



**Georgia-Pacific**  
Gypsum

# Environmental Product Declaration

ACCORDING TO ISO 14025 AND ISO 21930

*Type III environmental product declaration (EPD) developed according to ISO 14025 and 21930 for Gypsum  
1/2" DensArmor Plus® C Panel*





Certified  
Environmental  
Product Declaration  
[www.nsf.org](http://www.nsf.org)

## NSF Certified Environmental Product Declaration

This document is a Type III environmental product declaration by Georgia-Pacific LLC that is certified by NSF Certification, LLC as conforming to the requirements of ISO 14025 and ISO 21930. NSF Certification, LLC has assessed that the Life Cycle Assessment (LCA) information fulfills the requirements of ISO 14040 in accordance with the instructions listed in the product category rules cited below. The intent of this document is to further the development of environmentally compatible and sustainable construction methods by providing comprehensive environmental information related to potential impacts in accordance with international standards.

## Environmental Product Declaration Summary

GENERAL SUMMARY			
<b>Owner of the EPD</b>	Georgia-Pacific Gypsum LLC 133 Peachtree St NE Atlanta, GA 30303		
<b>Product Group</b>	Glass Mat Gypsum Panels		
<b>Product Name</b>	1/2" DensArmor Plus® C Gypsum Panel		
<b>Product Definition</b>	Gypsum panel is the generic name for a family of sheet products consisting of a non-combustible core primarily of gypsum with a paper or glass mat facing. This EPD is for a gypsum panel with glass mat facing.		
<b>Product Category Rule (PCR)</b>	NSF International, Product Category Rules for North American Gypsum Boards – Gypsum PCR-2019: v1. ISO 21930 Sustainability in building construction – Environmental declaration of building products, Geneva, 2017.		
<b>Declared Unit</b>	1000 square feet, commonly referred to as MSF (92.9 square meters)		
EPD INFORMATION			
<b>Program Operator</b>	NSF Certification, LLC		
<b>Declaration Holder</b>	Georgia-Pacific Gypsum LLC		
<b>Product group</b> Gypsum Panel	<b>Date of Issue</b> May 21, 2020	<b>Period of Validity</b> 5 years from date of issue	<b>Declaration Number</b> EPD10357
<b>Declaration Type</b> A “Cradle-to-gate” EPD for 1/2" DensArmor Plus® C Gypsum Panel. Activity stages covered include the product manufacturing (modules A1 to A3). The declaration is intended for use in Business-to-Business (B-to-B) communication.			

<b>Product Applicability and Characteristics</b>	
1/2" DensArmor Plus® C gypsum panel is primarily used as an interior surface panel suitable to receive decoration for both residential and commercial building applications. Glass Mat Gypsum Panels are used in single and multiple layer wall systems and has a service life of 60 years. 1/2" DensArmor Plus® C gypsum panel is 1/2 inches thick, or 1.27 cm thick. Glass Mat Gypsum Panels are manufactured to ASTM C1658, Standard Specification for Glass Mat Gypsum Panels.	
<b>Content of the Declaration</b>	
The declaration follows Section 9, Content of the EPD, NSF International, Product Category Rules for North American Gypsum Panel Products – Gypsum PCR-2019: v1.	
<b>LCA Software and Version Number</b>	GaBi 9.5.2.49
<b>LCI Databases and Version Number</b>	GaBi Database, Service Pack 40
<b>This EPD was independently verified by NSF Certification, LLC in accordance with ISO 14025:</b>	Jenny Oorbeck <a href="mailto:joorbeck@nsf.org">joorbeck@nsf.org</a> 
<b>Internal</b>	<b>External</b>
	X
<b>EPD PROJECT REPORT INFORMATION</b>	
<b>EPD Project Report</b>	Life Cycle Assessment of Georgia-Pacific Gypsum Panel products, Final report 09/2019
<b>Prepared by</b>	Georgia-Pacific LLC 133 Peachtree St NE Atlanta, GA 30303
<b>This EPD project report was independently verified by in accordance with ISO 14025 and the reference PCR:</b>	Jack Geibig – EcoForm <a href="mailto:jgeibig@ecoform.com">jgeibig@ecoform.com</a> 
<b>PCR INFORMATION</b>	
<b>Program Operator</b>	NSF International 789 N. Dixboro Ann Arbor, MI 48105
<b>Reference PCR</b>	NSF International, Product Category Rules for North American Gypsum Panel Products – Gypsum PCR-2019: v1.
<b>Date of Issue</b>	2019
<b>PCR review was conducted by:</b>	Thomas Gloria, Ph.D. Jack Geibig Bill Stough

