studs 24" (610 mm) o.c. with 1" Type S Screw corrosion-resistant bugle head screws 8" (203 mm) o.c. at vertical studs and 12" (305 mm) at floor and ceiling runners.

Interior: 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically to framing with 1" (25 mm) Type S bugle head screws 8" (203 mm) o.c. at board edges and 8" (203 mm) at intermediate studs and 12" (305 mm) at floor and ceiling runners.

1-Hour Fire Rating

Design Reference: UL U425, GA WP 8006



Wall Thickness: 4-3/4" (121 mm)

Weight Per Sq. Ft.: 5 psf (19 Kg/m²)

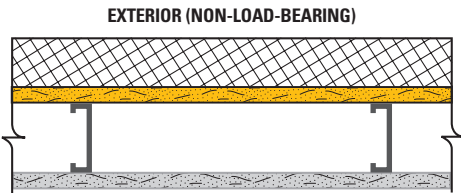
Exterior: 5/8" (15.9 mm) DensElement Sheathing applied vertically to min. 3-1/2" (89 mm) corrosion-resistant 25-gauge (33 mils) steel studs 24" (610 mm) o.c. with 1" (25 mm) Type S-12 corrosion-resistant bugle head screws 12" (305 mm) o.c.

Interior: 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically to framing with 1" (25 mm) Type S-12 bugle head screws 12" (305 mm) o.c. Insulation to completely fill stud cavity.

Fire-Rated Assemblies continued

1-Hour Fire Rating

Design Reference: GA WP 8122



Partition Thickness: 6" – 7" (152 – 178 mm) Varies based on insulation thickness

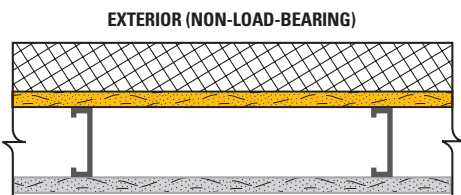
Weight Per Sq. Ft.: 7.0 psf (34 Kg/m²)

Exterior: 5/8" (15.9 mm) DensElement® Sheathing applied vertically to 3-5/8" (92 mm) 18-gauge (43 mils) steel studs 16" (406 mm) o.c. with #6 x 1-1/4" (32 mm) self-drilling, corrosion-resistant, bugle head drywall screws 8" (203 mm) o.c. at edges and ends and 12" (305 mm) o.c. at intermediate studs. Proprietary polymer modified exterior insulation and finish system applied over sheathing. 2" (51 mm) maximum foam-on-plastic thickness.

Interior: 5/8" (15.9 mm) ToughRock® Fireguard X® gypsum board or 5/8" (15.9 mm) DensArmor Plus® Fireguard X® interior panels applied vertically to studs with #6 x 1-1/4" (32 mm) self-drilling bugle head drywall screws 8" (203 mm) o.c. at edges and ends and 12" (305 mm) o.c. at intermediate studs.

1-Hour Fire Rating

Design Reference: GA WP 8123



Partition Thickness: 6" – 9" (152 – 229 mm) Varies based on insulation thickness

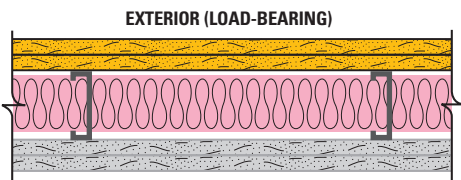
Weight Per Sq. Ft.: 7.0 psf (34 Kg/m²)

Exterior: 5/8" (15.9 mm) DensElement Sheathing applied vertically to 3-5/8" (92 mm) 18-gauge (43 mils) steel studs 24" (610 mm) o.c. with #6 x 1-1/4" (32 mm) self-drilling, corrosion-resistant bugle head drywall screws 8" (203 mm) o.c. at edges and ends and 12" (305 mm) o.c. at intermediate studs. Polymer-based exterior insulation and finish system applied over sheathing. 4" (102 mm) maximum foam-on-plastic thickness.

Interior: One layer 5/8" (15.9 mm) ToughRock Fireguard X gypsum board or 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels applied vertically to studs with #6 x 1-1/4" (32 mm) self-drilling bugle head drywall screws 8" (203 mm) o.c. at edges and ends and 12" (305 mm) o.c. at intermediate studs.

