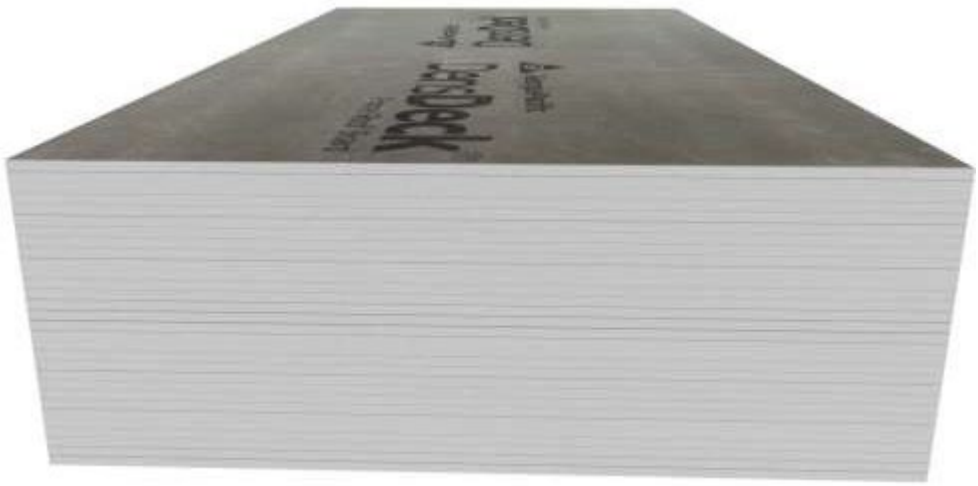
Georgia-Pacific Gypsum

# Environmental Product Declaration

## ACCORDING TO ISO 14025:2006 AND ISO 21930:2017

*Type III environmental product declaration (EPD) developed according to ISO 14025:2006 and 21930:2017 for Gypsum 1/2" DensDeck® Prime Roof Board*



NSF Certified Environmental Product Declaration www.nsf.org

| | |
|---|---|
| EPD Program and Program Operator Name, Address, Logo, and Website | NSF Certification LLC<br>789 N. Dixboro, Ann Arbor, MI 48105<br>www.nsf.org |
| General Program Instructions and Version Number | NSF Program Operator Rules, NSF International. February 23, 2015 |
| Manufacturer Name and Address | Georgia-Pacific Gypsum, LLC<br>133 Peachtree St NE<br>Atlanta, GA 30303 |
| Declaration Number | EPD11132 |
| Declared Product & Functional Unit | 1/2" DensDeck® Prime Roof Board<br>1 $m^2$ of installed roof cover board |
| Reference PCR and Version Number | ULE Part A: Life Cycle Assessment Calculation Rules and Reports Requirements, v4.0<br>ULE Part B: Roof Cover Protection Board EPD Requirements, v1.0 |
| Description of product's intended application and use (as identified when determining product RSL) | 1/2" DensDeck® Prime Roof Board is used in a variety of commercial roof assemblies both as a roof cover board below the roof membrane and a thermal barrier above the roof deck. |
| Product RSL Description (if appl.) | 40 years |
| Markets of Applicability | North America |
| Date of Issue | August 8, 2025 |
| Period of Validity | 08/08/2025 - 08/08/2030 |
| EPD Type | Product-specific |
| Dataset Variability | N/A |
| EPD Scope | Cradle to gate with options (A4, A5, B4, C1-C4) |
| Year(s) of reported manufacturer primary data | 2023 |
| LCA Software & Version Number | Sphera's LCA FE (fka GaBi) v10.9.0.20 |
| LCI Database(s) & Version Number | Sphera's MLC (fka GaBi) v2025.1 |
| LCIA Methodology & Version Number | IPCC AR6, IPCC AR5, TRACI v2.1; CML v4.7 |

| | |
|---|---|
| The sub-category PCR review was conducted by: | Jack Geibig (Chair), Angela Fisher, Mike Ennis |
| This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR<br><br>☐ INTERNAL X EXTERNAL | Jack Geibig, EcoForm, LLC jgeibig@ecoform.com |
| This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: | Sphera Solutions, Inc. |
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: | Jack Geibig, EcoForm, LLC jgeibig@ecoform.com |

Limitations

Environmental declarations from different programs (ISO 14025) may not be comparable.

Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.

Full conformance with this PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

# 1 General Information

## 1.1 Description of Organization

Georgia-Pacific Gypsum LLC manufacturers a wide array of interior and exterior products designed to provide the highest level of performance in the most challenging commercial and residential applications. Since 1965, Georgia-Pacific has developed the highest quality gypsum building products in the industry. Georgia-Pacific's versatile ToughRock® gypsum boards are ideal for interior applications, and the Dens® family of high-performance fiberglass mat-faced gypsum products offer exceptional strength and superior moisture, mold and fire resistance. Today, Georgia-Pacific is still innovating groundbreaking gypsum products designed to help construct the highest quality commercial and residential buildings.