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis

## 1 PRODUCT IDENTIFICATION

### 1.1 PRODUCT DEFINITION

Glass Mat Gypsum Panels is Georgia-Pacific Gypsum's name for a family of sheet products consisting of a noncombustible core primarily of gypsum, with glass mat surfacing. Glass Mat Gypsum Panels consists of glass mat surfaces on the face and back. Glass Mat Gypsum Panels have a noncombustible gypsum core. The panel can vary in thickness and length and can have specific glass mat facers and additives in the core to enhance physical and performance properties of the board.

Glass Mat Gypsum Panels shall comply with Standard Specification for Gypsum Board ASTM C1177, ASTM C1178, and ASTM C1658.

### 1.2 PRODUCT STANDARD

Applicable product standards for gypsum wallboard (UNSPSC Code 30161500) include:

- ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
- ASTM C1658 Standard Specification for Glass Mat Gypsum Panels
- ASTM D3273-12 Standard Test Method for Resistance to Growth of Mold on the Surface Interior Coatings in an Environmental Chamber.
- ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- ASTM E119 - 10b- Standard Test Methods for Fire Tests of Building Construction and Materials.

## 2 PRODUCT APPLICATION

DensArmor Plus® Panels are an interior wall or ceiling covering material for use in new construction or renovation work. They are designed for direct attachment with screws or nails to wood and metal framing or existing surfaces.

## 3 DECLARED UNIT

The declared unit is 1,000 square feet (MSF) of gypsum panel. The conversion factor to kilograms is 1.04 ft<sup>2</sup>/kg (=1000 ft<sup>2</sup>/966 kg).

**Table 1: Product data summary**

PRODUCT	THICKNESS INCHES (CM)	SPECIFIC DENSITY LB/MSF (KG/92.9M <sup>2</sup> )	CORE TYPE	ASTM STANDARD
1/2" DensArmor Plus® C Gypsum Panel	1/2" (1.27 cm)	2.13E003 (966)	Type C	C1658

### 3.1 TECHNICAL DATA

See Table 2 for a summary of technical data for 1/2" DensArmor Plus® C gypsum panel.

**Table 2: Technical Data**

TECHNICAL DATA	VALUE AND UNITS/TEST RESULTS/STATEMENT	REFERENCED DOCUMENTS
"R" factor – thermal resistance in US unit [SI unit]	0.56R	ASTM C518
Safety Data Sheet	Yes	Available at gpgypsum.com
Mold resistance (if applicable)	Score 10 out of 10	ASTM D3273
Water Absorption (if applicable)	5%	ASTM C1658
Surface burning characteristics (if applicable)	See flame and smoke	
Flame Spread	0	ASTM E84
Smoke Developed	0	ASTM E84
Water Vapor transmission Desiccant Method Test	>25 US Perms	ASTM E96
Abuse/Impact resistance test (if applicable)	N/A	
Total Recycled content (%)	Dependent on the facility	As defined in ISO 14021
Pre-consumer (%)	Dependent on the facility	As defined in ISO 14021
Post-consumer (%)	Dependent on the facility	As defined in ISO 14021

## 4 MATERIAL CONTENT

### 4.1 DEFINITIONS

Per Glass Mat Gypsum Panels SDS Product List B: calcium sulfated dihydrate (Gypsum), crystalline silica (quartz), and fibrous glass (fiberglass), and vermiculite.

The material content for 1/2" DensArmor Plus® C gypsum board is represented by the following quantities\*:

Gypsum	–	90.1%
Glass mat	–	5.54%
Additives (dry and wet)	–	4.34%

\*Numbers may not add up to exactly 100% due to rounding

Product formulation (wet value at the time of manufacture), on the basis of 1000 square feet (1 MSF or 92.9m<sup>2</sup>) of 1/2" DensArmor Plus® C gypsum panel output (dry value) with a finished density of 2.13E003 lb/MSF at 0.5% moisture content at the facility gate.

