TECHNICAL GUIDE

DENSELEMENT™ BARRIER SYSTEM

denselement.com

Product Overview

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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 a Georgia-Pacific (GP) approved fluid applied flashing. When properly installed, and when the joints, fasteners, penetrations, openings, and materials are properly sealed with a GP approved fluid-applied flashing, the DensElement Barrier System is a vapor permeable water-resistive barrier (WRB) and air-barrier (AB). This system eliminates the expense of buying and installing building wrap, fluid-applied, or self-adhered membranes onto the surface of standard gypsum sheathing.

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

The DensElement Barrier System holds an ICC-ES ESR-3786 Evaluation Report as a water-resistive and air-barrier.

The DensElement Barrier System 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 System (EIFS) when the joints, openings, penetrations, material transitions, and fasteners are properly sealed with a GP approved fluid applied flashing. DensElement Barrier System should be specified when fire resistance, water and air resistance are required. By installing DensElement Barrier System, this multiple step process can be done without the time and expense of installing a traditional water-resistive barrier air barrier (WRB-AB).

A combination Sheathing, Water-Resistive Barrier-Air-Barrier

DensElement™ Sheathing's fiberglass mat facing and AquaKor™ Technology penetrate into the core. The basis 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 joints, fasteners, openings, penetrations, and material transitions are sealed with a GP approved fluid-applied flashing.

Strength and Durability

The fiberglass mats and AquaKor™ Technology penetrate into the core to form an integrated panel that offers superb strength and durability. The flexural strength of DensElement Sheathing is approximately the same in either direction and provides a rigid sheathing allowing for either horizontal or vertical application to framing members.

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, (15.9 mm) is UL classified as Type DGG and is included in many UL and ULC assemblies. With Prosoco's NFPA 285 Compliance Program, the system meets the NFPA 285 criteria in ICC-ES Acceptance Criteria (AC) 212 for water-resistive barriers. The DensElement Barrier System is NFPA 285 compliant with EIFS assemblies that hold an ICC-ES Evaluation Report.

Mold Resistance

DensElement Sheathing has been tested and validated by UL Environmental, ul.com/spot.

Easy to Install

DensElement Sheathing can be cut and fastened with standard drywall tools and attached with non-corrosive fasteners to either metal or wood framing.

Standards and Code Compliance

DensElement Sheathing is manufactured to meet ASTM C 1177. Application standards, 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, water-resistive barrier, and air-barrier with the codes listed below as recognized by ICC-ES ESR-3786 by meeting established water-resistive barrier and air-barrier acceptance criteria.

2009, 2012, 2015 International Building Code (IBC)

2009, 2012, 2015 International Residential Code (IRC)

2009, 2012, 2015 International Energy Conservation Code (IECC)

2012, 2015 International Green Building Code (IGBC)

2014 Florida Building Code – Building

2014 Florida Building Code – Residential

2013 California Building Code (CBC)

2013 California Residential Code (CRC)

2017 City of Los Angeles Building Code (LABC)

2017 City of Los Angeles Residential Building Code (LARC)

DensElement™ Barrier System comparisons to building wrap and fluid applied systems

The uncontrolled flow of air into, and out of, buildings can create performance problems with respect to energy consumption, moisture intrusion, and indoor air quality. Building codes require a Water-Resistive Barrier to shed bulk water away from the building and an air-barrier to keep moisture laden air from entering the building.

Air leakage in a building is driven by pressure differences that are primarily created as a result of wind, the stack effect within the building, and the building's mechanical ventilation system.[1]

Air-barriers can be installed on either the inside or outside of an exterior wall. However, it is common to install the air-barrier on the outside as it is usually easier to meet the "continuous air-barrier" requirement on the outside wall.