## 1.2 Product Definition

DensDeck® Prime Roof Board is designed to address persistent challenges inherent in commercial roofing assemblies, such as fire resistance, strength and dimensional stability, when installed in a properly designed roof assembly. It is a fiberglass mat-faced, noncombustible (as described and tested in accordance with ASTM E136), nonstructural, gypsum core panel. It is recommended for mechanically attached, adhered and partially adhered roofing systems, providing an ideal bonding surface for roofing membranes as well as air/vapor retarders.

### *1.2.1 Product Identification*

1/2" DensDeck® Prime Roof Board is a 0.5” (1.27 cm) thick Glass Mat Gypsum Panel and is sold in 4' x 4' (1.219 m x 1.219 m) and 4' x 8' (1.219 m x 2.438 m) sheets as shown in Figure-1-1.

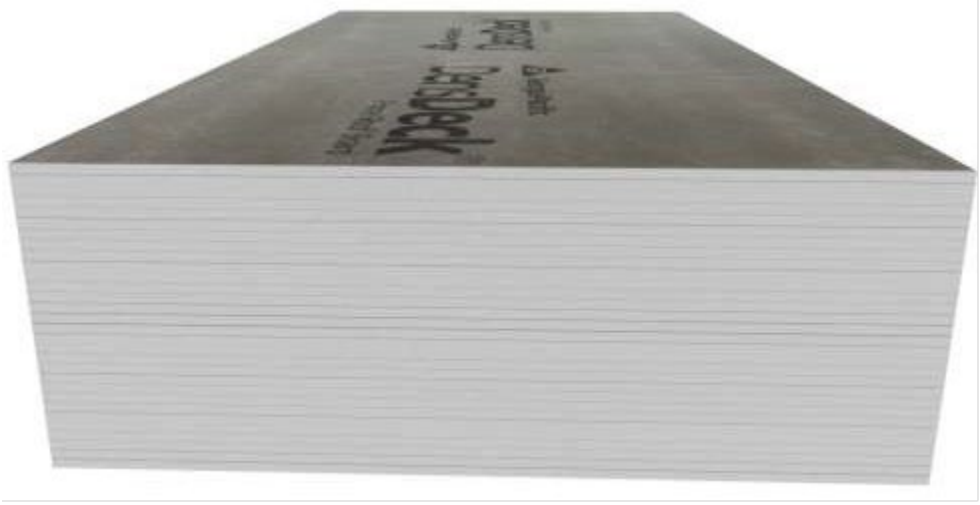


**Figure 1-1: Image of DensDeck Roof Board**

### *1.2.2 Product Specification*

1/2" DensDeck® Prime Roof Board complies with the standards listed in Table 1-1. Additional technical information, installation guides, product safety data sheets, and health product declarations can be found at www.buildgp.com.

**Table 1-1: Technical specification data for 1/2" DensDeck® Prime Roof Board**

| Name | Standard | Value | Unit |
|---|---|---|---|
| Mass | - | 2.0661 (10.082) | lb/sf ($kg/m^2$) |
| Thickness | ASTM C473 | 0.5 ± 0.03125 (12.7 ± 0.79375) | in (mm) |
| Compressive Strength | ASTM C473 | 900 (6205) | psi (kPa) |
| Total Water Absorption | ASTM C473 | ≤5.0 | % |
| Surface Water Absorption | ASTM C473 | 1.0 | g |
| R-value | ASTM C518 | 0.56 (0.1) | $ft^2$•°F• hr/BTU ($m^2$• K/W) |
| Linear Variation with Change in Temperature | | 8.5E-06 (15.3E-06) | in/in/°F (mm/mm/°C) |
| Linear Variation with Change in Moisture | | 6.25E-06 | in/in/% RH |
| Permeance | ASTM E96 | >23 >1300 | perm (ng/Pa• s• $m^2$ ) |
| Class Fire Rating | ASTM E84 | 0/0 | Flame/Smoke Spread |
| Mold Resistance | ASTM 3273 | 10 (highest possible) | |
| Flute Spanability | ASTM E661 | 5 (127) | in (mm) |

Figure 1-1 shows a simplified process flow diagram for the 1/2" DensDeck® Prime Roof Board

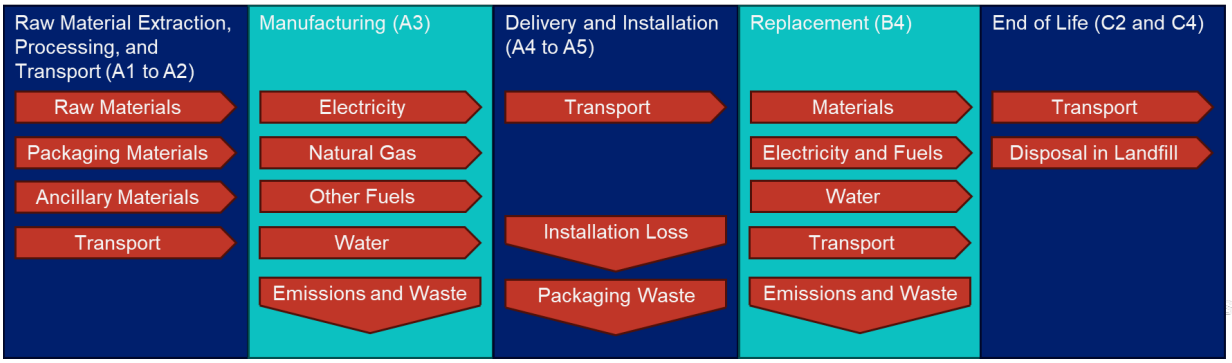



**Figure 1-1: Simplified process flow diagram for 1/2" DensDeck® Prime Roof Board**

## *1.2.3 Product-Specific EPD*

1/2" DensDeck® Prime Roof Board is produced at 7 facilities across the US:

