

GP Georgia-Pacific
DensArmor Plus[®]
Abuse-Resistant Interior Panel

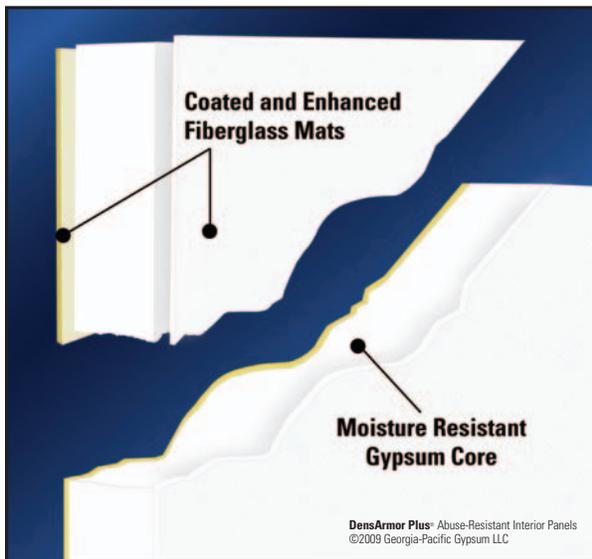
GP Georgia-Pacific
DensArmor Plus[®]
Impact-Resistant Interior Panel

MOISTURE- AND MOLD-RESISTANT HIGH-PERFORMANCE SOLUTIONS

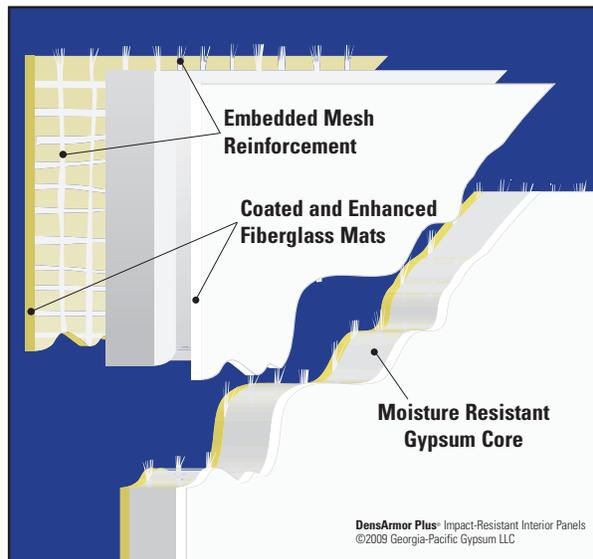


Product Overview

DensArmor Plus® Abuse-Resistant Interior Panel



DensArmor Plus® Impact-Resistant Interior Panel



Like DensArmor Plus® High-Performance Interior Panels, DensArmor Plus® Abuse-Resistant and Impact-Resistant Interior Panels have fiberglass mats for superior mold and moisture resistance compared to paper-faced drywall.

- Fiberglass mats, instead of paper facings, eliminate a potential food source for mold growth and may reduce remediation and scheduling delays associated with paper-faced drywall
- Replaces traditional paper-faced abuse- and impact-resistant panels
- Used pre-rock, DensArmor Plus Abuse- and Impact-Resistant Panels stand up to ambient moisture and incidental wettings during and after construction
- Backed with a 6-month weather exposure limited warranty against delamination, deterioration or decay. For complete warranty, visit www.gpgypsum.com.

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DensArmor Plus High-Performance and Abuse-Resistant Panels are the first and only interior gypsum panels to be GREENGUARD Indoor Air Quality Certified® and GREENGUARD Children & SchoolsSM Certified for low emissions of volatile organic compounds (VOCs) by a leading third-party organization, GREENGUARD Environmental Institute. In addition, these panels are the first and only interior panels listed as GREENGUARD microbial resistant. This listing means DensArmor Plus panels, which feature fiberglass mats instead of the paper facings used on the surface of traditional gypsum board products, resist mold growth. The microbial resistant test is based on ASTM Standard D 6329-98, a testing standard set by ASTM International, which develops testing guidelines and procedures for building materials, products, systems and services.

These panels also qualify for Collaborative for High Performance Schools (CHPS) credits. CHPS, based in California, is a national non-profit organization that works with school districts and their design teams to improve the quality of education by using products that have met requirements to receive CHPS credits.

Areas of Use

Interiors of exterior walls, where moisture intrusion is most likely.

Pre-rock areas, where the windows, doors or roof have not been installed, making moisture intrusion inevitable.

DensArmor Plus Abuse-Resistant Interior Panels are perfect for hallways, dorm and hospital rooms and other high traffic areas where scuffing and abrasions may occur.

DensArmor Plus Impact-Resistant Interior Panels, with an embedded mesh for the ultimate performance, excel in ultra high traffic such as dorms and hospital corridors or secure areas such as correctional institutions.

CAUTION: For product fire, safety and use information, go to gp.com/safetyinfo.

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DensArmor Plus® Abuse-Resistant and Impact-Resistant Panels feature fiberglass mats on both sides for superior moisture protection. A revolutionary departure from traditional wallboard, the face of DensArmor Plus panels finishes in a similar manner to traditional abuse- and impact-resistant gypsum boards and offers superior performance in resisting mold growth.

For years, DensGlass™ Exterior Sheathing (formerly DensGlass Gold® Exterior Sheathing) has been proven tough in commercial construction—under the most challenging weather conditions. Now the same powerful protection is working on the inside as DensArmor Plus Abuse-Resistant and Impact-Resistant Panels.

Integrating DensArmor Plus panels into your specifications is part of an overall building solution that can help address the mold issue and reduces the time and expense of replacing alternative products if they become wet.

