

**UK
EDITION**

GP Georgia-Pacific
DensDeck[®]
Roof Board

AN INTRODUCTION

PROTECTING FLAT ROOFS SINCE 1987



Who is Georgia-Pacific?

Georgia-Pacific is part of Koch Industries with a diverse set of businesses and industries across the world. Koch Industries, based in Wichita, Kansas, is the second largest private company in America, employing approximately 130,000 people in 70+ countries.

From the time we were founded in 1927, Georgia-Pacific has never stopped growing. We started in a single building in Augusta, Georgia, and now have more than 300 Georgia-Pacific locations around the world. Through all the ups and downs of the past century, we have kept one eye on tomorrow, watching for opportunities to grow with customers and expand into new industries and markets.

Georgia-Pacific manufactures products with divisions such as:

- Consumer Products – Tissue, Towel, Napkin, Professional Cleansers etc.;
- Packaging – Linerboard, Packaging, Cellulose, Kraft Paper etc.;
- Building Products – Gypsum, Wood etc.

Gypsum Construction Products

Georgia-Pacific is a leading manufacturer of innovative solutions which have long been recognized for contributing to the sustainability of commercial and residential buildings. Our pioneering and state-of-the-art fibreglass mat technology has inspired the construction industry to build with products that help manage incidental moisture exposure during and after construction.

With a history of innovation dating back 30+ years with the introduction of DensGlass® Sheathing, the first Dens® Solutions product that set the foundation for innovation in gypsum products for decades to come. It was the first fibreglass mat gypsum sheathing in the industry, and DensGlass® Sheathing remains the number one architecturally specified sheathing, in the US, today.¹

Available worldwide, Dens® Solutions are industry trusted, high-performing fibreglass mat gypsum panels. DensGlass® Sheathing, DensElement® Barrier System, DensShield® Tile Backer, DensGlass® Shaftliner and DensArmor Plus® Interior Panels carry the mark of the valued heritage of our Gold colour, as a visible standard-bearer of Georgia-Pacific's position as the first manufacturer to create a fibreglass mat board and as a relentless innovator of strength and moisture resistant products for over 30 years.

DensGlass® Sheathing

Widely recognized by the Gold colour, DensGlass® fibreglass mat gypsum sheathing has an exemplary track record that spans more than 30 years. It is a preferred substrate under brick, stone, stucco, siding and ETICS/EIFS due to its ability to help protect a structure against incidental moisture during and after construction.

DensGlass® Sheathing adds performance and durability to a wide range of fire-rated and non-fire-rated building assemblies. DensGlass® Sheathing has a BBA certificate 21/5958.

DensArmor Plus® Interior Panels

DensArmor Plus® Interior Panels, which feature fibreglass mats instead of the paper facings used on the surface of traditional gypsum board products, for interior use and are mould and moisture resistant. They are ideal for areas prone to high humidity such as basements and residential bathrooms, and are ideal for commercial installations. They are designed for direct attachment with screws or nails to wood and metal framing or existing surfaces. They may be used as a covering material for flat or curved structures.

DensGlass® Shaftliner

DensGlass® Shaftliner fibreglass mat gypsum liner panels are ideal for use in vertical and horizontal shaft wall assemblies, stairwell applications and area separation walls in commercial and multi-family construction.

DensGlass® Shaftliner panels help maintain flexibility with construction schedules despite bad weather and allow mechanical work such as HVAC system installation to start before the building is fully wind and weather-tight.

DensDeck® Roof Boards

Including a high-performance roof board in your roofing system is essential to the protection of the building and the valuable contents inside. With its combination of fire resistance, strength and dimensional stability, industry professionals count on DensDeck® Roof Boards to enhance the performance of their roofing systems. And in keeping with the tradition of market-driven innovation DensDeck® Prime Roof Board now includes EONIC™ Technology, an enhancement that has doubled its resistance to moisture, making it the only roof board with manufacturing specifications that include maximum 5% total water absorption resistance by weight and 1 gram surface water absorption performance on both sides of the board.²

¹ Based upon survey of CMD Group project specifications from 01/01/17 – 12/31/17.