- Antioch, California
- Fletcher, Oklahoma
- Fort Dodge, Iowa
- Las Vegas, Nevada
- Lovell, Wyoming
- Newington, New Hampshire

- Savannah, Georgia

The weighted average results for 1/2" DensDeck® Prime Roof Board were calculated based on its 2023 annual throughput from each facility. The boards produced at different facilities have the same thickness as defined in Table 1-1.

### *1.2.4 Application*

1/2" DensDeck® Prime Roof Board is primarily used in commercial roof assemblies under the roofing membrane and have a reference service life (RSL) of 40 years.

### *1.2.5 Material Composition*

The material content for 1/2" DensDeck® Prime Roof Board is shown in Table 1-2. Product formulation (wet value at the time of manufacture), on the basis of 1 $m^2$ of 1/2" DensDeck® Prime Roof Board output (dry value) with a finished density of 10.082 kg/$m^2$ (2.0661 lb/ $ft^2$) at 0.5% moisture content at the facility gate.

Calcium sulfated dihydrate (gypsum), fibrous glass (fiberglass), crystalline silica (quartz), and vermiculite are listed in the Glass Mat Faced Gypsum Panel Safety Data Sheet. 1/2" DensDeck® Prime Roof Board is not hazardous in the form in which it is shipped by the manufacturer but may become hazardous by downstream activities such as cutting, sanding, or otherwise working with this product that generate large amounts of dust.

**Table 1-2: Material composition**

| INGREDIENT NAME | CAS NUMBER | PERCENT COMPOSITION |
|---|---|---|
| Calcium sulfate dihydrate (gypsum) | 10101-41-4 | 81.89 |
| Fibrous glass (fiberglass) | 65997-17-3 | 6.8027 |
| Crystalline Silica (quartz) | 14808-60-7 | 0.020535 |
| Vermiculite | 1318-00-9 | 0 |
| Additional wet and dry additives | N/A | 11.287 |

# 2 Methodological Framework

## 2.1 Functional Unit

Per section 3.1 of the Part B PCR (UL Environment, 2021), the functional unit for this EPD is 1 $m^2$ of installed roof cover board, excluding other layers, ancillary materials, fasteners, and adhesives required to achieve the expected performance. Additional details are provided in Table 2-1.

**Table 2-11: Functional unit properties**

| NAME | VALUE |
|---|---|
| Functional Unit | 1 $m^2$ installed roof cover board, including 7% installation waste |
| Declared thickness | 1.27 cm (0.5 in) |
| Surface weighted per functional unit | 10.082 kg/$m^2$ (2.0661 lbm/$ft^2$) |

## 2.2 System Boundary

The system boundary for this EPD is cradle to gate with options (A4, A5, B4, C1-C4) as shown in Table 2-2.

**Table 2-22: Description of the system boundary modules**

| PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Raw material supply | Transport | Manufacturing | Transport from gate to site | Assembly/Install | Use | Maintenance | Repair | Replacement | Refurbishment | Building Operational Energy Use During Product Use | Building Operational Water Use During Product Use | Deconstruction | Transport | Waste processing | Disposal | Reuse, Recovery, Recycling Potential |
| x | x | x | X | X | MND | MND | MND | X | MND | MND | MND | X | X | X | X | MND |

## 2.3 Product Specific Calculations for Use Phase

Per PCR Part B section 3.5 (UL Environment, 2021), modules B1, B2, B3, B5, B6, and B7 are assumed to be zero for 1/2" DensDeck® Prime Roof Board.

## 2.4 Reference Service Life and Estimated Building Service Life

The default reference service life (RSL) of 40 years and building estimated service life of 75 years provided in the Part B PCR section 3.6 (UL Environment, 2021) is used for this EPD.

## 2.5 Allocation

Facility-level data such as air, water and soil emissions, gypsum raw material, paper raw material, water consumption and energy were allocated according to production mass as required by the Part B PCR section 3.7 (UL Environment, 2021). There are no co-products in the foreground system, therefore allocation was not required.

Descriptions of allocation procedures in Sphera's MLC background datasets are available online at https://lcadatabase.sphera.com/ (Sphera, 2025)

## 2.6 Cut-Off Rules

Per the Part B PCR section 3.8 (UL Environment, 2021), all known mass and energy flows are reported for the processes within the system boundary, and no known energy or material flows have been deliberately excluded. Use of tools for installation has been excluded, since they are used in many projects, it is difficult to determine the exact share of specific installation, and they are assumed to contribute negligibly to the results. Energy use for installation and deconstruction was excluded based on Part B PCR section 3.13 (UL Environment, 2021). Any excluded flows are less than 1% of energy, mass, or environmental impacts, and the total excluded flows per module are less than 5%. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding

environmental impacts.