### 4.2 PACKAGING

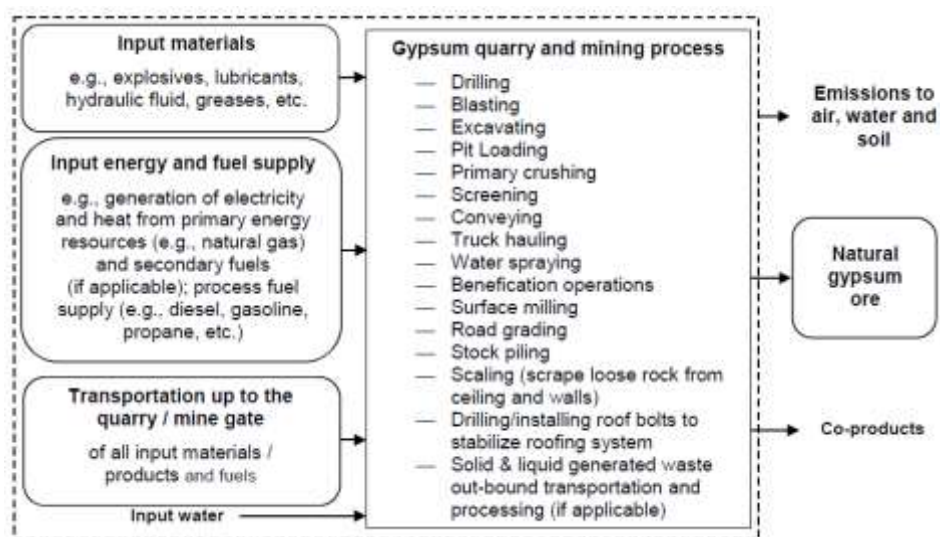
Packaging consists of banding, rail bags and slip sheets; cardboard and metal edge/corner protectors; risers/spacers constructed of gypsum board; and adhesive for risers/spacers.

## 5 PRODUCT STAGE

The system boundary for the gypsum panel starts with the raw material acquisition and extends through the manufacturing of the panel, cradle-to-shipping gate. All transportation distances for the raw materials, chemicals and the final product were included. Data included from gypsum panel manufacturing, emissions to air, water and soil, and any solid waste or wastewater. The figures below illustrate the system boundary for gypsum facer manufacturing and gypsum wallboard manufacturing.

**Table 3: Description of the system boundary**

Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage			
Raw Material Supply	Transport	Manufacturing	Transport	Construction-insulation process	Use Stage	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND



**Figure 1: System boundary for gypsum quarry and mining**

Gypsum glass mat manufacturing is also included in Module A1.

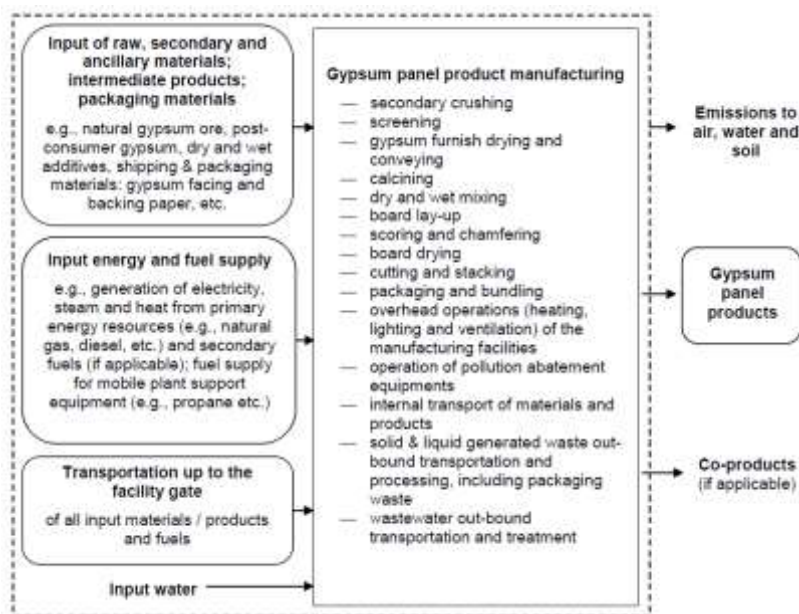


Figure 2: System boundary for gypsum panel product manufacturing

## 6 LIFE CYCLE INVENTORY

### 6.1 CUTOFF CRITERIA

The cut-off criteria follows the rules outlined in the Gypsum PCR and did not exceed 3% of the total mass, energy or environmental relevance.