When tested, as manufactured, in accordance with ASTM D 3273, all DensArmor Plus interior panels scored a 10, the highest level of performance for mold resistance under the ASTM D 3273 test method. The score of 10, in the ASTM D 3273 test, indicates no mold growth in a 4-week controlled laboratory test. The mold resistance of any building product when used in actual job site conditions may not produce the same results as were achieved in the controlled, laboratory setting. No material can be considered mold proof. When properly used with good design, handling and construction practices, Dens™ Brand gypsum products provide increased mold resistance compared to standard paper-faced gypsum products.

Georgia-Pacific Gypsum Products and LEED

Many of our products may qualify to contribute to earning LEED credits through their Green Building Rating System for *New Construction & Major Renovations Version 2.1* (LEED-NC 2.1) and other current LEED building standards. To find the Georgia-Pacific Gypsum plant source, call our Technical Hotline at 1-800-225-6119, and you may qualify for points in the following LEED categories:

Materials and Resources

- Regional Materials Credits 5.1 and 5.2
- Innovation in Design Credit

(When tested, as manufactured, in accordance with ASTM D 3273 and ASTM D 6329-98, product demonstrates significant mold growth resistance.)

Reduce Costly Remediation With Proven Fiberglass Mat Technology



Only fiberglass mat DensArmor Plus® interior panels allow contractors to hang them before dry-in. Paper-faced products are often damaged by wind-driven rain and moisture during installation. DensArmor Plus panels stand up to normal weather conditions which allows for acceleration of schedules and the potential reduction of costly delays.

Only DensArmor Plus interior panels offer a six-month weather exposure limited warranty that guards against delamination and deterioration when exposed to normal weather conditions during and after installation.

It is very important at the beginning of the specification process to understand the types of abuse a singular structure must endure in daily operation, and in turn, specify the correct system for that application.

A psychiatric hospital, designed to keep patients in, safe by themselves, and separate from each other may require different type construction than an elementary school, concerned about scuffs and dents. Both structures require durable gypsum products, but the most appropriate material should be specified. By understanding the short term requirements, long term money can be saved.

What about an Abuse-Resistant System?

An **abuse-resistant system** consists of a substrate that provides more abuse resistance than conventional gypsum panels.

- A plaster finish provides a monolithic surface and increased abrasion and impact resistance, achieving the highest quality interior panel finish.
- A primer-surfacer used in replacing a skim coat and paint primer can provide increased abrasion resistance.
- Abuse-resistant systems have been comprehensively tested for fire resistance and impact resistance. These ratings are only applicable when all of the system components are used together.
- Substitutions of any of the components are not recommended and are not supported by Georgia-Pacific Gypsum. Always refer to the appropriate product material safety data sheet for complete health and safety information.

“High traffic” is a relative term when it comes to any building project. Any commercial, institutional or residential building can include such a space. Regardless of the application, however, there are two types of potential damage that architects must consider when specifying a wall system for a high-traffic area:

Abuse Resistance: Abrasion or scuffing of the walls due to high traffic of daily operations and indentation of the wall surface. The occasional contact by humans, cleaning equipment, and the gentle shoves of furniture. Generally used in high traffic areas, abuse-resistant gypsum board reduces lifecycle cost by significantly increasing the time period between periodic maintenance and improvement of the walls appearance. Abuse resistance is an important design consideration for interior areas where a higher resistance to abrasion, indentation and impact penetration is required.

Impact Resistance: Damage due to continuous impact or high energy that can tear into the stud cavity. Using appropriate materials to resist damage not only contributes to long term looks and appeal, but also decreases short term maintenance costs of repairing the dents in the wall surface, and/or the possibility of intrusion into the inside of the wall.

In response to this, the gypsum industry has developed specialized high-performance wall panels to provide architects with appropriate and cost-effective resistance to damage, while keeping design flexibility high. These materials, along with proper systems, have helped bridge the gap between design and strength.

Abuse-Resistant vs. Impact-Resistant Interior Panels

The markets for abuse-resistant and impact-resistant panels have grown over time. They are often placed together in one gypsum category by architects and those who specify material for a job. They are thought to be interchangeable. The truth is they are separate product lines with different applications. Because of the activities taking place inside a facility, one must specify gypsum panels for specific applications.

While abuse-resistant panels are now commonly used in hospitals, sometimes architects specify impact resistance for applications where a less expensive abuse-resistant board will do the job. If there is a concern about incidental damage, such as things or people accidentally banging into the walls, then an abuse-resistant product is fine. The appropriate word is **accident**.

If people are purposely trying to destroy walls, such as prison inmates or patients in psychiatric wards, then an impact-resistant panel would be the best solution. The appropriate words are **intentional impact**.

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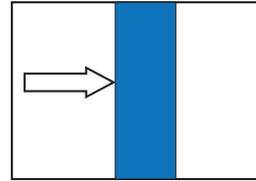
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Industry Standards

Another way to understand the difference between **penetration** and **surface damage** is graphically. At the most basic level, abuse resistance can be defined as the ability of a partition system to resist two primary types of wall damage.

Surface Damage: Abrasion and Indentation

This includes surface damage that can be caused by regular, ordinary contact with people and furniture, as well as contact with various moving objects such as a medical gurney, vacuum cleaners, mail carts and other cleaning equipment.

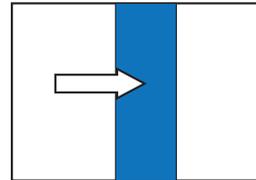


Penetration: Both Hard-Body and Soft-Body

Hard-Body: hard objects, machinery, tools

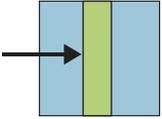
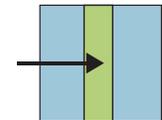
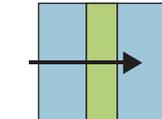
Soft-Body: human or animal

The impact of penetration through the partition into the wall cavity, causing damage that can be expensive to repair and in some instances dangerous.