## 2.7 Data Sources

Primary data for material and energy inputs associated with the production of 1/2" DensDeck® Prime Roof Board were collected for each of the 7 that produce it. Primary data was also provided by suppliers of the glass mat used in the roof board. This primary data was provided for the 12 calendar months of 2023.

Secondary data from Sphera's managed LCA content (MLC) v2025.1 was used for environmental burdens associated with raw materials and energy inputs and waste management processes as described in the background report. Table 2-3 lists all the datasets used in the model. Additional information on these datasets can be found online at https://lcadatabase.sphera.com/ (Sphera, 2025).

**Table 2-3: List of secondary datasets used**

| FLOW/ PROCESS | GEO REF | DATASET | PROVIDER | REF YEAR |
|---|---|---|---|---|
| **Electricity** | US | Electricity grid mix | Sphera | 2022 |
| | Savannah, GA | Electricity grid mix – SRSO | Sphera | 2022 |
| | Fletcher, OK | Electricity grid mix – SPSO | Sphera | 2022 |
| | Antioch, CA | Electricity grid mix – CAMX | Sphera | 2022 |
| | Newington, NH | Electricity grid mix – NEWE | Sphera | 2022 |
| | Fort Dodge, IA | Electricity grid mix – MROW | Sphera | 2022 |
| | Lovell, WY; Las Vegas, NV | Electricity grid mix – NWPP | Sphera | 2022 |
| **Thermal Energy** | US | Natural gas mix | Sphera | 2021 |
| **Diesel** | US | Diesel mix at refinery | Sphera | 2021 |
| | US | Diesel mix at filling station | Sphera | 2021 |
| **Propane** | US | Propane at refinery | Sphera | 2021 |
| **Gasoline** | US | Gasoline mix (regular) at refinery | Sphera | 2021 |
| **Truck** | US | Truck - Trailer, basic enclosed / 45,000 lb payload - 8b | Sphera | 2023 |
| **Ammonium sulfate** | US | Ammonium sulphate, by product acrylonitrile, hydrocyanic acid | Sphera | 2024 |
| **Boric acid** | US | Boric acid by-product sodium sulfate (approximation) | Sphera | 2024 |
| **Dispersing agent** | GLO | Dispersing agent (anionic dispersant and ethoxylate non-ionic mixture) | Sphera | 2024 |
| **Dried starch** | US | Dried starch (corn wet mill) (economic allocation) | Sphera | 2024 |
| **Ethylenediaminetetraacetic acid** | RER | Ethylenediaminetetraacetic acid (EDTA) (approximation) | Sphera | 2024 |
| **Glass fibers** | US | Glass fibres | Sphera | 2024 |
| **Glucose** | US | Glucose (via starch hydrolysis) | Sphera | 2024 |
| **Kraft paper** | RER | Kraft paper (EN15804 A1-A3) | Sphera | 2024 |
| **Softwood Lumber** | US | Lumber softwood (at sawmill, economic allocation) | Sphera | 2024 |
| **Lubricants** | US | Lubricants at refinery | Sphera | 2021 |
| **Surfactant** | GLO | Non-ionic surfactant (fatty acid derivate) | Sphera | 2024 |
| **Polyacrylate ink** | US | Polyacrylate ink (approximation) | Sphera | 2024 |
| **Polyethylene Film** | US | Polyethylene Film (LDPE/PE-LD) | Sphera | 2024 |
| **Portland cement** | US | Portland cement | PCA | 2024 |
| **Potassium persulfate** | RER | Potassium persulfate | Sphera | 2024 |

| FLOW/ PROCESS | GEO REF | DATASET | PROVIDER | REF YEAR |
|---|---|---|---|---|
| **Wood Incineration** | US | Pure wood (10% H2O content) in waste incineration plant | Sphera | 2024 |
| **Silicate dispersion** | DE | Silicate dispersion plaster | Sphera | 2024 |
| **Siloxane** | US | Siloxane (cyclic) (from organosilanes) | Sphera | 2024 |
| **Sodium sulfate** | DE | Sodium sulfate by-product sodium chlorite (from sodium chlorates) | Sphera | 2024 |
| **Vermiculite** | US | Vermiculite | Sphera | 2024 |
| **Wax / Paraffins** | RER | Wax / Paraffins at refinery | Sphera | 2021 |
| **White Mineral Oil** | US | Lubricants at refinery | Sphera | 2021 |
| **Tap Water** | US | Tap water from groundwater | Sphera | 2024 |
| **Tap Water** | US | Tap water from surface water | Sphera | 2024 |
| **Mfg. Waste Landfilling** | US | Inert matter (Glass) on landfill | Sphera | 2024 |
| **Product Landfilling** | RER | Inert matter (Unspecific construction waste) on landfill | Sphera | 2024 |
| **Paper Incineration** | US | Paper waste (water 0%) in waste incineration plant | Sphera | 2024 |
| **Paper Landfilling** | US | Paper waste on landfill, post-consumer | Sphera | 2024 |
| **Plastic Landfilling** | US | Plastic waste on landfill, post-consumer | Sphera | 2024 |
| **Plastic Incineration** | US | Plastics wastes in waste incineration plant (0% H2O content) | Sphera | 2024 |
| **Wastewater Treatment** | US | Municipal wastewater treatment (mix) | Sphera | 2024 |