² Based on published manufacturing specifications as of December 1, 2017.



Futureproof your flat roof with DensDeck® Roof Board

DensDeck® Roof Boards can provide added resistance for your roof build-ups on specialist buildings such as:

- data centres,
- airports, and
- biotech facilities,
- as well as any other type of commercial roof build-up.

DensDeck® Roof Boards, with their non-combustible gypsum core¹, can provide roofing systems with added:

- fire resistance,
- enhanced resistance against wind uplift and impact, and
- acoustic performance.

A Class 1 FM-approved roof build-up featuring DensDeck® Roof Boards provides fire resistance and loss prevention beyond current building regulations.

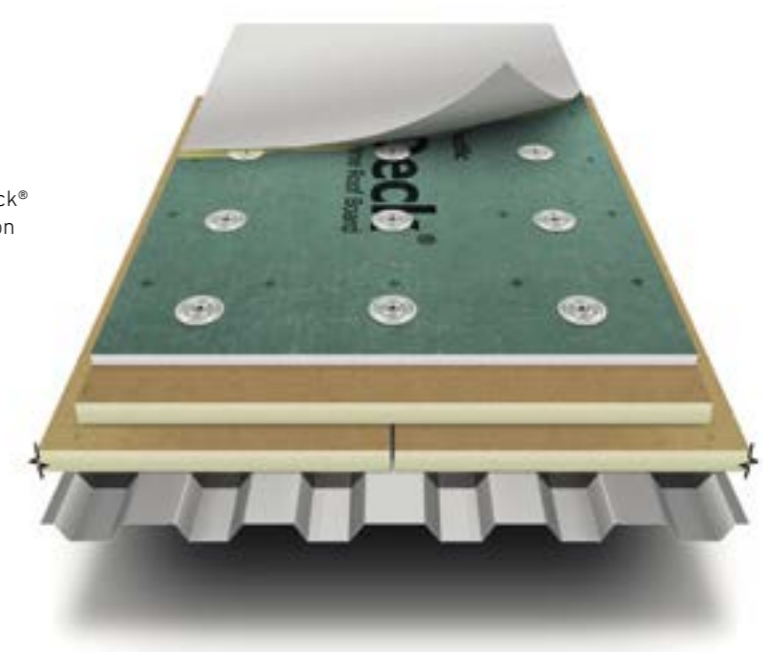
DensDeck® Roof Boards provide robust protection for insulation layers and reduce potential damage to waterproofing membranes. DensDeck® Roof Boards can help to avoid costly roof repairs.

DensDeck® Roof Boards have been tested extensively for the contribution they make, alongside insulation, to achieving high standards of acoustic performance.

As a cover board for warm flat roofs, DensDeck® Roof Boards are a robust protective and acoustic layer for the roof assembly that also provides a superior thermal barrier in case of fire.

DensDeck® Roof Boards have provided flat roofs with strength, robustness and exceptional fire performance for over thirty years.

¹ As described and tested in accordance with ASTM E136.



Fire Resistance

DensDeck® Roof Board has a non-combustible gypsum core and is classified as non-combustible¹ and has an A1 reaction to fire classification². They are used as part of the roof system to help protect the building from the spread of fire should the unthinkable happen.

Gypsum contains crystallised water incorporated into its structure. In a fire, the energy from the heat vaporises the crystallised water calcining the gypsum and creating natural fire resistance.

DensDeck® Roof Boards incorporate fibreglass mat facers that act as the first line of defence and help maintain the structural integrity of the board in the case of fire.

DensDeck® Roof Boards provide excellent fire resistance over combustible and non-combustible roof decks, including steel decks.