Applications and Levels

Georgia-Pacific Gypsum has defined three separate levels of abuse resistance to help building owners and/or design professionals determine the type and amount of durability needed for specific building applications. Each category is described below. Each category shown represents an improvement over standard interior drywall construction.

<p>Light Duty</p>	<p>For areas requiring a basic upgrade to standard drywall, with improved resistance to incidental surface and indentation damage.</p>	<p>Single-family homes Cafeterias/public areas in medical institutions Elementary school classrooms/Stairwells</p>	<p>Incidental Damage</p> 
<p>Mild to Moderate Duty</p>	<p>For areas requiring a moderate resistance to incidental surface damage, indentation and penetration, damage from people and objects.</p>	<p>Middle/High school – classrooms, stairwells College lecture halls Multi-family stairways – common areas Mailrooms Shipping/Receiving areas Shopping Centers</p>	<p>Unintended Damage</p> 
<p>Extreme Duty</p>	<p>For areas requiring resistance to extreme levels of penetration and/or surface indentation, and damage from hard objects.</p>	<p>Court detention facilities Government/military installations Airports Sports facilities Hospital corridors Gymnasiums</p>	<p>Extreme Damage</p> 

Testing Methods—The Significance and Use

Abuse-resistant systems are tested to ensure long term performance in real world applications. All Georgia-Pacific Gypsum products and systems undergo exhaustive testing to ensure that they meet exacting standards. Independent products and systems are tested in accordance with ASTM standards. The American Society for Testing Materials (ASTM) established abuse and impact resistance standards to measure the ability of gypsum panels to withstand surface abrasion, indentation and wall penetration.

The standard ASTM C 1629, "Standard Classification for Abuse-Resistant, Non-Decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels," is the result of an industry initiative for testing method unification.

Each abuse impact property of abuse-resistant wall panels is divided into three classification levels. The three levels of classification are: Level I, Level II and Level III.

The test methods specified are utilized to establish the abuse resistance classification of an abuse-resistant wall panel. Each classification level requires a minimum overall specified performance. Any classified abuse-resistant wall panel can be used at a classification level which is rated lower than the highest level qualified.

It is critical to understand the ASTM testing methods, as well as the optimal usage for various enhanced gypsum wallboards; this is integral to maximizing durability, design flexibility and long-term cost efficiency of high traffic and high use areas.

Performance Testing – Abuse Resistance Testing Methods

Surface Damage, Abrasion Resistance—ASTM D 4977

This test method measures the ability of a gypsum panel surface to resist scratches and scuff marks by subjecting the panel to 50 back and forth cycles with a brush. This test was intended for mineral-surfaced roofing products and was modified with the addition of a 25 lb. weight to provide a suitable test of the abrasion resistance of wall panel products. In this test, the sample material is placed under a moving weighted wire brush. The value reported for the test reflects the number of cycles to which the partition can be exposed prior to failure. Failure is recorded as the depth of abrasion after 50 cycles.

Interpreting Results: The board with the least amount of “rub” is the most abrasion resistant.

Surface Abrasion (Modified ASTM D 4977)



Surface Damage, Indentation Resistance—ASTM D 5420

This test method, sometimes referred to in the industry as the “Gardner Impact Test 1”, was originally used to measure the impact resistance or toughness of plastic material. This test was modified to test gypsum panels in the same manner. This test measures the ability of a gypsum panel to resist dents from small hard objects. In this test, a 2 lb. weight is raised 36” (914 mm) above the material, then dropped onto a small 5/8” round die which hits the sample gypsum panel. The depth of the indentation is measured and recorded. The results are the average of three or more tests.

Interpreting Results: The less penetration, the better.

Surface Indentation (ASTM D 5420-Gardner Impact Test)



Penetration Soft-Body Impact—ASTM E 695

This test method covers the measurement of the relative resistance of wall, floor and roof construction to impact loading. Sources of impact may include accidental impact from a human body due to pushing, shoving or falling; or moving heavy objects such as furniture. Soft-body impact resistance testing uses a 50 lb. leather bag which is pulled away from the sample (in 6 inch increments) and released. The values reported represent the foot-pounds of energy required to produce failure of the partition.

Interpreting Results: The higher the level recorded, the better the soft-body impact performance.

Single Drop Soft-Body Impact (Modified ASTM E 695)



Penetration Hard-Body Impact ASTM C 1629—Annex A1

This proposed test method is as follows: samples of drywall, 24” x 24”, are mounted on 3-5/8” 20-gauge steel studs, 16” o.c.

A 2-3/4” diameter steel ram is driven into the board surface. The weight is increased until failure. A new panel is used for each impact. By increasing the weight of the ram, this increases the amount of impact energy which will impede the partition assembly. This is measured in foot-pounds. Hard-body impact resistance testing uses a weighted ram which is pulled away from the sample and released. The value reported is the maximum amount of impact force required to cause penetration into the partition cavity with a single blow (defined as failure of the system).

Interpreting Results: The higher the level, the greater the resistance to hard-body impact.