## 2.8 Data Quality

A detailed description of the data collected, and the data quality requirements related to ISO 14044:2006 (ISO, 2006b), ISO 21930:2017 (ISO, 2017), and the UL Part A (UL Environment, 2022) and Part B (UL Environment, 2021) PCRs is provided in the LCA background report and is summarized here. Data quality is assessed based on its representativeness (technology coverage, geographic coverage, time coverage), precision, completeness, consistency, reproducibility, transparency, and uncertainty as shown in Table 2-3. Additionally, secondary LCI data sets outside of the databases listed in section 3.1.2 of the UL Part A (UL Environment, 2022) contribute less than 80% of total impact to any of the required impact categories.

**Table 2-3: Summary of Data Quality Assessment**

| METRIC | DESCRIPTION | EVALUATION |
|---|---|---|
| Geographic Representativeness | All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. | Very Good |
| Technological Representativeness | All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. | Very Good |
| Temporal Representativeness | All primary data were collected for the year 2023. All secondary data come from the MLC 2025.1 databases and are representative of the years 2020 – 2024 | Very Good |
| Completeness | Each foreground process was checked for mass balance and completeness of the emission inventory. No data were knowingly omitted. All background data are sourced from MLC 2025.1 databases with the documented completeness. | Very Good |

## 2.9 Period Under Review

Primary data was collected for the calendar year 2023.

## 2.10 Estimates and Assumptions

Assumptions associated with product transport, installation, and deconstruction based on Part B PCR section 3.13 (UL Environment, 2021) are shown in Table 2-4.

**Table 2-4: Transport, installation, and deconstruction assumptions**

| | |
|---|---|
| **Product transport from point of manufacture to building site** | Mode: Diesel-powered truck/trailer<br>Distance: 800 km |
| **Product transport from building site to waste processing** | Mode: Diesel-powered truck/trailer<br>Distance: 161 km |
| **Installation & deconstruction procedures** | Manual (no operational energy use) |

# 3 Technical Information and Scenarios

## 3.1 Manufacturing (A1 to A3)

Crushed natural gypsum, found in sedimentary rock formations, or synthetic gypsum, FGD, is heated in a process called calcination to remove moisture. The calcined gypsum is mixed with water and additives to enhance the board's characteristics, and a slurry is formed. This slurry is fed onto a continuously moving sheet of glass mat, and another sheet is laid on top. As the board moves down the conveyer, the gypsum begins recrystallizing, and the hardened board is cut to finished length and dried to remove any free moisture. End tape is applied to the finished product, and it is packaged for shipment. Georgia-Pacific produces roof board at eight different facilities across the US and each manufacturing sites follows the same general processes as shown in Figure 3-1.

For each 1000 kg of 1/2" DensDeck® Prime Roof Board 20.4 kg of gypsum are beneficially reused or recycled offsite and 67.3 kg are taken by truck an average of 68 km to be landfilled.