2-Hour Fire Rating

Design Reference: UL U425, GA WP 8203



Wall Thickness: 6" (152 mm)

Weight Per Sq. Ft.: 10 psf (49 Kg/m²)

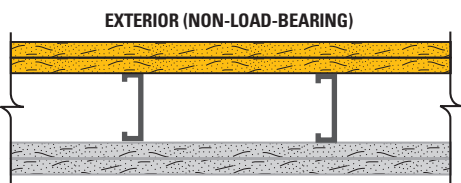
For two layers of exterior sheathing, the inside layer can be either 5/8" DensGlass® Fireguard® Sheathing or DensElement Sheathing.

Exterior: Two layers 5/8" (15.9 mm) DensElement Sheathing applied vertically to min. 3-1/2" (89 mm) corrosion-resistant, 20-gauge (30 mils) steel studs 24" (610 mm) o.c. Base layer attached with 1" (25 mm) Type S-12 corrosion-resistant bugle head screws 12" (305 mm) o.c. Face layer attached with 1-5/8" (41 mm) Type S-12 corrosion-resistant bugle head screws spaced 12" (305 mm) o.c. Joints staggered.

Interior: Two layers 5/8" (15.9 mm) DensArmor Plus Fireguard interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically to framing. Base layer attached with 1" (25 mm) Type S-12 bugle head screws 12" (305 mm) o.c. Face layer attached with 1-5/8" (41 mm) Type S-12 bugle head screws spaced 12" (305 mm) o.c. Joints staggered. Insulation to completely fill stud cavity. (Load bearing: 80% of design load.)

2-Hour Fire Rating

Design Reference: UL U411, V487



Wall Thickness: 6 1/8" (156 mm)

Weight Per Sq. Ft.: 9 psf (44 Kg/m²)

For two layers of exterior sheathing, the inside layer can be either 5/8" DensGlass Fireguard Sheathing or DensElement Sheathing.

Exterior: Two layers 5/8" (15.9 mm) DensElement Sheathing applied vertically to min. 2-1/2" (64 mm) corrosion-resistant, 25-gauge (18 mils) steel studs 24" (610 mm) o.c. Base layer attached with 1" (25 mm) Type S corrosion-resistant bugle head screws 16" (406 mm) o.c. Face layer attached with 1-5/8" (41 mm) Type S corrosion-resistant bugle head screws spaced 8" (203 mm) o.c. Joints staggered.

Interior: Two layers 5/8" (15.9 mm) DensArmor Plus Fireguard X® interior panels or 5/8" (15.9 mm) ToughRock Fireguard X gypsum board applied vertically to framing. Base layer attached with 1" (25 mm) Type S bugle head screws 16" (406 mm) o.c. Face layer attached with 1-5/8" (41 mm) Type S bugle head screws spaced 16" (406 mm) o.c. in the field and along vertical edges and 12" (305 mm) o.c. to the floor and ceiling runners. Joints staggered. Batt or blanket insulation optional.

Delivery, Handling and Storage

All DensElement® Barrier System materials shall be delivered in their original bundles or packaging. The plastic packaging used to wrap gypsum sheathing products for rail and/or truck shipment is intended to provide temporary protection from moisture exposure during transit only and is not intended to provide protection during storage after delivery. Such plastic packaging shall be removed immediately upon receipt of the shipment. Failure to remove protective plastic shipping covers can result in condensation, which can lead to damage.

All DensElement Barrier System materials should be kept dry during storage and upon delivery. DensElement® Sheathing shall be neatly stacked flat with care taken to prevent sagging or damage to edges, ends and surfaces. DensElement Sheathing shall be properly supported on risers on a level platform, and fully protected from weather, direct sunlight exposure, dirt and mud, and condensation. DensElement Sheathing shall be stacked flat rather than on edge or end.

Protect the DensDefy® Liquid Flashing and DensDefy® Transition Membrane material from damage, weather, excessive temperatures and construction traffic.

Store the DensDefy Liquid Flashing and DensDefy Transition Membrane material at temperatures of 40 degrees Fahrenheit or above in dry conditions.