Roofing specifications, for steel deck installations, often include a fire resistant layer above the steel deck to help compartmentalise, control and limit the amount of fuel that can be contributed to a fire should that occur inside the building.

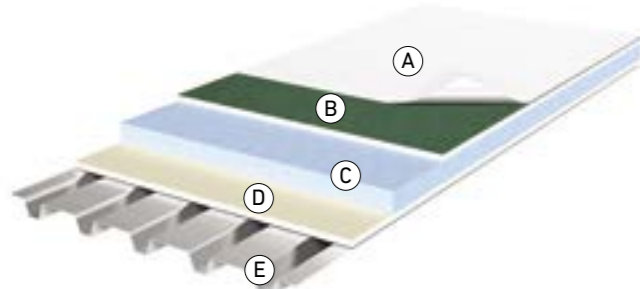
Roof boards are typically installed onto the deck, and under the insulation, to resist internal fire and heat from spreading into the roof assembly. The use of DensDeck® Roof Boards in this application can help satisfy the compartmentalisation requirements of Requirement B3: Internal fire spread (structure) as detailed in Approved Document B.

Cover boards are fitted over the insulation layer, and underneath the waterproofing layer, to help shield the roof build up from external fire sources. The use of DensDeck® Roof Boards in this application can help satisfy the requirements of Requirement B4: External fire spread as detailed in Approved Document B.

FM Approvals

DensDeck® Roof Boards are often utilised in FM Approved constructions as a roof board. In many assemblies it will be used as a cover board. In other assemblies it will serve as both roof and cover board in the same assembly. in the same system.

The following is a typical configuration of a roof deck for a FM Class 1 fire rating system and is shown here for illustration purposes only. Please consult FM or RoofNav (<https://www.roofnav.com>) for additional information.

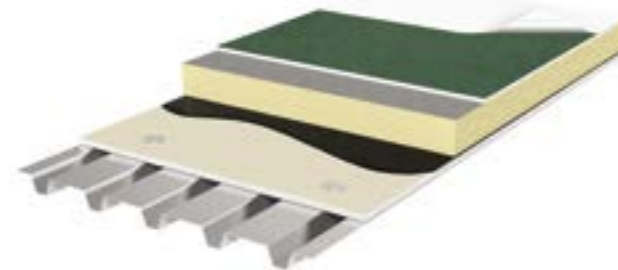


- A Membrane (various)
- B Cover board - minimum 6.4 mm (1/4 inch) DensDeck® Roof Board
- C Rigid Foam Insulation
- D Roof board - minimum 6.4 mm (1/4 inch) DensDeck® Roof Board
- E Metal Deck

Wind Uplift

In certain wind situations, wind-generated forces trying to lift the roofing off a building can be significant.

Adhered systems

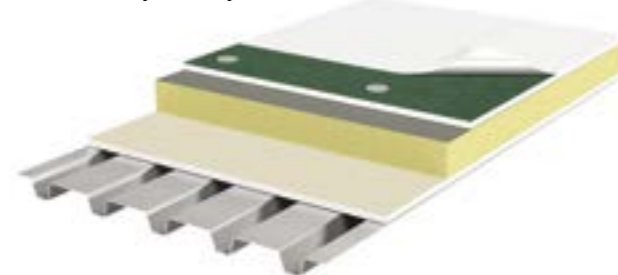


Where the waterproofing membrane is held down by a continuous coating of adhesive, wind performance relies on the strength of the substrate. If the waterproofing membrane is bonded directly to a low density insulation layer, uplift forces can pull the insulation apart.

DensDeck® Roof Board, installed between the membrane and the insulation, can prevent this.

The facings of the DensDeck® Roof Board help to provide an even bond with waterproofing membranes. This improves wind uplift resistance of the roof build up. The fibreglass facing of the cover board also helps protect the membrane from repeat hail strikes or accidental puncture by flying debris.