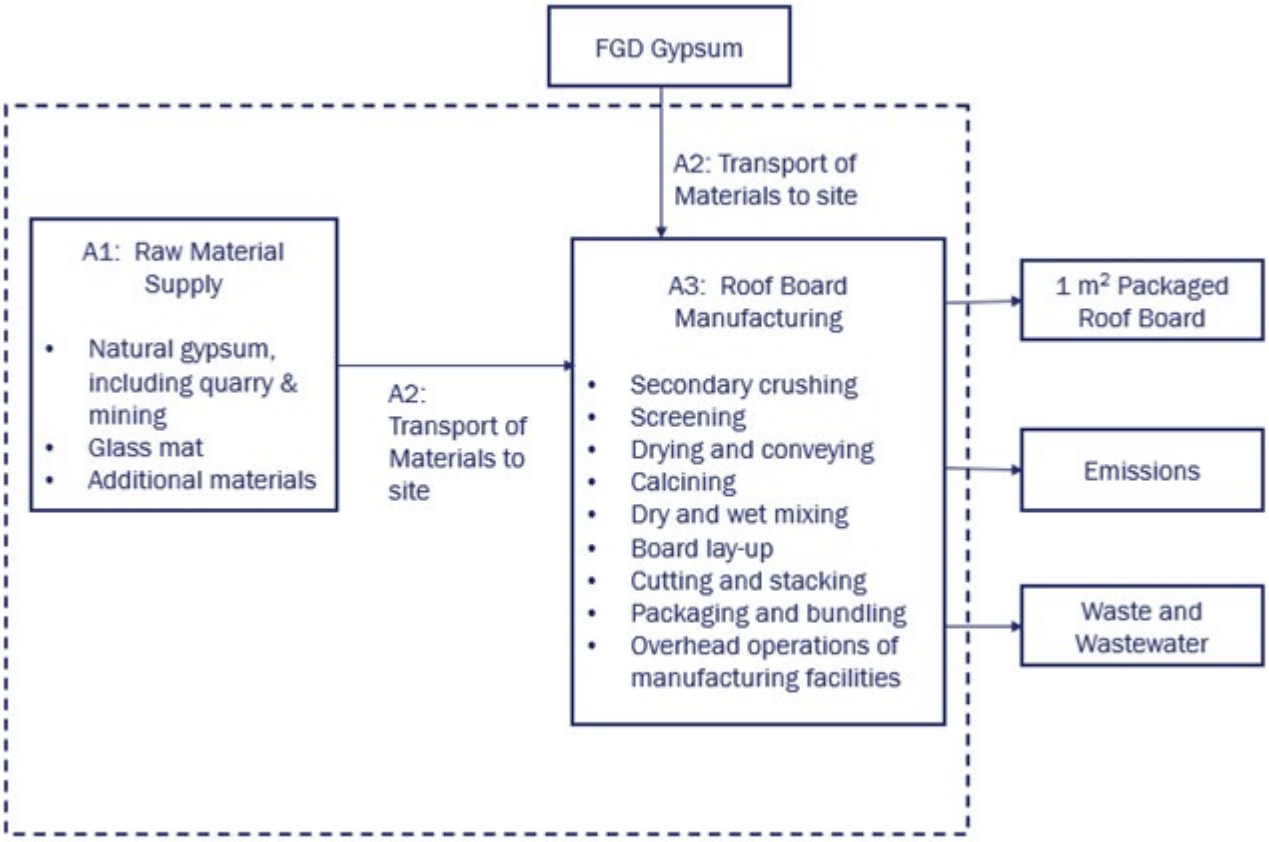



**Figure 3-1: Simple flow chart providing details on the Product Stage (A1 to A3) for 1/2" DensDeck® Prime Roof Board**

## 3.2 Packaging

Roof board Is shipped on pallets from every facility except Las Vegas and Lovell. The mass of pallets per m2 of roof board are shown in Table 3-1. Production of packaging is included in module A3 and only one reuse of pallets is considered. Transport of the packaging to the manufacturing sites is included in module A2, while transport of the packaging to the installation site is included in module A4. Packaging disposition at end-of-life is based on PCR Part B, Section 4.2, Table 3 (UL Environment, 2021) and is included in section A5.

**Table 3-1: Packaging composition and disposition at end-of-life.**

| MATERIAL | MASS | UNITS | DISPOSITION AT END-OF-LIFE |
|---|---|---|---|
| Pallets | 0.0102 | kg/m² | Reused once and then landfilled |

## 3.3 Transport to the Building Site (A4)

Table 3-2 shows the assumptions associated with transport of the packaged 1/2" DensDeck® Prime Roof Board to the building site.

**Table 3-2: Transport to the building site (A4) details**

| NAME | VALUE | UNITS |
|---|---|---|
| Fuel type | Diesel | |
| Liters of fuel | 38.8 | l/100 km |
| Vehicle type | Diesel-powered truck/trailer | |
| Transport distance | 800 | km |
| Capacity utilization (including empty runs) | 0.78 | mass % |
| Gross density of products transported | 790 | $kg/m^3$ |
| Capacity utilization volume factor | 1 | |

## 3.4 Product Installation (A5)

The roof board are installed manually under the roofing membrane. Materials required and instructions are provided in the DensDeck® Roof Board Installation Guide. Necessary tools include a knife, cutting gloves, measuring tape, straight edge or T-square, chalk line, and tools to apply adhesive or install fasteners (e.g., screws). These materials are excluded from the study because they are used in many installations and applications and a single installation is unlikely to consume a substantial portion of their operation life. Therefore, they are considered to be negligible. No operational energy use is considered per Part B PCR section 3.13 (UL Environment, 2021).

The installation process considers 7% material loss due to cutting and fitting done manually. Additionally, electricity use from power tools such as reciprocating saws or track saws will contribute negligible to the overall impacts. This installation scrap is accounted in A5 along with the management of packaging waste generated during installation. The EPD considers packaging waste processing routes in the US (e.g., landfill, incineration, recycling) based on PCR Part A, Section 2.8.5, Table 3 (UL Environment, 2022) (Table 3-2).