Hard-Body Impact (ASTM C 1629 A1)



DensArmor Plus® Abuse-Resistant Interior Panels Test Results

Test	General Description of Test	Test Result Metrics	Product Test Result
Surface Abrasion Surface Damage ASTM D 4977	A wire brush is cycled across the board surface. Failure is recorded as the depth of abrasion after 50 cycles. The lower the number the better the abrasion resistance.	1. 0.0126" 2. 0.059" 3. 0.010"	Level 3
Surface Indentation ¹ Surface Damage ASTM D 5420	A 2 lb. weight is raised 3 feet, then dropped onto a small 5/8" round die which hits the sample. The value reported is the average of 3 or more tests.	Indentation Resistance 1. 0.150" 2. 0.100" 3. 0.050"	Level 1
Soft-Body Impact Penetration ASTM E 695	A leather bag filled with 50 lbs. of shot is released against the surface of the board at increasing height until failure.	Soft Body 1. 90 ft lbs 2. 195 ft lbs 3. 300 ft lbs	Level 1

DensArmor Plus® Impact-Resistant Interior Panels Test Results

Test	General Description of Test	Test Result Metrics	Product Test Result
Surface Abrasion Surface Damage ASTM D 4977	A wire brush is cycled across the board surface. Failure is recorded as the depth of abrasion after 50 cycles. The lower the number the better the abrasion resistance.	See above.	Level 3
Surface Indentation ¹ Surface Damage ASTM D 5420	A 2 lb. weight is raised 3 feet, then dropped onto a small 5/8" round die which hits the sample. The value reported is the average of 3 or more tests.	See above.	Level 1
Soft-Body Impact Penetration ASTM E 695	A leather bag filled with 60 lbs. of shot is released against the surface of the board at increasing height until failure.	See above.	Level 3
Hard-Body Impact Penetration ASTM C 1629	A 2" diameter steel ram is driven into the board surface. Weight is increased until failure.	Hard Body 1. 50 ft lbs 2. 100 ft lbs 3. 150 ft lbs	Level 2

1. ASTM D 4226, ASTM D 5420, ASTM D 5628 Falling Dart Impact (Gardner Impact)

Enhanced Construction Schedule

The unique, moisture-resistant features of DensArmor Plus® Abuse-Resistant and Impact-Resistant Panels allow builders to install gypsum assemblies when it's not feasible to wait until cladding is completed. Georgia-Pacific Gypsum Dens™ Brand gypsum products offer weather exposure limited warranties against damage from exposure to normal weather conditions or humidity if they are stored and installed according to instructions from the manufacturer.

DensArmor Plus panels can potentially accelerate the construction process by up to 10 weeks. The potential savings in both time and money were a result of being able to install the gypsum panels earlier in the construction cycle before a structure is fully enclosed, allowing crews to work simultaneously and compressing schedules. All of our DensArmor Plus Interior Panels (High-Performance, Abuse-Resistant and Impact-Resistant) can be installed in this manner.

By building from the inside out with these moisture-resistant gypsum products, general contractors potentially can complete projects ahead of schedule, and building owners have an opportunity to generate faster cash flow by moving paying occupants in more quickly. Not every project will realize such significant results and cost savings will vary by project.

For more information on the value of using Georgia-Pacific Gypsum Dens Brand products in commercial construction, visit www.gpgypsum.com.



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Limited Warranty

DensArmor Plus® Abuse-Resistant and Impact-Resistant Panels are based on proven and patented Dens™ Brand gypsum products, which have a lengthy history of performance. Based on that track record, Georgia-Pacific Gypsum backs the performance of DensArmor Plus panels with the following limited warranty:*

- Six months of coverage against weather exposure (delamination, deterioration and decay)
- A three-year warranty against manufacturing defects.

**For complete warranty details, visit www.gpgypsum.com or call 1.800.225.6119.*



Physical Properties

Properties	DensArmor Plus® Fireguard® Type X Abuse-Resistant Panel	DensArmor Plus® Fireguard® Type X Impact-Resistant Panel
Thickness, nominal	5/8" (15.9mm) ± 1/64" (0.4mm)	5/8" (15.9mm) ± 1/64" (0.4mm)
Width, standard	4' (1219mm) ± 3/32" (2.4mm)	4' (1219mm) ± 3/32" (2.4mm)
Length, standard	8' (2440mm) to 12' (3658mm) ± 1/4" (6.4mm)	8' (2440mm) to 12' (3658mm) ± 1/4" (6.4mm)
Weight ¹ , lbs./M sq. ft., nominal	2800 ¹	3000 ¹
Edges	Tapered	Tapered
Surfacing	Coated fiberglass mat on face, back	Coated fiberglass mat on face, back
Flexural strength, parallel, lbf. ^{3,6}	>100	>100
Flexural strength, perpendicular ^{3,6}	>140	>140
R Value ²	.67	.67
Nail pull resistance minimum, lbf. ^{3,6}	90	90
Hardness core, edges and ends, lbf.	>15	>15
Water absorption (% of weight) ^{3,5}	<5%	<5%
Surface water absorption ^{3,5}	<1.6 grams	<1.6 grams
Surface burning characteristics (per ASTM E 84 or CAN/ULC-S102): flame spread/smoke developed	0/0	0/0
Humidified deflection, inches ^{3,4}	<1/8"	<1/8"
Combustibility ⁷	Noncombustible	Noncombustible
Linear expansion with moisture change in/in %RH	6.25 x 10 ⁻⁶	6.25 x 10 ⁻⁶
Coefficient of thermal expansion in/in/°F	8.5 x 10 ⁻⁶	8.5 x 10 ⁻⁶
ASTM	C 1658	C 1658

¹ Represents approximate weight for design and shipping purposes.

² Tested in accordance with ASTM C 518.

³ Tested in accordance with ASTM C 473.

⁴ Maximum requirements for ASTM C 1177 and ASTM C 1658.

⁵ Maximum requirements for ASTM C 630, ASTM C 1396 and ASTM C 1658.

⁶ Minimum requirements for ASTM C 1177 and ASTM C 1658

⁷ As defined and tested in accordance with ASTM E136.

NOTE: Specified minimum values are as in applicable ASTM C 630, ASTM C 1396, ASTM C 1177 and ASTM 1658 standards.

Installation

DensArmor Plus® Abuse-Resistant and Impact-Resistant Interior Panels are installed in a similar manner to traditional paper-faced drywall. DensArmor Plus panels should be installed according to the most current versions of Gypsum Association Publication GA-216 “Application and Finishing of Gypsum Panel Products” and ASTM C 840 “Standard Specification for Application and Finishing of Gypsum Board for Non-Fire Rated Construction.” For best results, abut DensArmor Plus panels against regular paper-faced drywall only at inside or outside corners to eliminate transitions in the field of a wall or ceiling. Adjust fastening tools to ensure that the fasteners are not over-driven through the face of the panel. Nails and screws should be driven with the heads slightly below the surface of the panel.