Mechanically fixed systems



Cover boards can also enhance durability in roof systems using mechanical fasteners rather than adhesives. In these systems, wind forces may try to rock the fasteners sideways, and the fasteners can lose compression or even back out of the decking. A suitable cover board under the membrane can keep the fasteners from rocking and protect the roof.

Note: AVCL (Air and Vapour Control Layer) not shown in illustrations. The requirement for an AVCL should be assessed in accordance with 'BS 5250:2021 Management of moisture in buildings. Code of practice' by a suitably qualified professional.

¹ As described and tested in accordance with ASTM E136.
² A1 Reaction to Fire classification in accordance with BS EN 13501-1.

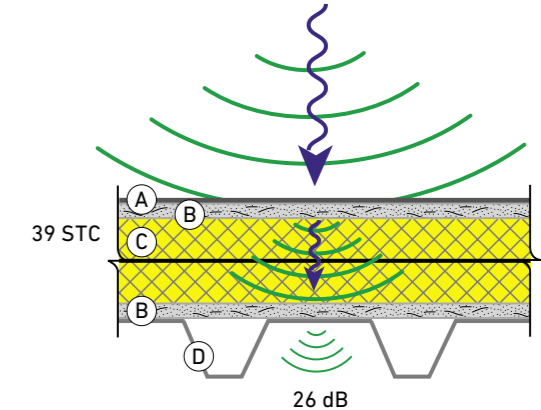
Acoustic Performance

To block unwanted entry of sound through a roof assembly, multiple layers of DensDeck® Roof Boards can help efficiently keep outside sound outside. Whether around airports, in urban environments or to keep equipment noise from disrupting the occupants of a building, DensDeck® Roof Board can effectively contribute to sound isolation.

Sound Transmission Class (STC), measured in decibels, is the weighted average of the drop in sound intensity measured in a range of frequencies from 125 to 4,000 Hz across a barrier. The sound level outside is reduced by the STC number and if the result is close to or below the background, interior sound level, it will not be heard or will not be disruptive.

An Outdoor Indoor Transmission Class (OITC) rating is a single number calculated in accordance with standard ASTM E1332 using the Transmission Loss measured at 18 one-third octave bands from 80 Hz to 4000 Hz. The rating is most appropriate for comparing the performance of exterior facade elements including roofs exposed to typical transportation noise sources.

Sound Isolation Example (assembly 9) 65 dB Sound Source



- A Membrane
- B 15.9 mm (5/8 inch) DensDeck® Roof Board
- C 2 x 51 mm (2 inch) foam insulation
- D Steel Deck

Sound Testing of Steel Deck Roof Assemblies Tested for STC

	STC	Roof Board	Insulation	Cover Board	Attachment
1	28	None	100 mm (4 inch) Polyiso	None	Mechanical
2	28	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	100 mm (4 inch) Polyiso	None	Mechanical
3	29	None	100 mm (4 inch) Polyiso	6.4 mm (1/4 inch) DensDeck® Prime Roof Board	Mechanical
4	30	None	100 mm (4 inch) Polyiso	12.7 mm (1/2 inch) DensDeck® Prime Roof Board	Mechanical
5	31	None	100 mm (4 inch) Polyiso	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Mechanical
6	33	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	100 mm (4 inch) Polyiso	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Adhered
7	35	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	100 mm (4 inch) Polyiso	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Mechanical
8	37	2 x 15.9 mm (5/8 inch) DensDeck® Prime Roof Board	100 mm (4 inch) Polyiso	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Mechanical
9	53	2 x 15.9 mm (5/8 inch) DensDeck® Prime Roof Board	150 mm (6 inch) mineral wool + flute filler	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Adhered
10	55	2 x 15.9 mm (5/8 inch) DensDeck® Prime Roof Board	150 mm (6 inch) mineral wool + flute filler	2 x 15.9 mm (5/8 inch) DensDeck® Prime Roof Board	Adhered
11	56	15.9 mm (5/8 inch) DensDeck® Prime Roof Board	75 mm (3 inch) Polyiso	12.7 mm (1/2 inch) DensDeck® Prime Roof Board	Mechanical

The table summarises results from sound testing conducted on 22 gauge type B steel deck assemblies with DensDeck® Prime Roof Boards. The tests were conducted using a modified version of ASTM E90 and E413, and the results are based on characteristics, properties and performance of materials and systems obtained under controlled test conditions. Actual results may vary and Georgia-Pacific makes no representations or warranties concerning the STC rating of any assembly.