Refer to Handling Gypsum Panel Products, GA-801, for proper storage and handling requirements of DensElement Sheathing.

Recommendations and Limitations for Use

The following recommendations and limitations are important to ensure the proper use and benefits of DensElement® Barrier System. Failure to strictly adhere to such recommendations and limitations may void the limited warranty provided by GP Gypsum for such products. For details, please go to BuildGP.com/DensElement/Resources/Literature and click on the warranty tab.

DensElement® Sheathing, DensDefy® Liquid Flashing and DensDefy® Transition Membranes are resistant to normal weather conditions. They are not intended for use as a cladding system, long-term outdoor exposure, for immersion in water, and cascading water from an unfinished roof or floor. Water should always be directed away from the DensElement Barrier System.

DensElement Barrier System is intended for use in vertical wall applications. When used at slanted wall conditions, ensure the wall is adequately sloped to prevent water from pooling or ponding on the system and proper drainage is achieved. DensElement Barrier System should not be used in roof applications. For roof applications, consult our DensDeck® Roof Board literature.

Avoid conditions that will create moisture in the air and condensation within the exterior walls. This is especially important during periods when the exterior and interior temperature differentials can create a condensation point within the exterior wall. The use of forced-air heaters creates volumes of water which, when not properly vented, can condense on building materials. The use of heaters and any resulting damage is not the responsibility of Georgia-Pacific Gypsum. Consult heater manufacturer for proper use and ventilation.

Georgia-Pacific Gypsum does not warrant and is not responsible or liable for the performance of any cladding or cladding system that is attached or adhered to the DensElement Barrier System. The compatibility of any cladding system is the responsibility of the cladding manufacturer or design authority.

Brackets to support heavy cladding such as tile, marble or stone should be installed directly to the framing and not over the DensElement Sheathing.

Do not apply DensElement Sheathing to cementitious or masonry surfaces. Do not attach cement board panels directly to DensElement Sheathing.

DensElement Barrier System is not intended for interior applications or as a substrate for adhered exterior tile, stone or brick.

DensElement Barrier System should not be used in lieu of plywood or OSB where the physical properties of a wood structural panel are required.

Do not use DensElement Sheathing as a base for nailing or mechanical fastening. Fasteners shall be driven into framing and shall be flush with the face, not countersunk.

Application temperature is above 25°F (-4°C) and rising. Do not apply DensElement Barrier System below grade.

Exterior wall design details, including, but not limited to, cladding attachments, control joints, material transition details, and window and door integration, per the project specification, must be properly installed.

Seams, joints, rough openings, transitions and penetrations must be properly sealed, taped or flashed. Failure to do so will void the warranty.

Protect exposed wall ends, such as those that may be found in parapets and rough openings to prevent water from entering the cavity.

Recommendations and Limitations for Use *continued*

DensDefy® Liquid Flashing is not for use as a structural sealant.

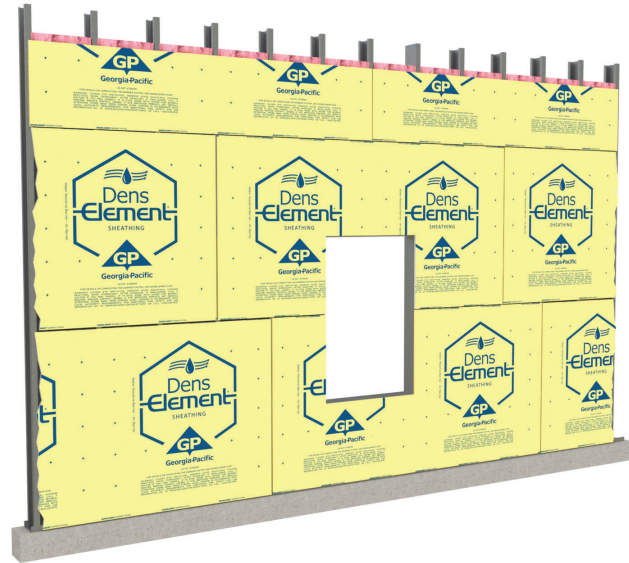
DensDefy Liquid Flashing and DensDefy® Transition Membrane are not for use in place of appropriate through-wall flashing.