The DensElement Barrier System is also a vapor permeable water-resistive barrier. The WRB-AB integrated into the gypsum sheathing are better suited to resist wind and suction loads with less risk of tearing or detaching from the building during construction.[2]

Summary of benefits and limitations for common exterior water-resistive and air-barrier strategies.[3]

DensElement Barrier System	• Visible and easy to install on exterior of building • No coating over field of sheathing (sealant at all joints, fasteners, openings, penetrations, and transitions) • Rigid and supportive sheathing surface for sealing • Time and money savings by eliminating additional WRB	• Detailed attention to joints, fasteners, openings, penetrations, and transitions sealant required • Must accommodate shrinkage and movement of wood framing
Taped building wrap	• Visible and easy to install on exterior of building • Minimal detailing • Serves as both the WRB and AB	• Unable to accommodate high pressures (limited to low rise structures) • Can be easily damaged during construction from wind (blow-off, tear) • Easily torn around sharp penetrations and flashings • Most difficult of membrane approaches to make airtight
Fluid applied membranes	• Visible and easy to install on exterior of building • Minimal detailing • Single material • Rigidly supported (integral support of membrane by exterior sheathing)	• Fluid-applied is more expensive than the other options • Weather can delay application

From Canadian Mortgage and Housing Corporation Project #5314.00, Air Leakage Control in Multi-Unit Residential Buildings, Submitted by RDH Building Engineering Ltd.:

[1] Executive Summary page
[2] Page 19-20
[3] Page 23

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 (ng/m^2•s•Pa)	>20
R Value[4], ft^1•°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 (wet cup method)
[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

Georgia-Pacific Gypsum and Sustainability

Georgia-Pacific Gypsum's definition of sustainability is meeting the needs of society today without jeopardizing our ability to do so in the future. We are committed to using resources efficiently to provide innovative products and solutions that meet the needs of customers and society, while operating in a manner that is environmentally and socially responsible, as well as economically sound.

We continue to focus on:

- Improving energy efficiency at our manufacturing plants
- Seeking out opportunities to reduce water use, and to reuse water more efficiently
- Finding cost effective ways to further reduce air emissions
- Recovering and reusing materials that otherwise would end up in landfills.

Green building codes, standards, and programs are establishing themselves across the country. They promote the use of products that contribute to the performance of the building, along with minimizing environmental and human health impacts over the life of the building or home. Because we embrace product performance and operate in an environmentally, socially, and economically sound manner, owners and architects can feel good about the structures they build using our products.

Many of our products contribute to LEED® and other green building codes, standards, or program credits or requirements. Please refer to www.gpgypsum.com for recycled content, regional materials, and low emitting materials information. For general information on sustainability, visit www.buildgp.com/sustainability.

DensElement™ Barrier System and Sustainability in Practice

The DensElement Barrier System has a lower environmental impact when compared to a multi-product system as modeled by the Athena Impact Estimator, an on-line tool that compares whole building life-cycle impacts of similar buildings. The Impact Estimator measures the Global Warming Potential, Non-Renewable Energy Savings and other environmental impacts of one building compared to another based on the materials used.

When measuring the Global Warming Potential and Non-Renewable Energy Savings of a building using the DensElement Barrier System compared to a building that uses a traditional building wrap, a building with the DensElement Barrier System is estimated to have a Global Warming Potential savings equal to 22 miles driven by an average car in the US and a Non-Renewable Energy Savings equivalent to powering a 60 W light bulb for 728 hours per 1000 square-feet of DensElement used.

These estimates are based on the Athena Impact Estimator, a whole-building tool used by design teams to explore the environmental footprint of different material choices

http://www.athenasmi.org/our-software-data/impact-estimator/

The car and light bulb examples are based on the CO2 equivalents from the Athena Impact Estimator and put into the Solidworks.com sustainability products calculator.

http://www.solidworks.com/sustainability/products/calculator/

Architectural Specifications

DensElement Barrier System 3-part guide specification is downloadable as a rewritable Microsoft Word document in CSI and ARCOM MasterSpec formats. 061656 (See DensElement Barrier System 3-part spec guide/BSD Speclink 061000: http://www.productmasterspec.com/Profile/Georgia-Pacific_Building_Products/64807). See the DensElement Barrier System CAD details: https://www.buildgp.com/gypsum-cad

Exterior Wall Installation Instructions

DensElement™ Sheathing must be installed in accordance with the instructions in this brochure 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. Countersunk or overdriven fasteners will have to be spot treated with a GP approved liquid flashing. 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 7" (178mm) 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.