1. DensArmor Plus Abuse- and Impact-Resistant panels shall be installed on a minimum of 20-gauge steel studs, 16” o.c.
2. For fire rated installations, the installation and details shall be in conformity with those assemblies published in the Gypsum Association Fire Resistance Design Manual GA-600, and UL and ULC Fire Resistance Directories.
3. Nails shall be spaced a maximum of 8” (203.2 mm) on center on ceilings, and a maximum of 8” (203.2 mm) on center on walls.
4. Nails shall be driven with the heads slightly below the surface of the gypsum board, avoiding damage to the face and core of the board, such as breaking the fiberglass mat or fracturing the core.
5. Screws shall be spaced not more than 12” (304.8 mm) on center along the framing members for ceilings and 16” (406.4 mm) on center for walls where the framing members are 16” on center. Screws shall be spaced not more than 12” on center along the framing members for ceilings and walls where framing members are 24” (609.6 mm) on center.
6. When using a combination of fasteners consisting of nails along the perimeter and screws in the field of the gypsum board, the spacing between a nail and an adjacent screw shall be not more than the spacing specified for screws.
7. Screws shall be driven to provide screw head penetration just below the DensArmor Plus panel surface without breaking the fiberglass mat surface of the panel or stripping the framing member around the screw shank.
8. Suitable fascia and moulding shall be provided around the perimeter to protect the DensArmor Plus panels from direct exposure to water. Unless protected by metal or other water stops, the edges of the DensArmor Plus boards shall be placed not less than 1/2” (12.7 mm) away from abutting vertical surfaces. Do not allow water to pond on DensArmor Plus panels.

Decorative Finishes

A mock up or test wall should be used to ensure the proposed decorative finish will produce an acceptable result. Proper installation, finishing and priming are critical. Skipping a step, such as the application of a primer; or taking shortcuts, such as not using proper sanding techniques, will negatively impact the quality of the final decorative finish.

Because many factors that are unrelated to the manufacture of the panels can affect the acceptability of the final finish result, Georgia-Pacific Gypsum makes no warranty, express or implied, regarding the finish results to be achieved with DensArmor Plus® panels.

The following guidelines for priming DensArmor Plus Abuse-Resistant and Impact-Resistant Interior Panels have been developed by the Rohm & Haas Paint Quality Institute.

1. A high solids primer with at least 40% volume solids should be used. The primer can best be applied by roller at a higher film thickness in one coat vs. brush or spray applied.
2. For adequate coverage, the primer should be applied to a dry film thickness of 1.7 to 1.8 mils to ensure uniform coverage and appearance. The number of coats to achieve the dry film thickness will depend on the primer used. For instance, a primer with lower than 37% volume solids may need two coats for adequate coverage.

% Volume Solids of Primer	Spread Rate, square feet/gallon
37	330-350
40	355-380
43	380-400
47	420-450

3. For best results, apply the high solids primer with a 3/8" nap roller at a natural application rate.
4. It is possible to use a 1/2" nap roller and apply a thicker coat. However, the roller pattern is more pronounced and some may find it objectionable.
5. To maximize the mold-resistant benefit of DensArmor Plus panels, a 100% acrylic primer with mildecide should be used.
6. High-quality flat or satin paint should be applied over the primer. Semi-gloss or gloss paints are not recommended.
7. Level 5 finish is recommended for semi-gloss or gloss paints, per GA-214.

Primers on the market that provide best finishing results include:

- a. ICI Paints Glidden® Gripper® Interior/Exterior Stain Killer Primers/Sealer GL3210-1200
- b. ICI Paints Prep and Prime® Gripper MultiPurpose Interior/Exterior Water Based Primer Sealer 3210-1200
- c. Pratt and Lambert Paints, SUPRIME® Interior Latex Enamel Undercoater Z1013/F1013
- d. Do It Best® Interior Latex Wood & Wall Primer
- e. Do It Best® Latex Stainblocker Primer
- f. Sherwin Williams® Builders Solution®

Build surfacers that provide best finishing results include:

- a. ICI Paints Prep and Prime Fill & Seal Equalizing Interior Water-Based Primer Sealer 1070-1200
- b. Sherwin Williams® Prep Rite High Build Interior-Latex Primer Surfacer

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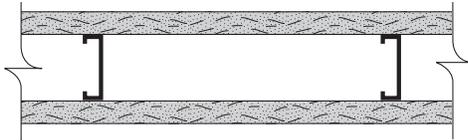
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Fire and Sound Rated Assemblies

Like DensArmor Plus® High-Performance Interior Panels, DensArmor Plus® Abuse-Resistant and Impact-Resistant Panels are offered in 5/8" Type X core types for use in fire-rated assemblies. These panels can be used in any Georgia-Pacific Gypsum or non-proprietary assembly where Type X gypsum board is required.

1-Hour Fire Rating

Test Reference: UL U465, ULC W415, GA WP 1081



48 STC Sound Trans.

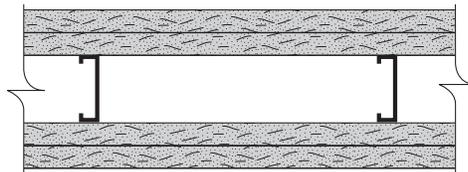
Test Reference: RAL TL99-103
 Partition Thickness: 4-7/8"
 Weight per Sq. Ft.: 6.0

Any 5/8" DensArmor Plus® Fireguard® Type X Interior panel applied vertically (U465, W415, WP1081) or horizontally (U465) to each side of 3-5/8" steel studs 24" o.c. with 1" Type S drywall screws 8" o.c. at edges and 12" o.c. at intermediate studs.