NOTE: Joints between DensElement® Panels in fire-rated assemblies must be constructed with the edges and ends in "moderate contact." Small gaps may exist along the joint due to the allowable width tolerance of sheathing stated in ASTM C1177.

Exterior Wall Installation Instructions

DensElement® Sheathing must be installed in accordance with the instructions in this technical guide and Gypsum Association publication GA-253 and ASTM C1280. DensElement Sheathing can be installed parallel or perpendicular to wood or metal framing. Use appropriate board orientations for specific fire assemblies and shear wall applications as defined within this document, other reference documents or as required by the design authority. The framing width shall not be less than 1½" (38 mm) wide for wood framing and 1¼" (32 mm) for steel framing. Framing members shall not vary more than 1/8" (3 mm) from the plane of the faces of adjacent framing. Fasteners shall be driven flush with the panel surface (not countersunk) and into the framing. Locate perimeter fasteners at least 3/8" (9 mm) from the ends and edges of the panel. Nails or screws, as listed in the fastener chart, may be used to attach DensElement Sheathing to framing. DensElement Sheathing is not to be used as a base for nailing or other fastening.

Install DensElement Sheathing with end joints staggered on horizontal applications and vertical applications (when applicable). Ends and edges of the DensElement Sheathing should fit tightly (less than 1/8"). DensElement shall not be less than 8" (178 mm) from the finish grade in weather-protected siding systems, and not less than 12" (305 mm) from the ground for properly drained crawl spaces. Consult with design authority for control joint recommendations.









Fastening and Framing

Thickness	Framing Spacing	Panel Orientation	Fastener Spacing – Wood Framing ¹	Fastener Spacing – Metal Framing ¹
5/8" (15.9 mm)	24" (610 mm) o.c. max ²	Parallel ³ or perpendicular	8" (203 mm) o.c. field ³ & perimeter	8" (203 mm) o.c. along framing

¹ Fire-rated assemblies may require additional fasteners; see specific assembly details.

² For racking strength resistance, apply panel edges parallel with framing spaced a maximum of 16" (406 mm) on center (o.c.) for 5/8" (15.9 mm) DensElement® Barrier System.

³ Fastener spacing around the perimeter of the wall and along intermediate vertical framing members.

Fastener*	Type	Length 5/8" (15.9 mm) Thick Sheathing	Description	Application
	Type S-12	1-1/4" (32 mm)	Bugle-head, fine-thread, corrosion-resistant, drill-point drywall screw	DensElement® Sheathing to heavy-gauge metal framing (18 gauge or thicker)
	Type S	1-1/4" (32 mm)	Bugle-head, fine-thread, corrosion-resistant, sharp-point drywall screw	DensElement Sheathing to light-gauge metal framing furring (20-25 gauge)
	Type W	1-5/8" (41 mm)	Bugle-head, rust-resistant, coarse-thread, sharp-point drywall screw	DensElement Sheathing to wood framing
	Type W, S, and S-12	1-1/4" (32 mm) metal 1-5/8" (41 mm) wood	Wafer-head, corrosion-resistant screws, drill or sharp point	DensElement Sheathing to heavy-gauge or light-gauge, metal or wood framing
	ASTM C514 and 12 gauge	1-3/4" (45 mm)	11-gauge, galvanized nail	DensElement Sheathing to wood framing
	16 gauge galvanized staples	1-5/8" (41 mm)	No. 16 gauge, flattened, galvanized, divergent-point wire staples with not less than a 7/16" (11mm) wide crown outside measure.	DensElement Sheathing to wood framing

*For screws, meet or exceed ASTM C1002 or C954. Contact fastener manufacturer for correct amount of corrosion resistance.