Installing Exterior Wall Cladding over DensElement Barrier System

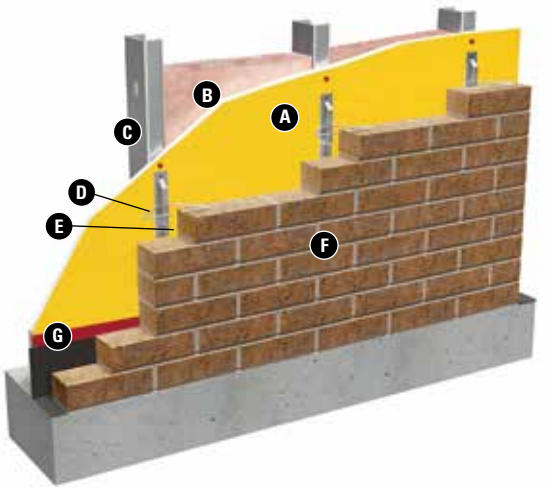
Conventional exterior claddings – including wood, vinyl, metal or cement composition, stone, brick, EIFS, and rainscreen claddings – may be applied over the DensElement Barrier System. For stucco, install a vapor-permeable water resistive barrier equal to the performance of one layer of #15 felt complying with ASTM D226.

Wall Applications

Installing Cladding over DensElement™ Barrier System

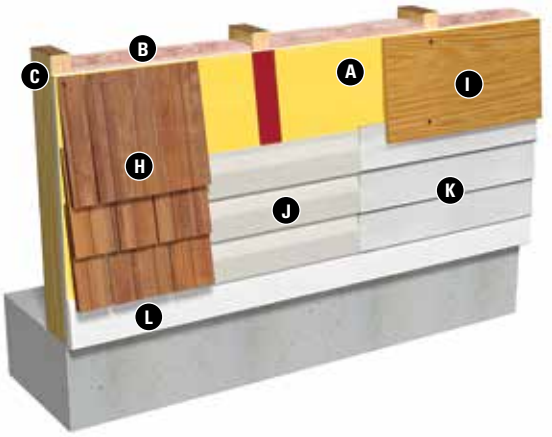
A. DensElement Barrier System with joints, sheathing fasteners, penetrations, openings and material transitions sealed
B. Insulation
C. Framing
D. Masonry Tie
E. 2" (50 mm) Max. Air Space
F. Brick Masonry
G. Fluid applied flashing
H. Wood Siding
I. Plywood Siding
J. Vinyl Siding
K. Fiber Cement Siding
L. Metal Siding

Important: Illustrations not intended for design or specification purposes.



Brick Cavity Wall

Masonry can be applied over DensElement Barrier System just as it would be over any other type of sheathing. Attach the masonry ties securely through the panels and into the steel or wood framing. Space the ties as required by masonry courses. Apply continuous insulation as required by building code or design authority.

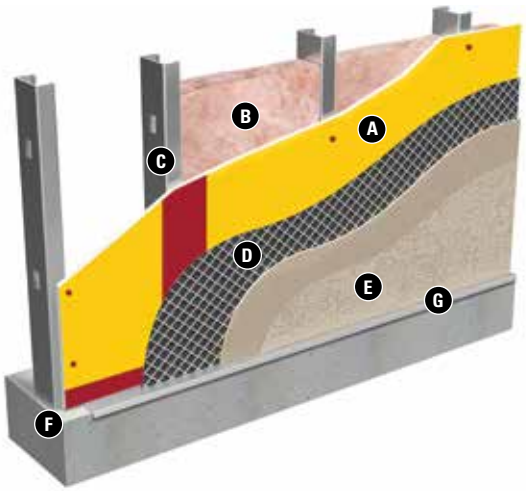


Vinyl, Metal, Wood, Fiber Cement Siding

DensElement Barrier System can be used in applications such as under wood or plywood panel siding and other horizontal siding applications. All siding must be attached through the DensElement Barrier System and into the steel or wood framing.