Sound Tested with 2-1/2" fiberglass insulation, friction fit in cavity

2-Hour Fire Rating

Test Reference: UL U411, cUL U411



50-54 STC Sound Trans.

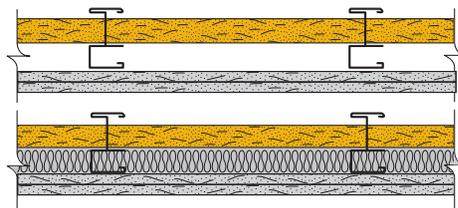
Test Reference: WHI 218-1
 Partition Thickness: 5-1/8"
 Weight per Sq. Ft.: 10

Base Layer: Any 5/8" DensArmor Plus Fireguard Type X Interior panel applied parallel to each side of 2-1/2" steel studs 24" o.c. with 1-1/4" Type S screws 16" o.c.

Face Layer: Any 5/8" DensArmor Plus Fireguard Type X Interior panel applied parallel to each side with drywall adhesive or secured with 1-5/8" Type S screws 12" o.c. at top and bottom track, 16" o.c. at edge joints only. Stagger joints 24" each layer and side.

Sound Tested with 2-1/2" fiberglass insulation

UL V473



STC = 47
 based on RAL TL 89 - 379

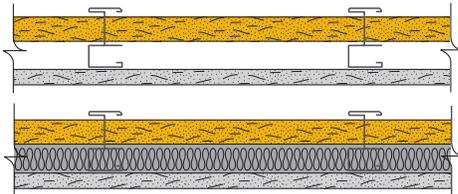
Test Reference: UL V473

Approx. Weight: 9 psf

Fiberglass sound insulation thickness is 1", 2-1/2" and 3-1/2" for C-T and C-H studs of 2-1/2", 4" and 6" respectively. Finished one side. Components: 1" DensGlass™ Fireguard® Type X Ultra Shaftliner panel, C-T studs and two layers of any 5/8" DensArmor Plus Fireguard® Type X panels installed horizontally for base layer and vertically for face layer. Edges and ends offset 24" o.c.

C-T or C-H Stud	2-1/2"	4"	6"
Wall Thickness	3-3/4"	5-1/4"	7-1/4"

Series 622 1-Hour Fire Rating



STC = 39, est.

Test Reference: GA File # WP 7001, WHI Design, GP/WA 60-01

Approx. Weight: 7 psf

Fiberglass sound insulation thickness is 1", 2-1/2" and 3-1/2" for C-T, C-H or I studs of 2-1/2", 4" and 6" respectively. Finished one side. Components: 1" DensGlass Fireguard Type X Ultra Shaftliner panel, studs and one layer of any 5/8" DensArmor Plus Fireguard Type X gypsum board installed vertically.

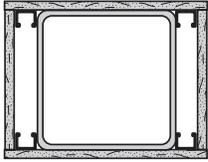
C-T, C-H or I Stud	2-1/2"	4"	6"
Wall Thickness	3-1/8"	4-5/8"	6-5/8"

CAUTION: For product fire, safety and use information, go to gp.com/safetyinfo.

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1-Hour Fire Rating

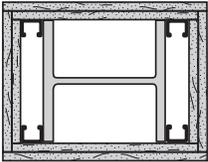
Test Reference: UL X528, GA CM 1851



One layer of any 5/8" DensArmor Plus® Fireguard® Type X panel applied without horizontal joints and parallel to 1-5/8" steel studs located at each corner of TS8x8x0.250 tube steel column with 1" Type S drywall screws 24" o.c. Steel cornerbead, 1-1/2" flanges, applied with 1" Type S drywall screws 12" o.c. in each flange. Joint compound 1/16" thick applied over corner bead.

2-Hour Fire Rating

Test Reference: UL X517, ULC Z503



Two layers of any 5/8" DensArmor Plus Fireguard Type X gypsum board screw-attached to 1-5/8" steel studs located at each corner of W10 x 49 column with 1" Type S screws 24" o.c. for base layer and 1-5/8" Type S drywall screws 12" o.c. for face layer. 1-1/4" steel beads at corners attached with 6d coated nails 1-3/4" long, 0.0915" shank, 1/4" heads, 12" o.c.

Architectural Specifications—DensArmor Plus® Abuse- and Impact-Resistant Panels

SECTION 09 29 00

GYPSUM BOARD

Part 1 – General

1.01 Summary

A. Section Includes: Fiberglass mat faced, abuse- and impact-resistant gypsum board.

EDIT LIST BELOW TO CONFORM TO PROJECT REQUIREMENTS. VERIFY SECTION NUMBERS AND TITLES.

B. Related Sections:

1. Section 06 10 00 Rough Carpentry.
2. Section 09 21 16 Gypsum Board Assemblies.
3. Section 09 22 00 Supports for Plaster and Gypsum Board.

IF THE PROJECT INCLUDES ALLOWANCES OR ALTERNATES OR UNIT PRICES, RETAIN PARAGRAPHS BELOW AND COORDINATE WITH DIVISION 01.

C. Allowances:

D. Unit Prices:

E. Alternates:

1.02 References

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM C630 Standard Specification for Water-Resistant Gypsum Backing Board.
4. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
5. ASTM C1396 Standard Specification for Gypsum Board.
6. ASTM C1658 Standard Specification for Glass Mat Gypsum Panels.
7. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
8. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

B. Gypsum Association (GA):

1. GA-216 Application and Finishing of Gypsum Panel Products.

1.03 Submittals

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.04 Quality Assurance

RETAIN BELOW IF REQUIRED, REVISE LIMITS IF REQUIRED.