Negative Uniform Wind Load

5/8" (15.9 mm) DensElement Sheathing Vertically or Horizontally Applied

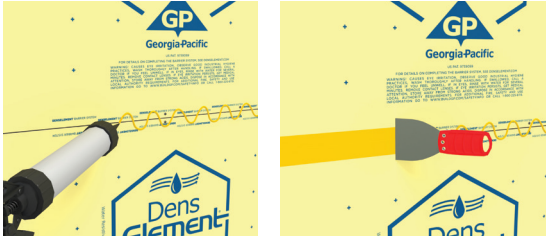
Sheathing Thickness in. (mm)	Framing Spacing in. (mm)	Screw Spacing in. (mm)	Board Orientation	Ultimate Load PSF* (kPa)	Test Report
5/8 (15.9)	16 (406)	8 (203)	Horizontal	131 (6.3)	ITS #F7036.01-550-44
5/8 (15.9)	16 (406)	6 (152)	Horizontal	170 (8.2)	ITS #F7036.01-550-44
5/8 (15.9)	16 (406)	4 (102)	Horizontal	212 (10.1)	ITS #F7036.01-550-44
5/8 (15.9)	12 (305)	8 (203)	Horizontal	158 (7.6)	ITS #F7036.01-550-44
5/8 (15.9)	12 (305)	6 (152)	Horizontal	212 (10.1)	ITS #F7036.01-550-44
5/8 (15.9)	12 (305)	4 (102)	Horizontal	315 (15.1)	ITS #F7036.01-550-44
5/8 (15.9)	8 (203)	8 (203)	Horizontal	193 (9.2)	ITS #F7036.01-550-44
5/8 (15.9)	8 (203)	6 (152)	Horizontal	261 (12.5)	ITS #F7036.01-550-44
5/8 (15.9)	8 (203)	4 (102)	Horizontal	375 (17.9)	ITS #F7036.01-550-44
5/8 (15.9)	24 (610)	8 (203)	Vertical	69 (3.3)	TPI #89-047
5/8 (15.9)	24 (610)	8 (203)	Horizontal	85 (4.1)	TPI #89-047
5/8 (15.9)	16 (406)	8 (203)	Vertical	96 (4.6)	TPI #89-047

*Apply appropriate safety factor from the design method used to calculate design load.

Components and Installation Instructions

Panel Seams, Vertical Corners, Fasteners and Transitions for WRB-AB Compliance Using DensDefy® Liquid Flashing, Rough Openings and Penetrations.

Panel Seams



1. Apply DensDefy Liquid Flashing over the DensElement® Sheathing joint in a zigzag or ribbon pattern.
2. With a straight-edge tool, spread evenly over the sheathing seam.
3. Apply at a rate to achieve a minimum thickness of 16 wet mils over the entire joint area, leaving no exposed sheathing. Cover a minimum of 1 in. on both sides of the seam.

Vertical Corners



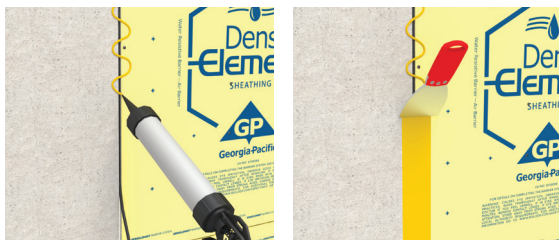
1. Apply DensDefy Liquid Flashing over the inside and/or outside corner in a zigzag or ribbon pattern.
2. With a straight-edge tool, spread evenly over the sheathing corner.
3. Apply at a rate to achieve a minimum thickness of 16 wet mils over the corner area. Cover a minimum of 2 in. on both sides of the corner.

Fasteners



1. The fasteners should be spotted with DensDefy Liquid Flashing and wiped down with a straight-edge tool, leaving a minimum thickness of 16 wet mils over the entire fastener.

Material Transitions With DensDefy Liquid Flashing



1. If the gap between materials is over 1/4 in., fill the gap between the DensElement Sheathing and adjacent materials with a backer rod.
2. Apply DensDefy Liquid Flashing over the DensElement Sheathing and adjacent material in a zigzag or ribbon pattern.
3. Using a straight-edge tool, spread DensDefy Liquid Flashing over material transition joint.
4. Apply at a rate to achieve a minimum thickness of 16 wet mils. Ensure the flashing is applied a minimum of 2 in. on each substrate material surface.