Wall Applications

A. DensElement™ Barrier System with joints, sheathing fasteners, penetrations, openings and material transitions sealed
B. Insulation
C. Framing
D. Paper-Backed Metal Lath
E. Conventional Stucco System
F. Minimum 1/4" (6 mm) Gap
G. Flashing and Weeps



Conventional Stucco

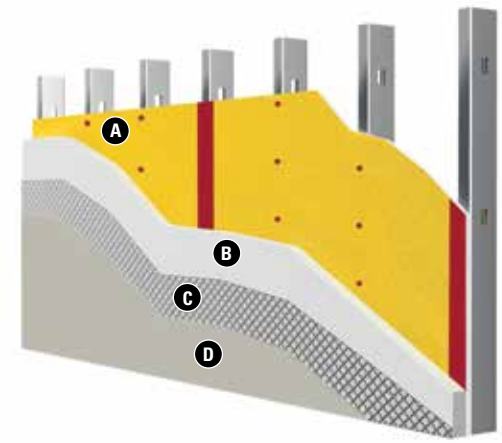
Stucco systems may be applied over DensElement Barrier System using one layer of #15 felt and metal lath. Metal lath must be mechanically attached through the DensElement Barrier System into the steel or wood framing. Install stucco system in accordance with the manufacturer's instructions and local building code requirements.

Exterior Insulation and Finish Systems (EIFS)

DensElement Barrier System is an ideal substrate for adhesive or mechanical application of expanded polystyrene (EPS) or extruded polystyrene insulation in EIFS applications and is recommended for all climate zones.

- Eliminates the need for EIFS manufacturer's air and water-resistive barrier coatings.
- Maximum framing spacing 24" (610 mm) o.c. for 5/8" (15.9 mm) DensElement™ Sheathing.

A. DensElement Barrier System with joints, sheathing fasteners, penetrations, openings and material transitions sealed
B. Polystyrene Insulation – ribbon adhered
C. Reinforcing Mesh Embedded in Base Coat
D. Finish Coat



Fastening and Framing

5/8" (15.9 mm)	24" (610 mm) o.c. max[2]	Parallel[2] 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) off center (o.c.) for both 1/2" (12.7 mm) and 5/8" (15.9 mm) DensElement™ Barrier System.

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

	1-1/4" (32 mm)	Bugle head fine thread, corrosion-resistant drill point drywall screw	DensElement Barrier System to heavy-gauge metal framing (18 gauge or thicker)
	1-1/4" (32 mm)	Bugle head fine thread, corrosion-resistant sharp point drywall screw	DensElement Barrier System to light-gauge metal framing furring (20-25 gauge)
	1-5/8" (41 mm)	Bugle head, rust-resistant, coarse thread sharp point screw	DensElement Barrier System to wood framing
	1-1/4" (32 mm) metal 1-5/8" (41 mm) wood	Wafer head, corrosion-resistant screws, drill or sharp point	DensElement Barrier System to heavy-gauge or light-gauge, metal or wood framing
	1-3/4" (45 mm)	11-gauge, galvanized nail	DensElement Barrier System 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 Horizontally Applied

Stud Spacing, In./O.C. (mm)	Screws, In./O.C. (mm)	Average load, PSF* (kPa)
16 (406)	8 (203)	131 (3.27)
16 (406)	6 (152)	158 (7.56)
16 (406)	4 (102)	193 (9.24)
12 (305)	8 (203)	170 (8.14)
12 (305)	6 (152)	212 (10.15)
12 (305)	4 (102)	261 (12.50)
8 (203)	8 (203)	212 (10.15)
8 (203)	6 (152)	318 (10.44)
8 (203)	4 (102)	398 (19.06)

NOTE: Apply DensElement Barrier System to appropriately engineered framing system. Tested applied to 6" (152 mm) x 1-5/8" (41 mm) 18-gauge (43 mils) steel studs using #6 1-1/4" (32 mm) bugle head screws. Other stud sizes may be suitable.