A. Regulatory Requirements: Provide products that comply with the following limits for surface burning characteristics when tested per ASTM E84:

1. Flame spread: 25, maximum.
2. Smoke developed: 450, maximum.

B. Provide products that have been GREENGUARD Indoor Air Quality Certified® by the GREENGUARD Environmental Institute under the GREENGUARD Standard for Low Emitting Products and GREENGUARD for Children & SchoolsSM product certification program.

1.05 Delivery, Storage and Handling

A. Delivery: Deliver materials to the jobsite in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible. Product may also be wrapped in temporary factory-applied plastic packaging (plastic wrap) that must be removed upon receipt. Failure to remove the plastic shipping covers and plastic wrap may result in entrapment of condensation or moisture, which may cause application problems.

B. Storage and Handling: Store and handle materials to protect against contact with damp and wet surfaces, exposure to weather, breakage and damage to edges. Provide air circulation under covering and around stacks of materials. Store materials flat, inside and under cover.

THIS GUIDE SPEC WAS WRITTEN TO PROVIDE THREE EDITING OPTIONS: 1) PROPRIETARY, 2) GENERIC, OR 3) A COMBINATION OF THE TWO.

Part 2 – Products

IF PROPRIETARY PRODUCT NAMES ARE INCLUDED IN THE “MATERIALS” ARTICLE BELOW, DELETE THIS ARTICLE ALTOGETHER. IF A PROPRIETARY SPECIFICATION IS REQUIRED, RETAIN THIS ARTICLE AND DELETE THE “MATERIALS” ARTICLE.

2.01 Manufacturers

EDIT LISTS BELOW TO CONFORM TO PROJECT REQUIREMENTS. IF OTHER MANUFACTURERS ARE BEING ADDED TO THIS SECTION, ADD LISTINGS OF THEIR PROPRIETARY PRODUCT NAMES.

A. Georgia-Pacific Gypsum LLC:

1. Abuse-Resistant Fiberglass Mat Faced Gypsum Board: DensArmor Plus® Fireguard® Type X Abuse-Resistant Interior Panels.
2. Impact-Resistant Fiberglass Mat Faced Gypsum Board: DensArmor Plus Fireguard Type X Impact-Resistant Interior Panels

THIS ARTICLE INCLUDES GENERIC DESCRIPTIONS OF GYPSUM BOARD PANELS; THE NAMES OF THE CORRESPONDING GEORGIA-PACIFIC GYPSUM PRODUCTS ARE INCLUDED AS ACCEPTABLE PRODUCTS. IF THIS SECTION IS BEING EDITED TO BE GENERIC, THESE PRODUCT NAMES SHOULD BE DELETED.

IF OTHER MANUFACTURERS ARE BEING ADDED TO THIS SECTION, 1) ADD THE PROPRIETARY PRODUCT NAMES OF THOSE MANUFACTURERS, OR 2) IF PROPRIETARY NAMES ARE LISTED IN THE “MANUFACTURERS” ARTICLE ABOVE, DELETE THEM FROM THIS ARTICLE ALTOGETHER.

2.02 Materials

A. Abuse-Resistant Fiberglass Mat Faced Gypsum Board:

1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 2800 pounds per M square feet.
5. Edges: Tapered.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Flexural Strength, Parallel (ASTM C473, ASTM C1658): Not less than 100 lbf.
8. Flexural Strength, Perpendicular (ASTM C473, ASTM C1658): Not less than 140 lbf.
9. R-Value (ASTM C518): 0.67.
10. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 90 lbf.
11. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/8 inch.
12. Hardness Core, Edges, and Ends (ASTM C473, ASTM C1396, ASTM C1658): Not less than 15.
13. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
14. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
15. Abuse Resistance (ASTM C1629):
 - a. Surface Abrasion: Level 3.
 - b. Surface Indentation: Level 1.
 - c. Soft-Body Impact: Level 1.
16. Acceptable Products:
 - a. 5/8 inch DensArmor Plus Fireguard Type X Abuse-Resistant Interior Panel, Georgia-Pacific Gypsum.

B. Impact-Resistant Fiberglass Mat Faced Gypsum Board:

1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet.

CAUTION: For product fire, safety and use information, go to gp.com/safetyinfo.

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4. Weight: 2800 pounds per M square feet.
5. Edges: Tapered.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Flexural Strength, Parallel (ASTM C473, ASTM C1658): Not less than 100 lbf.
8. Flexural Strength, Perpendicular (ASTM C473, ASTM C1658): Not less than 140 lbf.
9. R-Value (ASTM C518): 0.67.
10. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 90 lbf.
11. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/8 inch.
12. Hardness Core, Edges, and Ends (ASTM C473, ASTM C1396, ASTM C1658): Not less than 15.
13. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
14. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
15. Abuse Resistance (ASTM C1629)
 - a. Surface Abrasion: Level 3.
 - b. Surface Indentation: Level 1.
 - c. Soft-Body Impact: Level 3.
 - d. Hard-Body Impact: Level 2.
16. Acceptable Products:
 - a. 5/8 Inch DensArmor Plus® Fireguard® Type X Impact-Resistant Interior Panel, Georgia-Pacific Gypsum.

Part 3 – Execution

3.01 Installation

A. General: In accordance with ASTM C840, GA-216 and the manufacturer’s recommendations.

1. Manufacturer’s Recommendations:
 - a. Current “Product Catalog,” Georgia-Pacific Gypsum.

3.02 Protection

REVISE BELOW IF OTHER THAN AIA GENERAL CONDITIONS ARE USED.