Components and Installation Instructions *continued*

Material Transitions With DensDefy® Transition Membrane



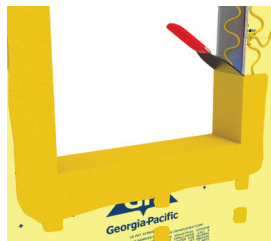
1. Choose the appropriate DensDefy Transition Membrane width to achieve a minimum 2 in. (50 mm) overlap on both sides of the transition. Pre-cut manageable lengths and place over the center of the transition area. Note: At corners or changes in plane, creasing the membrane prior to placement can help align the membrane.
2. Remove release paper from the DensDefy Transition Membrane and press in place following the contour of the substrate, avoiding wrinkles and fishmouths.
3. Use a J-roller to apply even pressure to fully adhere the membrane and achieve a smooth and wrinkle-free surface.
4. Terminate all DensDefy Transition Membrane edges with a counter flash of DensDefy® Liquid Flashing, ensuring liquid flashing covers membrane and adjacent material, leaving no exposed membrane edges.

Transitions at Floor Line Conditions or Vertical/Horizontal Expansion Joints



1. For gaps greater than ¼" and less than 1", place pre-cut lengths over the center of the transition area. Loop the membrane in a concave or convex fashion to accommodate potential movement. Use bond-breaker material to ensure membrane does not adhere to surfaces inside the expansion joint. Maintain a minimum 2" (50 mm) overlap on both sides of the joint.
2. Use a J-roller to apply even pressure to fully adhere the membrane and achieve a smooth and wrinkle-free surface.
3. Terminate all DensDefy Transition Membrane edges with a counter flash of DensDefy Liquid Flashing, ensuring liquid flashing covers membrane and adjacent material, leaving no exposed membrane edges.

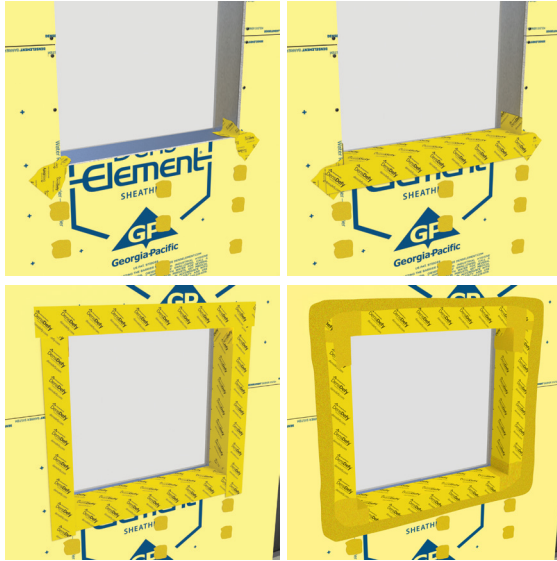
Rough Openings With DensDefy® Liquid Flashing



1. Rasp any jagged or uneven DensElement® Sheathing edges and clean framing free of debris and dust or other bond-inhibiting materials. Note: For treated lumber, clean with an isopropyl alcohol wipe and allow to flash off prior to application of DensDefy Liquid Flashing.
2. Apply a bead of DensDefy Liquid Flashing into the entire width of the inside corners of the opening.
3. Apply DensDefy Liquid Flashing over the entire width of the opening sill, jamb and header in a zigzag or ribbon pattern.
4. Apply DensDefy Liquid Flashing over the DensElement Sheathing adjacent to the opening sill, jamb and header in a zigzag or ribbon pattern.
5. With a straight-edge tool, spread DensDefy Liquid Flashing over the entire width of the sill, jamb, header and DensElement Sheathing surface adjacent to the opening.
6. Apply at a rate to achieve a minimum thickness of 16 wet mils over the opening area, leaving no exposed sheathing. Cover a minimum of 2 in. of the sheathing surface adjacent to the opening.

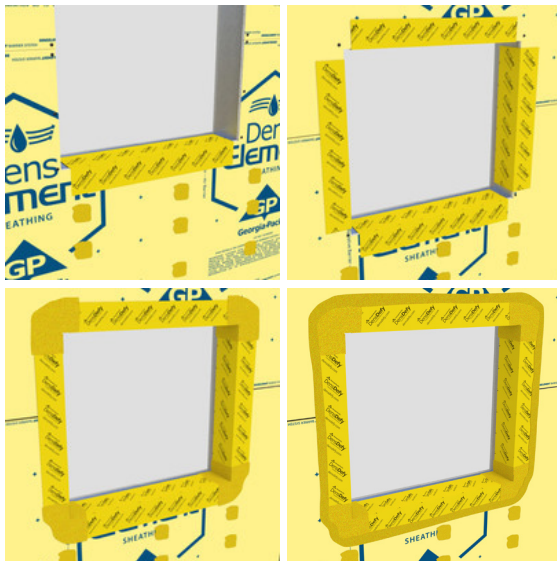
Components and Installation Instructions *continue*