Source: Tested in accordance with ASTM E330 Architectural Testing, Inc., an Intertek company.

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

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

Thickness Inches (mm)	Board Orientation	Stud Spacing in. o.c. (mm)	Ultimate Load PSF* (kPa)
5/8" (15.9)	Vertical	24 (610)	68 (3.26)
5/8" (15.9)	Horizontal	24 (610)	85 (4.07)
5/8" (15.9)	Vertical	16 (406)	92 (4.40)

Source: TPI Report #89-047; wind load per ASTM E330 (bugle head screws 8" (203 mm) o.c.).

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

Fire-Rated Assemblies

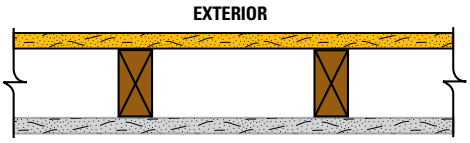
5/8" DensElement™ Sheathing is listed in UL fire-rated assemblies under the Type DGG designation under Georgia-Pacific Gypsum LLC.

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 water-resistive and air-barrier performance, the exterior wall joints will need to be flashed as described in this guide. For additional fire safety information concerning DensElement Sheathing, visit www.buildgp.com/safetyinfo.

1-Hour Fire Rating
Design Reference: UL U305, U337, GA WP 8130



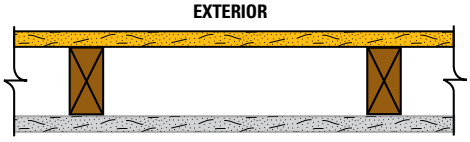
Wall Thickness: 4-3/4" (121 mm)

Weight per Sq. Ft.: 7.5 psf (37 Kg/m^2)

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 each side.

1-Hour Fire Rating
Design Reference: UL U309, cUL U309, GA WP 3510, GA WP 8105



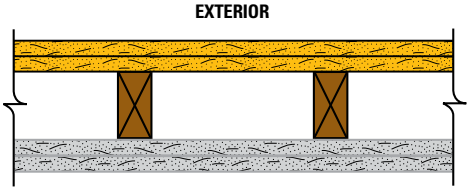
Wall Thickness: 4-7/8" (124 mm)

Weight per Sq. Ft.: 7.0 psf (34 Kg/m^2)

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, cUL U301, GA WP 8416



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

Weight per Sq. Ft.: 12.0 psf (58 Kg/m^2)

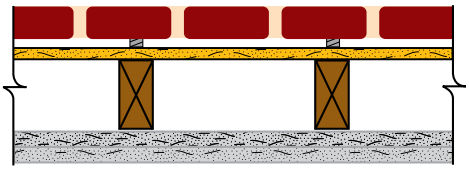
Exterior: Two layers 5/8" (15.9 mm) DensElement Sheathing applied vertically or horizontally to 2" (51 mm) x 4" (102 mm) wood studs 16" (406 mm) o.c. Base layer attached with 1-7/8" (48 mm) galvanized roofing nails 6" (152 mm) o.c. Face layer attached with 2-3/8" (60 mm) galvanized roofing nails 8" (203 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, cUL U302, GA WP 8410

EXTERIOR



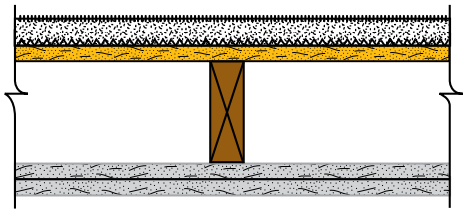
Wall Thickness: 10-1/8" (257 mm)