**Table 3-3: Installation into the building details (A5)**

| NAME | VALUE | UNITS |
|---|---|---|
| Ancillary materials | N/A | $kg/m^2$ |
| Net freshwater consumption | N/A | $m^3/m^2$ |
| Other resources | N/A | $kg/m^2$ |
| Electricity consumption | N/A | $kWh/m^2$ |
| Other energy carriers | N/A | $MJ/m^2$ |
| Product loss per functional unit | 0.70575 | $kg/m^2$ |
| Additional waste materials at the construction site before waste processing, generated by product installation | 0.7167 | $kg/m^2$ |
| Output materials resulting from on-site waste processing | N/A | $kg/m^2$ |

| NAME | VALUE | UNITS |
|---|---|---|
| Mass of packaging to end-of-life | 0.01095 | $kg/m^2$ |
| Biogenic carbon contained in packaging | 0.020074 | $kg\ CO_2\ /m^2$ |
| Direct emissions to ambient air, soil, and water | N/A | $kg/m^2$ |
| VOC emissions | N/A | $kg/m^2$ |

### *3.4.1 Reference Service Life*

The default RSL of 40 years provided by the Part B PCR section 3.6 (UL Environment, 2021) is used in this EPD. Table 3-4 provides details on the relevant in-use conditions associated with the assumed RSL.

**Table 3-4: RSL details**

| PCR REQUIREMENT | DESCRIPTION FOR 1/2" DENSDECK® PRIME ROOF BOARD |
|---|---|
| Declared product properties (at the gate) and finishes, etc. | As described in Table 1-1 |
| Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes) | Gypsum roof board should be stored, handled, and installed in accordance with GP's storage, handling and installation instructions (available at www.gpgypsum.com), standard building practices and all applicable building codes. |
| An assumed quality of work, when installed in accordance with the manufacturer's instructions | Building industry good practices should be followed regarding handling, finishing, storage, and maintenance. |
| Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature | Apply only as many DensDeck® Roof Boards as can be covered by a roof membrane system in the same day. Normal weather conditions that excludes things like impacts with objects, high force winds, earthquake, flood, fire or other acts of God or nature. |
| Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure) | N/A |
| Use conditions, e.g. frequency of use, mechanical exposure. | Gypsum roof board is used continuously throughout its lifetime, and as a non-structural component it is not intended to be exposed to significant mechanical stress. |
| Maintenance, e.g. required frequency, type and quality of replacement components | No general maintenance is required, but the overlying roof is assumed to be replaced after 20 years. Replacement components should be the same type and quality as the original components. |

## 3.5 Use (B4)

Per the Part B PCR section 3.5 (UL Environment, 2021), modules B1, B2, B3, B5, B6, and B7 are assumed to be zero. A total of 0.9 manual replacements are required in module B4 based on the default RSL of 40 years and the building ESL of 75 years (rounded up to the nearest tenth) as shown in Table 3-5. The replacement of the gypsum board uses the same assumptions for installation and deconstruction as the initial installation in A5 and the final deconstruction in C1.

**Table 3-5: Replacement (B4) details**

| NAME | VALUE | UNITS |
|---|---|---|
| RSL | 40 | Years |

| | | |
|---|---|---|
| ESL | 75 | Years |
| Replacement cycle (rounded up to nearest tenth) | 0.9 | (ESL/RSL) - 1 |
| Energy inputs | N/A | kWh/m$^2$ |
| Net freshwater consumption | N/A | m$^3$/m$^2$ |
| Ancillary materials | N/A | kg/m$^2$ |
| Replacement of worn parts | N/A | kg/m$^2$ |
| Direct emissions to ambient air, soil, and water | N/A | kg/m$^2$ |

## 3.6 Disposal

After manual deconstruction, the product is collected with mixed construction waste and transported 161 km to a landfill and disposed (Table 3-6).

**Table 3-6: Disposal details**

| NAME | VALUE | UNITS |
|---|---|---|
| Mass of waste collected with mixed construction waste | 10.082 | kg/m$^2$ |
| Mass of waste disposed in landfill | 10.082 | kg/m$^2$ |
| Removals of biogenic carbon (excluding packaging) | N/A | kg $CO_2$/ m$^2$ |

# 4 Environmental Indicators Derived from LCA

The impact categories and methodologies required by the Part A PCR section 4.7 (UL Environment, 2022) were used. The life cycle impact assessment (LCIA) used IPCC AR5 (IPCC, 2014) and AR6 (IPCC, 2023) for global warming excluding biogenic $CO_2$, TRACI v2.1 (US EPA, 2024) for acidification, eutrophication, ozone depletion, and smog formation, and CML v4.7 (CML, 2016) was used for abiotic resource depletion, fossil. LCIA results are shown by module in Table 4-1. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development, however the EPD users shall not use additional measures for comparative purposes. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Since deconstruction is assumed to be manual, there are no impacts associated with module C1, and since all the gypsum is landfilled at end-of-life, there are no impacts associated with module C3.