Rough Openings With DensDefy® Transition Membrane



1. Apply corner reinforcement pieces or "bow ties" at rough opening corners.
2. Choose appropriate DensDefy Transition Membrane widths to achieve a minimum 2 in. (50 mm) overlap on both sides of the transition. Pre-cut manageable lengths. Note: At corners or changes in plane, creasing the membrane prior to placement can help align the membrane.
3. Remove release paper from the DensDefy Transition Membrane and press in place following the contour of the substrate, avoiding wrinkles and fishmouths.
4. Apply pre-cut lengths along rough opening header. Overlap, in a shingle lap fashion, a minimum 2" (50 mm) onto jamb protection.
5. Use a J-roller to apply even pressure to fully adhere the membrane and achieve a smooth and wrinkle-free surface.
6. Terminate all DensDefy Transition Membrane edges with a counter flash of DensDefy® Liquid Flashing, ensuring liquid flashing covers membrane and adjacent material, leaving no exposed membrane edges.

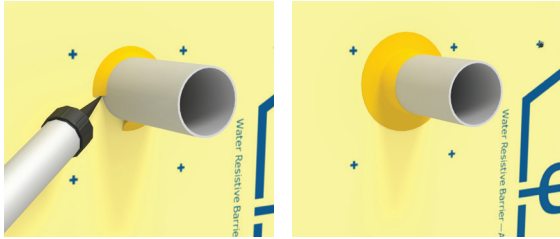
Rough Openings With Combination Method



1. Choose appropriate DensDefy Transition Membrane widths to achieve a minimum 2 in. (50 mm) overlap on both sides of the transition. Pre-cut manageable lengths for handling. Note: At corners or changes in plane, creasing the membrane prior to placement can help align the membrane.
2. Remove release paper from the DensDefy Transition Membrane and press in place following the contour of the substrate, avoiding wrinkles and fishmouths.
3. Apply pre-cut lengths of DensDefy Transition Membrane to sill, jambs and header, keeping membrane 1 - 2 in. from rough opening corners. Cover a minimum of 2 in. of the sheathing adjacent to the opening.
4. Use a J-roller to apply even pressure to fully adhere the membrane and achieve a smooth and wrinkle-free surface.
5. Apply DensDefy Liquid Flashing to all rough opening corners, overlapping the membrane edges by at least 1 in.
6. Terminate all DensDefy Transition Membrane edges with a counter flash of DensDefy Liquid Flashing, ensuring liquid flashing covers membrane and adjacent material, leaving no exposed membrane edges.

Components and Installation Instructions *continued*

Pipe Penetrations



1. Mechanically secure penetrations. Penetrations should be rigid and secured mechanically.
2. If the gap between materials is over 1/4 in., install backer rod between penetration and DensElement® Sheathing to form a back dam regardless of size of penetration or opening.
3. Apply a thick bead of DensDefy® Liquid Flashing around the penetration.
4. With a straight-edge tool, spread DensDefy Liquid Flashing on the face of the sheathing, over the annulus between the penetration and the sheathing, and onto the penetrating item. Completely seal the joint around the penetration.