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® 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 8420

FIRE SIDE



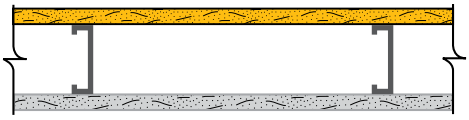
Wall Thickness: 8-5/8" (219 mm)

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 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 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, cUL U465, GA WP 8007

EXTERIOR



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

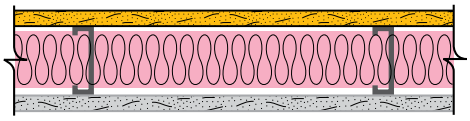
Weight per Sq. Ft.: 6 psf (29 Kg/m^2)

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" (25 mm) corrosion resistant bugle head screws 8" (203 mm) o.c. at board edges and 8" (203 mm) at intermediate studs.

Interior: 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 with 1" (25 mm) Type S bugle head screws 8" (203 mm) o.c. at board edges and 12" (305 mm) at intermediate studs. Sound tested with 3" mineral fiber, 2.5 psf, in stud space.

1-Hour Fire Rating
Design Reference: UL U425, cUL U425, GA WP 8006

EXTERIOR



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

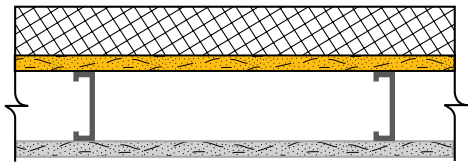
Weight per Sq. Ft.: 6 psf (29 Kg/m^2)

Exterior: 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. with 1" (25 mm) Type S corrosion resistant bugle head screws 8" (203 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 to framing with 1" (25 mm) Type S 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



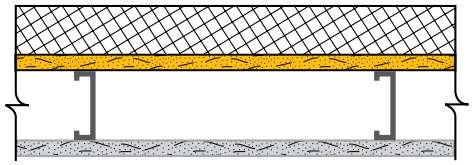
Partition Thickness: 6" – 7" (152 – 178 mm) Varies based on insulation thickness

Weight per Sq. Ft.: 7.0 psf (34 Kg/m^2)

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 8" (203 mm) o.c. at intermediate studs. Proprietary polymer modified exterior insulation and finish system applied over sheathing. 2" (51 mm) maximum foam-plastic thickness.

Interior: 5/8" (15.9 mm) ToughRock® Fireguard X® gypsum board or 5/8" (15.9 mm) DensArmor Plus® Fireguard® 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

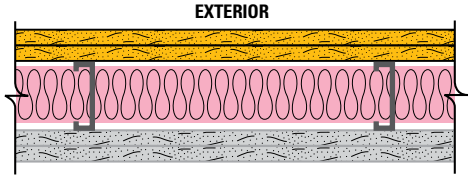
Weight per Sq. Ft.: 7.0 psf (34 Kg/m^2)

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 8" (203 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 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
For two layers of exterior sheathing, the inside layer can be either 5/8" DensGlass® Fireguard® Sheathing or DensElement Sheathing.

Design Reference: UL U425, cUL U425, GA WP 1716, GA WP 8203



Wall Thickness: 6" (152 mm)

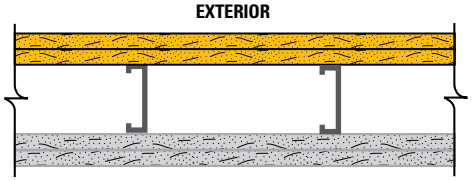
Weight per Sq. Ft.: 11.0 psf (54 Kg/m^2)

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 8" (203 mm) o.c. Face layer attached with 1-5/8" (41 mm) Type S-12 corrosion resistant bugle head screws spaced 8" (203 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
For two layers of exterior sheathing, the inside layer can be either 5/8" DensGlass Fireguard Sheathing or DensElement Sheathing.