Puncture Resistance

The use of DensDeck® Roof Board as a cover board helps to protect thermoplastic roofing membranes from puncture and damage from impact.

All types of commercial roofing membranes are susceptible to everyday punctures from a variety of sources. Rigid objects with sharp edges like dropped tools; heavy equipment; winds blown debris; and frequent foot traffic for general maintenance and repair can cause punctures at any time. DensDeck® Prime Roof Boards, when used as a cover board, support waterproofing membranes so they can better resist puncture damage, allowing them to do their job as the front-line protection of the roof assembly against water intrusion.



Independent ASTM D5635 puncture tests¹ indicated that thermoplastic membranes do not puncture as easily when 6.4 mm (1/4 inch) DensDeck® Prime Roof Boards are used as a cover board, as compared to no cover board or HD ISO cover boards.

Thermoplastic membranes tested in assemblies with 6.4 mm (1/4 inch) DensDeck® Prime Roof Boards underneath were 150 percent more puncture resistant, on average, than membranes with no cover board at all.

When compared with a membrane with a 12.5 mm (1/2 inch) HD ISO used in place of a cover board, a membrane with 6.4 mm (1/4 inch) DensDeck® Prime Roof Board delivered, on average, 67% greater puncture resistance.

Durable and versatile, DensDeck® Prime Roof Boards can potentially save money for roofing contractors, building owners and facility managers by eliminating or reducing the need for costly repairs due to punctures during and after completion of the roof installation.

¹ Puncture resistance testing conducted by Jim Koontz & Associates, July 21, 2014 to August 1, 2014, in its Hobbs, N.M. laboratory, according to ASTM D5635 standards. Assemblies included a base layer of 2", 20-psi polyisocyanurate insulation; and configurations were covered with 45-mil thermoplastic polyolefin (TPO) or 48 mil polyvinyl chloride (PVC) membranes. The test method evaluates the maximum puncture load the samples can withstand, without allowing the passage of water when subjected to impact from a rigid object with sharp edges.

DensDeck® Roof Board – Physical Properties

Properties	6.4 mm (1/4 inch)	12.7 mm (1/2 inch)	15.9 mm (5/8 inch)
Thickness, nominal (mm)	6.4 ± 1.6	12.7 ± 0.8	15.9 ± 0.8
Width, standard (mm)	1219 ± 3	1219 ± 3	1219 ± 3
Length, standard (mm)	2438 ± 6.4	2438 ± 6.4	2438 ± 6.4
Weight ¹ , nominal (kg/m ²)	5.9	9.8	12.2
Surfacing	Fibreglass mat	Fibreglass mat	Fibreglass mat
Flexural Strength ² , parallel (N)	≥ 178	≥ 356	≥ 444
Flute Spanability ³ (mm)	67	127	203
Permeance ⁴ (ng/Pa·S·m ²)	> 2850	> 1995	> 1824
Thermal conductivity ⁵ (W/m·K)	0.10	0.13	0.14
Linear Variation with change in temperature (mm/mm/°C)	15.3 x 10 ⁻⁶	15.3 x 10 ⁻⁶	15.3 x 10 ⁻⁶
Linear Variation with change in moisture (mm/mm/%RH)	11.7 x 10 ⁻⁶	11.7 x 10 ⁻⁶	11.7 x 10 ⁻⁶
Water Absorption ⁶ (% max)	10	10	10
Compressive Strength ⁷ , nominal (kPa)	6205	6205	6205
Surface Water Absorption, nominal (grams)	< 2.5	< 2.5	< 2.5
Flame Spread, Smoke Developed (ASTM E84, UL 723, ULC CAN-S102)	0/0	0/0	0/0
Reaction to Fire Classification ⁸	A1	A1	A1
Bending Radius (mm)	1524	2438	3658
Mould Resistance ⁹	10 (highest possible)	10 (highest possible)	10 (highest possible)
Product Standard Compliance	ASTM C1177	ASTM C1177	ASTM C1177