A. Protect gypsum board installations from damage and deterioration until the date of Substantial Completion.

Limitations

- DensArmor Plus® Abuse-Resistant and Impact-Resistant Interior Panels are resistant to normal weather conditions but are not intended for immersion in water. Cascading roof/floor water should be directed away from the panels until building has been properly closed in.
- The use of forced air heaters creates volumes of water vapor, which, when not properly vented, can condense on building materials. The use of these heaters and any resulting damage is not the responsibility of Georgia-Pacific Gypsum. Consult heater manufacturer for proper use and ventilation. Avoid any condition that will create moisture in the air and condensation on the exterior walls during periods when the exterior temperature is lower than the interior temperature.
- If DensArmor Plus Abuse-Resistant or Impact-Resistant Panels are used in a horizontal position, such as on a ceiling, they should not be installed in pre-rock conditions. Do not allow water to pond or settle on the panels.
- DensArmor Plus panels are not intended for roof applications. For roof applications consult our DensDeck® roof board brochure.
- DensArmor Plus Interior Panels are not intended for sheathing applications. For sheathing applications consult our DensGlass™ Exterior Sheathing brochure.
- Georgia-Pacific Gypsum does not warrant and is not responsible or liable for the performance of the systems utilizing DensArmor Plus Interior Panels. The suitability and compatibility of any system is the responsibility of the system manufacturer or design authority.
- For all installations, design details such as fasteners, sealants and control joints per system specifications must be properly installed. Openings and penetrations must be properly sealed. Failure to do so will void the warranty.
- Do not finish the board until building has been properly closed in.
- Do not use DensArmor Plus panels as a base for nailing and mechanical fastening.

COMMONLY USED METRIC CONVERSIONS

Gypsum Panel Thickness

1/4 in. – 6.4 mm
1/2 in. – 12.7 mm
5/8 in. – 15.9 mm
1 in. – 25.4 mm

Gypsum Panel Width

2 ft. – 610 mm
4 ft. – 1219 mm
32 in. – 813 mm

Gypsum Panel Length

4 ft. – 1219 mm
5 ft. – 1524 mm
8 ft. – 2438 mm
9 ft. – 2743 mm
10 ft. – 3048 mm
12 ft. – 3658 mm

Framing Spacing

16 in. – 406 mm
24 in. – 610 mm

Fastener Spacing

2 in. – 51 mm
2.5 in. – 64 mm
7 in. – 178 mm
8 in. – 203 mm
12 in. – 305 mm
16 in. – 406 mm
24 in. – 610 mm

Temperature

40°F – 5°C
50°F – 10°C
125°F – 52°C

The Dens™ Brand of High-Performance Gypsum Products from Georgia-Pacific

DensGlass™ Exterior Sheathing (formerly DensGlass Gold® Exterior Sheathing)	The original and universal standard of superior weather resistance, with a 12-month weather exposure limited warranty. Look for the familiar GOLD color.
DensShield® Tile Backer	Acrylic-coated tile backer stops moisture at the surface. Lightweight and strong, built for speed on the job site. IBC/IRC Code Compliant. GREENGUARD listed for microbial resistance.
DensDeck® Roof Boards	Fiberglass mat coverboard with a track record of resistance <i>against</i> wind uplift, hail, foot traffic, fire, moisture and mold, in a broad range of applications. Look for green DensDeck® Prime and DensDeck® DuraGuard too.
DensGlass™ Ultra Shaftliner	Specially-designed panels for moisture-prone vertical or horizontal shafts, interior stairwells and area separation wall assemblies. 12-month weather exposure limited warranty. GREENGUARD listed for microbial resistance.
DensArmor Plus® High-Performance Interior Panel	High-performance interior panel that accelerates scheduling because it can be installed before the building is dried-in. Six-month weather exposure limited warranty. GREENGUARD Indoor Air Quality Certified® for low VOC emissions. GREENGUARD listed for microbial resistance.
DensArmor Plus® Abuse-Resistant Interior Panel (formerly DensArmor Plus® Abuse Guard®)	Same benefits as DensArmor Plus® High-Performance Interior Panel with added resistance to scuffs, abrasions and surface indentations. Ideal for healthcare facilities and schools. GREENGUARD Indoor Air Quality Certified® for low VOC emissions. GREENGUARD listed for microbial resistance.
DensArmor Plus® Impact-Resistant Interior Panel (formerly DensArmor Plus® High Impact)	Even greater durability with an embedded impact-resistant mesh for the ultimate performance in high traffic areas. Ideal for healthcare facilities, schools and correctional institutions.



SALES INFORMATION AND ORDER PLACEMENT

U.S.A. Midwest: **1-800-876-4746** West: **1-800-824-7503**
South: **1-800-327-2344** Northeast: **1-800-947-4497**

CANADA Canada Toll Free: **1-800-387-6823**
Quebec Toll Free: **1-800-361-0486**

Georgia-Pacific Gypsum LLC Technical Hotline
U.S.A. and Canada: **1-800-225-6119**



Some of our products have been certified by Scientific Certification Systems (SCS). SCS is an internationally recognized third-party evaluation, testing and certification organization. Its program spans a wide cross-section of the economy, including manufacturing and retailing, consumer products, the energy industry, and the home improvement and construction sectors. For details on specific Georgia-Pacific Gypsum products and plants, please contact our Technical Hotline at 800-225-6119.

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UPDATES AND CURRENT INFORMATION

The information in this document may change without notice. Visit our website at www.gpgypsum.com for updates and current information.

LIMITATION OF REMEDIES AND DAMAGES

Unless otherwise stated in our

written warranty for these products, our sole liability for any product claim shall be limited to reimbursement of the cost of repair or replacement of the affected product, up to a maximum amount of two times the original purchase price for the affected product. We shall not be responsible under any circumstances for lost profits, damage to a structure or its contents, or indirect, incidental, special or consequential damages. Claims shall be deemed waived if they are not submitted to us in writing within ten (10) days after discovery of a product defect/circumstance giving rise to a claim.

CAUTION: For product fire, safety and use information, go to gp.com/safetyinfo.

HANDLING AND USE

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

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.