Design Reference: UL U411, cUL U411, GA WP 1524



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

Weight per Sq. Ft.: 10 psf (49 Kg/m^2)

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 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. Sound tested with 3-1/2" (89 mm) fiberglass insulation.

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 GP approved fluid applied flashing material, from damage, weather, excessive temperatures, and construction traffic.

Store the GP approved fluid applied flashing material and primers at temperatures of 40 degrees Fahrenheit or above.

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 www.denselement.com for warranty information.

DensElement Sheathing and fluid-applied flashing materials 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.

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.

When DensElement Barrier System is used in slanted wall applications, protect the sheathing, sealed joints, treated fasteners, and openings from water ponding or settling on the assembly prior to cladding. Also, protect exposed wall ends such as those that may be found in parapets and openings to prevent water from entering the cavity.

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 laminate masonry, such as thin brick, directly to DensElement Sheathing.

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 applications.

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

Do not apply DensElement Barrier System below grade.

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

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

DensElement™ Barrier System Components and Installation Instructions

Sealing Joints, Vertical Corners, Fasteners, Openings, Penetrations and Transitions for Water-Resistive Barrier and air-barrier Compliance. Only a GP approved sealant can be used – such as Prosoco's R-Guard® FastFlash®.

Joints:

1. Apply Prosoco R-Guard FastFlash liquid flashing over the DensElement™ Sheathing joint in a zig-zag or ribbon pattern dispensed from a tube type container. Cover a minimum of 1-in. on both sides of the joint.
2. With a 4- or 6-in. straight edge knife or trowel, spread evenly over the sheathing joint.
3. Apply at a rate to achieve a minimum wet mil thickness of 16 mils over the entire joint area, leaving no exposed sheathing.

Vertical Corners:

1. Prime exposed gypsum edges of the DensElement Sheathing with Prosoco R-Guard PorousPrep Water-Based Primer.
2. Apply Prosoco R-Guard FastFlash liquid flashing over the inside and/or outside corner in a zig-zag or ribbon pattern dispensed from a tube type container. Cover a minimum of 2-in. on both sides of the corner.
3. With a 4- or 6-in. straight edge knife or trowel, spread evenly over the sheathing corner.
4. Apply at a rate to achieve a minimum wet mil thickness of 16 mils over the corner area.

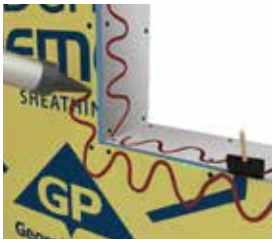
Fasteners:

1. The fasteners should be spotted with Prosoco R-Guard FastFlash liquid flashing and wiped down with a straight edge tool leaving a minimum wet mil thickness of 16 mils over the entire fastener.

Pipe Penetrations:

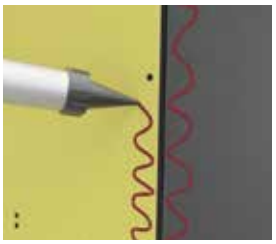
1. Mechanically secure penetrations.
2. If the gap between materials is over 1/8-in., install backer rod between penetration and DensElement Sheathing to form a back dam regardless of size of penetration or opening.
3. Apply a thick bead of Prosoco R-Guard FastFlash liquid flashing from a tube type container around the penetration.
4. Use a spatula to feather and completely seal the joint around the penetration.

Rough Openings:



1. Prime exposed gypsum edges of the DensElement™ Sheathing with Prosoco R-Guard® PorousPrep Water-Based Primer.
2. Apply a bead of Prosoco R-Guard® FastFlash® liquid flashing into the entire width of the inside corners of the opening dispensed from a tube type container.
3. Apply Prosoco R-Guard FastFlash liquid flashing onto the following openings:
   a. Sills
   b. Jambs
   c. Headers
4. Apply Prosoco R-Guard FastFlash liquid flashing over the entire width of the opening sill, jamb and header in a zig-zag or ribbon pattern dispensed from a tube type container or apply to where the window's rear air seal material will be located. Thus, the flashing should extend to the seal located toward the interior edge of the window frame.
5. Apply Prosoco R-Guard FastFlash liquid flashing over the DensElement Sheathing adjacent to the opening sill, jamb and header in a zig-zag or ribbon pattern dispensed from a tube type container. Cover a minimum of 2-in. of the sheathing surface adjacent to the opening.
6. With a 4- or 6-in. straight edge knife or trowel, spread Prosoco R-Guard FastFlash liquid flashing over the entire width of the sill, jamb, header and DensElement Sheathing surface adjacent to the opening.
7. Apply at a rate to achieve a minimum wet mil thickness of 16 mils over the opening area, leaving no exposed sheathing.

Material Transitions:



1. If the gap between materials is over 1/8-in., fill the gap between the DensElement Sheathing and adjacent materials with a backer rod.
2. If necessary, prime the adjacent material with primer per the material manufacturer's recommendations.
3. Apply Prosoco R-Guard FastFlash liquid flashing over the DensElement Sheathing and adjacent material in a zig-zag or ribbon pattern dispensed from a tube type container. Ensure the flashing is applied with a minimum of 2-in. on each substrate material surface.
4. With a 4- or 6-in. straight edge knife or trowel, spread Prosoco R-Guard FastFlash liquid flashing over material transition joint.
5. Apply at a rate to achieve a minimum wet mil thickness of 16 mils.

DensElement™ Barrier System Limited Warranty

GP Gypsum provides qualified purchases with a limited warranty for the installation of DensElement Barrier System as part of the original building envelope of a commercial or residential property entitles the qualified purchaser to a Limited Warranty.

For a full copy of the DensElement Barrier System Limited Warranty go to www.denselement.com

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, fire and mold in a broad range of commercial roofing applications. Look for DensDeck Prime and DensDeck DuraGuard Roof Boards, too.
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. GREENGUARD listed 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. 12-month limited warranty against delamination or deterioration during exposure to normal weather conditions. GREENGUARD listed for microbial resistance.
DensArmor Plus® Interior Panel	High-performance interior panel accelerates scheduling because it can be installed before the building is dried-in. A 12-month limited warranty against delamination or deterioration during exposure to normal weather conditions. GREENGUARD and GREENGUARD Gold certified for low VOC emissions. Listed in CHPS® High Performance Product Database as a low emitting product. GREENGUARD listed 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. Listed in CHPS® High Performance Product Database as a low emitting product. GREENGUARD listed 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. Listed in CHPS® High Performance Product Database as a low emitting product. GREENGUARD listed 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 job site. Conforms to requirements of 2012 IBC/IRC Code. GREENGUARD listed 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. Listed in CHPS® High Performance Product Database as a low emitting product.
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 and are listed in the CHPS® High Performance Product Database as a low emitting product. The ToughRock Mold-Guard Gypsum Board is also listed as GREENGUARD microbial resistant.
DensElement™ Barrier System	DensElement Barrier System delivers the same advantages of DensGlass Sheathing while incorporating AquaKOR™ Technology, a water-barrier system that maintains high vapor permeability mitigating the risk of moisture in the wall cavity. With this innovation built into its core, DensElement eliminates the need for additional barrier (WRB-AB) saving time, labor and materials.

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**
PROSOCO: **1-800-358-7809**

U.S. GREEN BUILDING COUNCIL MEMBER

TRADEMARKS

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WARRANTIES AND TERMS OF SALE

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

CAUTION

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

HANDLING AND USE

This product contains fiberglass facings which may cause skin irritation. Dust and fibers produced during the handling and installation of the product may cause skin, eye and respiratory tract irritation.

Avoid breathing dust and minimize contact with skin and eyes. Wear long sleeve shirts, long pants and eye protection.

Always maintain adequate ventilation. Use a dust mask or NIOSH/MSHA approved respirator as appropriate in dusty or poorly ventilated areas.

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.

www.denselement.com