¹ Represents approximate weight for design and shipping purposes. Actual weight may vary based on manufacturing location and other factors.

² Tested in accordance with ASTM C473, method B.

³ Tested in accordance with ASTM E661.

⁴ Tested in accordance with ASTM E96 (dry cup method).

⁵ Tested in accordance with BS EN 12664:2001 Thermal performance of building materials and products.

⁶ Specified values per ASTM C1177.

⁷ Tested in accordance with ASTM C473.

⁸ Tested and classified in accordance with EN 13501-1

⁹ When tested, as manufactured, in accordance with ASTM D3273, DensDeck® Roof Boards have scored a 10, the highest level of performance for mould resistance under the ASTM D3273 test method. The score of 10, in the ASTM D3273 test, indicates no mould growth in a 4-week controlled laboratory test. The mould 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 mould proof. For additional information, go to www.buildgp.com/safetyinfo

DensDeck® Prime Roof Board – Physical Properties

Properties	6.4 mm (1/4 inch)	12.7 mm (1/2 inch)	15.9 mm (5/8 inch)
Thickness, nominal (mm)	6.4 ± 1.6	12.7 ± 0.8	15.9 ± 0.8
Width, standard (mm)	1219 ± 3	1219 ± 3	1219 ± 3
Length, standard (mm)	1219, 2438 ± 6.4	1219, 2438 ± 6.4	1219, 2438 ± 6.4
Weight ¹ , nominal (kg/m ²)	5.9	9.8	12.2
Surfacing	Fibreglass mat with non-asphaltic coating	Fibreglass mat with non-asphaltic coating	Fibreglass mat with non-asphaltic coating
Flexural Strength ² , parallel (N)	≥ 178	≥ 356	≥ 444
Flute Spanability ³ (mm)	67	127	203
Permeance ⁴ (ng/Pa·S·m ²)	> 1710	> 1300	> 970
Thermal conductivity ⁵ (W/m·K)	0.12	0.16	0.17
Linear Variation with change in temperature (mm/mm/°C)	15.3 x 10 ⁻⁶	15.3 x 10 ⁻⁶	15.3 x 10 ⁻⁶
Linear Variation with change in moisture (mm/mm/%RH)	6.25 x 10 ⁻⁶	6.25 x 10 ⁻⁶	6.25 x 10 ⁻⁶
Water Absorption ⁶ (% max)	5	5	5
Compressive Strength ⁷ , nominal (kPa)	6205	6205	6205
Surface Water Absorption, nominal (grams)	1	1	1
Flame Spread, Smoke Developed (ASTM E84, UL 723, ULC CAN-S102)	0/0	0/0	0/0
Reaction to Fire Classification ⁸	A1	A1	A1
Bending Radius (mm)	1219	1829	2438
Mould Resistance ⁹	10 (highest possible)	10 (highest possible)	10 (highest possible)
Product Standard Compliance	ASTM C1177	ASTM C1177	ASTM C1177

¹ Represents approximate weight for design and shipping purposes. Actual weight may vary based on manufacturing location and other factors.