High-Performance Gypsum Products from Georgia-Pacific

DensDeck® Roof Board	Fiberglass mat roof board used as the ideal thermal barrier and cover board to improve resistance to wind uplift, hail, foot traffic and fire in a broad range of commercial roofing applications. Look for DensDeck® Prime Roof Board also.
DensGlass® Sheathing	The original and universal standard of exterior gypsum sheathing offers superior weather resistance, with a 12-month limited warranty against delamination or deterioration during exposure to normal weather conditions. Look for the familiar GOLD color. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensGlass® Shaftliner	These specially designed panels are perfect for moisture-prone vertical or horizontal shafts, interior stairwells and area separation wall assemblies. Includes a 12-month limited warranty against delamination or deterioration during exposure to normal weather conditions. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensArmor Plus® Interior Panel	High-performance interior panel accelerates scheduling because it can be installed before the building is dried-in. Includes a 12-month limited warranty against delamination or deterioration during exposure to normal weather conditions. GREENGUARD and GREENGUARD Gold certified for low VOC emissions. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensArmor Plus® Abuse-Resistant Interior Panel	With the same benefits as the DensArmor Plus® Interior Panel, these also offer added resistance to scuffs, abrasions and surface indentations; ideal for healthcare facilities and schools. GREENGUARD and GREENGUARD Gold certified for low VOC emissions. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensArmor Plus® Impact-Resistant Interior Panel	With even greater durability than abuse-resistant panels, these have an embedded impact-resistant mesh for the ultimate resistance in high-traffic areas; ideal for healthcare facilities, schools and correctional institutions. GREENGUARD and GREENGUARD Gold certified for low VOC emissions. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensShield® Tile Backer	Acrylic-coated tile backer stops moisture at the surface. Lightweight and strong, they are built for speed on the jobsite. Conforms to requirements of 2018 IBC/IRC Code. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
ToughRock® Gypsum Board	Paper-faced line of gypsum panels for a variety of applications including interior wall and ceiling applications, abuse-resistant boards and panels for use in fire-rated assemblies. ToughRock products are GREENGUARD and GREENGUARD Gold certified for low VOC emissions.
ToughRock® Mold-Guard™ Gypsum Board	ToughRock Mold-Guard Gypsum Board products have enhanced mold resistance in comparison to regular ToughRock® Gypsum Boards. They are GREENGUARD and GREENGUARD Gold Certified for low VOC emissions. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.
DensElement® Barrier System	DensElement® Barrier System is the result of innovative science called AquaKOR™ Technology that integrates the gypsum core and the fiberglass mat to form a hydrophobic, monolithic surface that blocks bulk water, but allows vapor to pass through. By retaining high permeability, DensElement Barrier System enables moisture vapor to pass through the wall in both directions in any climate. This allows wall assemblies to dry out should they get wet, helping to avoid mildew, mold and deterioration. As DensElement Barrier System is a continuous WRB-AB, no separate WRB-AB is needed. Meets UL 2824 GREENGUARD Certification Program for Microbial Resistance.



Georgia-Pacific Gypsum

U.S.A. GP Gypsum
CANADA Georgia-Pacific Canada LP

SALES INFORMATION AND ORDER PLACEMENT

U.S.A. Pacific Southwest: **1-800-824-7503**
Midwest: **1-800-876-4746**
Central: **1-800-231-6060 x 7709**
North: **1-800-947-4497**
Pacific Northwest: **1-800-444-0092**
South: **1-800-327-2344**

CANADA Canada Toll Free: **1-800-387-6823**

TECHNICAL HOTLINE

U.S.A. and Canada: **1-800-225-6119**



TRADEMARKS

Unless otherwise noted, all trademarks are owned by or licensed to Georgia-Pacific Gypsum.

WARRANTIES AND TERMS OF SALE

For current warranty information, please go to BuildGP.com/Warranties and select the applicable product. All sales by Georgia-Pacific are subject to our Terms of Sale available at BuildGP.com/TC.

CAUTION

For product fire, safety and use information, go to BuildGP.com/SafetyInfo or call 1-800-225-6119.

HANDLING AND USE

Refer to SDS for Instructions on safe handling and use of the product here:

BuildGP.com/DensElement/Resources/Literature/

FIRE SAFETY CAUTION

Passing a fire test in a controlled laboratory setting and/or certifying or labeling a product as having a one-hour, two-hour, or any other fire resistance or protection rating and, therefore, as acceptable for use in certain fire-rated assemblies/systems, does not mean that either a particular assembly/system incorporating the product, or any given piece of the product

itself, will necessarily provide one-hour fire resistance, two-hour fire resistance, or any other specified fire resistance or protection in an actual fire. In the event of an actual fire, you should immediately take any and all actions necessary for your safety and the safety of others without regard for any fire rating of any product or assembly/system.

DensElement.com