**Table 4-1: LCIA results for 1/2" DensDeck® Prime Roof Board**

| | A1 to A3 | A4 | A5 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|
| Global Warming (AR6) [kg CO2 eq.] | 4.45E+00 | 6.24E-01 | 3.81E-01 | 5.18E+00 | 1.64E-01 | 1.55E-01 |
| Global Warming (AR5) [kg CO2 eq.] | 4.55E+00 | 6.35E-01 | 3.91E-01 | 5.29E+00 | 1.67E-01 | 1.58E-01 |
| Acidification [kg SO2 eq.] | 8.16E-03 | 3.09E-03 | 8.99E-04 | 1.21E-02 | 4.33E-04 | 9.43E-04 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Eutrophication [kg N eq.] | 3.64E-03 | 2.35E-04 | 2.80E-04 | 3.81E-03 | 3.79E-05 | 4.54E-05 |
| Ozone Depletion [kg CFC 11 eq.] | 2.27E-08 | 2.80E-14 | 1.59E-09 | 2.19E-08 | 5.95E-15 | 3.51E-14 |
| Smog Formation [kg O3 eq.] | 2.31E-01 | 7.06E-02 | 2.31E-02 | 3.15E-01 | 9.60E-03 | 1.76E-02 |
| Abiotic Resource Depletion, Fossil [MJ] | 6.17E+01 | 7.94E+00 | 5.16E+00 | 7.07E+01 | 2.09E+00 | 1.96E+00 |

Resource use indicators are shown in Table 4-2.

**Table 4-2: Resource use results for 1/2" DensDeck® Prime Roof Board**

| | A1 to A3 | A4 | A5 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|
| RPRe [MJ] | 6.25E+00 | 3.33E-01 | 4.95E-01 | 6.77E+00 | 8.60E-02 | 3.90E-01 |
| RPRm [MJ] | 1.48E-01 | 0.00E+00 | 1.03E-02 | 1.42E-01 | 0.00E+00 | 0.00E+00 |
| NRPRe [MJ] | 6.24E+01 | 8.01E+00 | 5.22E+00 | 7.15E+01 | 2.11E+00 | 2.02E+00 |
| NRPRm [MJ] | 1.56E+00 | 0.00E+00 | 1.09E-01 | 1.50E+00 | 0.00E+00 | 0.00E+00 |
| RSF [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RE [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| SM [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW [m3] | 4.40E-02 | 3.60E-04 | 3.15E-03 | 4.32E-02 | 9.21E-05 | 4.88E-04 |

Output and waste flows are shown in Table 4-3.

**Table 4-3: Output and waste results for 1/2" DensDeck® Prime Roof Board**

| | A1 to A3 | A4 | A5 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|
| HWD | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NHWD [kg] | 7.25E-01 | | 7.65E-01 | 9.74E+00 | | 1.01E+01 |
| HLRW [kg] | 6.92E-06 | 3.27E-08 | 4.89E-07 | 6.72E-06 | 5.80E-09 | 2.23E-08 |
| ILLRW [kg] | 5.97E-04 | 2.75E-05 | 4.56E-05 | 6.25E-04 | 4.87E-06 | 2.15E-05 |
| CRU [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR [kg] | 2.71E-01 | 0.00E+00 | 2.20E-02 | 2.63E-01 | 0.00E+00 | 0.00E+00 |
| MER [kg] | 0.00E+00 | 0.00E+00 | 1.69E-03 | 1.52E-03 | 0.00E+00 | 0.00E+00 |
| EEE [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EET [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Biogenic carbon removals and emissions are shown in Table 4-4.

**Table 4-4: Biogenic carbon results for 1/2" DensDeck® Prime Roof Board[a]**

| | A1 to A3 | A4 | A5 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|
| BCRP [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BCEP [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BCRK [kg] | 1.84E-02 | 0.00E+00 | 1.29E-03 | 1.77E-02 | 0.00E+00 | 0.00E+00 |
| BCEK [kg] | 0.00E+00 | 0.00E+00 | 1.97E-02 | 1.77E-02 | 0.00E+00 | 0.00E+00 |
| BCEW [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CCE [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| CCR [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| CWNR [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

a. A5 included emissions and removals from packaging associated with installation loss.

### 4.1 Interpretation

The EPD results found that the replacement stage (B4) had the highest contribution to the environmental impacts because it requires 0.9 replacements. The product stage was otherwise the largest contributor primarily due to the raw materials and energy used during manufacturing. It should also be noted that the results represent a weighted average result, and results from products manufactured at different specific facilities may vary.

## 5 Additional Environmental Information

### 5.1 Environment and Health During Manufacturing

All environmental, health and safety regulatory requirements are met during the manufacture of 1/2" DensDeck® Prime Roof Board.

### 5.2 Environment and Health During Installation

Information about environment and health during installation of 1/2" DensDeck® Prime Roof Board can be found at www.buildgp.com.

### 5.3 Extraordinary Effects

#### Fire

1/2" DensDeck® Prime Roof Board is rated to have no flame spread and no smoke development (0/0) as evaluated against ASTM E84. It is also UL Certified and has FM Approvals. Additional information can be found at www.buildgp.com

#### Water

There are no extraordinary effects on the environment or health following the application of water to the product.

#### Mechanical Destruction

There are no extraordinary effects on the environment or health following unforeseeable mechanical destruction of the product. 1/2" DensDeck® Prime Roof Board is non-structural, non-loading bearing material.

### 5.4 Delayed Emissions

No quantitative or qualitative information on delayed emissions used to calculate Global Warming Potential are declared.

### 5.5 Environmental Activities and Certification

N/A

### 5.6 Further Information

Additional information and explanatory material, such as the DensDeck® Roof Board Installation Guide, product safety data sheets, and health product declarations can be found at www.buildgp.com.

# 6 References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