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Recommendations and limitations for use

The following recommendations and limitations together with the installation, handling, storage and other guidelines contained in this guide are important to ensure the proper use and benefits of DensDeck® Roof Boards. Failure to adhere to such recommendations and limitations may void the limited warranty provided by Georgia-Pacific Gypsum for such product. DensDeck® Prime Roof Boards (12.7 mm and 15.9 mm only) and DensDeck® StormX™ Roof Boards (15.9 mm) are backed with a limited warranty for up to 90 days of exposure to normal weather conditions when applied on vertical parapet walls. For additional details and warranty information for DensDeck® Roof Boards, please go to www.DensDeck.com.

Georgia-Pacific Gypsum does not warrant and does not provide specifications or instructions for any specific assembly or system utilizing DensDeck® Roof Boards or any component in such assemblies or systems other than DensDeck® Roof Boards. Any references to assemblies or systems are for illustration or general information only. Consult with the appropriate system manufacturer and/or designer for system specifications and instructions. In case of conflicting recommendations, system manufacturers and/or designer's should prevail.

Design

DensDeck® Roof Boards are manufactured to act with a properly designed roof system following good roofing practices. The actual use of DensDeck® Roof Boards as a roofing component in any system or assembly is the responsibility of the roofing system's designer. Georgia-Pacific Gypsum does not offer roofing system design services and neither warrants, nor is responsible for, any systems or assemblies utilizing DensDeck® Roof Boards or any component in such systems or assemblies other than DensDeck® Roof Boards.

The need for a separator sheet between the DensDeck® Roof Boards and the roofing membrane must be determined by the roof membrane manufacturer or roofing system designer.

Confirm any priming requirements of DensDeck® Roof Boards with membrane manufacturer.

The entry of water vapour and its subsequent condensation can be detrimental to a roof's performance, including the performance of DensDeck® Roof Boards. An Air and Vapour Control Layer (AVCL) can be used to control migration of water vapour into the roof system. Determining the need for an AVCL, its compatibility with other materials, such as structural concrete decks, and the details of its construction is the responsibility of the designer.

Application

When applying solvent-based adhesives or primers, allow sufficient time for the solvent to flash off to avoid damage to roofing components.

DensDeck® and DensDeck® Prime Roof Boards should not be subjected to abnormal or excessive loads or foot traffic, such as, but not limited to, use on plaza decks or under steel-wheeled equipment that may fracture or damage the panels. Provide suitable roofing system protection when required.

When Roof Top Paver Pedestal Systems are applied over DensDeck® Roof Boards, the calculated pedestal kPa loads with safety factor shall not exceed the compressive strength of DensDeck® Roof Boards.

For hot mopping asphalt or coal tar directly to DensDeck® Prime Roof Board, follow the manufacturer's recommended system application temperature guidelines and good roofing practices.

DensDeck® Prime Roof Board is the preferred substrate for torch application. However, the product must be dry prior to commencing installation of torch application.

- Ensure product is dry. Ensure proper torching technique.
- Limit the heat to the roof board. Maintain a majority of the torch flame directly on the roll.



GP Gypsum LLC
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CAUTION: For fire, safety and use information go to <https://buildgp.com/product-fire-safety-and-use-information/>.

TRADEMARKS

Unless otherwise noted, all trademarks are owned by or licensed to Georgia-Pacific Gypsum LLC. RoofNav is a registered mark of FM Approvals LLC.

WARRANTIES, REMEDIES 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.

UPDATES AND CURRENT INFORMATION

The information in this document may change without notice. Visit our website at <https://buildgp.com/gypsum/> for updates and current information.

CAUTION: For product fire, safety and use information, go to buildgp.com/safetyinfo or email: DensInternational@GAPAC.com

HANDLING AND USE

CAUTION: This product contains fibreglass facings which may cause skin irritation. Dust and fibres 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, trousers and eye protection. Use only in well-ventilated areas. Wear eye / face protection. Face masks to EN 149 FFP2. Wear eye / face protection. Eye protection to BS EN 166.

FIRE SAFETY

CAUTION: Passing a fire test in a controlled laboratory setting and/or certifying or labelling 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.