### 6.2 DATA QUALITY

GP gypsum quarry, gypsum paper, gypsum glass mat, and wallboard facilities estimated, calculated, or measured the collected primary data for the production of natural gypsum, gypsum paper, gypsum glass mat, and gypsum panel product. The data was validated by the plant managers at the facilities and by the internal LCA project team.

All specific processes discussed in the Gypsum Panel Products PCR are considered and modeled to represent gypsum panel products produced at Georgia-Pacific LLC. The background process data were supplied by the USLCI database, GaBi thinkstep LCI database and the US adjusted ecoinvent v 2.2 LCI database and modeled in GaBi 9 with the 2019 database.

### 6.3 REPRESENTATIVENESS

The 2017 production data from 3 facilities for 1/2" DensArmor Plus® C gypsum panel represents 100% of total GP production in 2017 for that product. Secondary data from appropriate LCI datasets range from 2014-2018.

## 6.4 ALLOCATION

Allocation is necessary for the gypsum panel and gypsum paper facilities because the mill produces other paper or panel products. The allocation rules for the LCA follow the PCR allocation rules for gypsum panel products.

Mill 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.

FGD gypsum was performed according to the allocation rule outlined in the PCR Section 7. The FGD gypsum is considered burden free as it is not a primary material of the coal-fired power generation and is a waste input.

## 7 LIFE CYCLE ASSESSMENT

### 7.1 RESULTS OF THE LIFE CYCLE ASSESSMENT

The LCA results for 1/2" DensArmor Plus® C panel are shown in Table 4. The U.S. Environmental Protection Agency's TRACI (Tool for the Reduction and Assessment of Chemical and other Environmental Impacts) life cycle impact assessment methodology (version 2.1) is applied to calculate environmental performance of gypsum board. Per declared unit, impact indicator results, energy and material resource consumption, and waste are presented in Table 4. Impact indicators used are global warming potential (GWP), acidification potential, eutrophication potential, smog potential, and ozone depletion potential. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceedance of thresholds, safety margins, or risks.



Table 4: EPD Summary Results - 1 MSF of 1/2" DensArmor Plus® C Gypsum Panel

PARAMETER	UNITS	TOTAL OF PRODUCT STAGE (A1-A3)
<b>ENVIRONMENTAL IMPACTS</b>		
Global warming potential (GWP 100)	kg CO <sub>2</sub> -eq	389
Ozone depletion potential (ODP)	kg CFC-11-eq	2.35E-005
Eutrophication potential (EP)	kg N-eq	0.453
Acidification potential (AP)	kg SO <sub>2</sub> -eq	1.58
Photochemical ozone creation potential (POCP)	kg O <sub>3</sub> -eq	29.2
<b>RESOURCE USE</b>		
RPRE: Renewable Primary energy used as energy carrier (fuel)	MJ	145
RPRM: Renewable primary resources with energy content used as material	MJ	0
NRPRE: Non-renewable primary resources used as an energy carrier (fuel)	MJ	4.46E003
NRPRM: Non-renewable primary resources with energy content used as material	MJ	0
SM: Secondary materials	kg	0
RSF: Renewable secondary fuels	MJ	0
NRSF: Non-renewable secondary fuels	MJ	0
RE: Recovered energy	MJ	0
FW: Use of net fresh water resources	m <sup>3</sup>	6.84
Abiotic depletion potential - fossil fuels (ADP <sub>fossil</sub> )	MJ	591
<b>WASTE FLOWS</b>		
HWD: Hazardous waste disposed	kg	4.21E-006
NHWD: Non-hazardous waste disposed	kg	45.2
HLRW: High-level radioactive waste, condition, to final repository	kg	8.67E-005
ILLRW: Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	0.00238
CRU: Components for re-use	kg	0
MR: Materials for recycling	kg	0
MER: Materials for energy recovery	kg	0
EE: Exported energy	MJ	0

## 7.2 INTERPRETATION

The LCA study results found the manufacturing stage has the highest contribution to global warming and smog creation potential. The manufacturing stage includes the gypsum wallboard production and the energy consumption for wallboard manufacturing. The raw materials supply had the highest contribution to acidification potential, eutrophication potential, and ozone depletion potential. This stage includes the extraction and production of all raw materials used in the gypsum panel product.

## 8 ADDITIONAL ENVIRONMENTAL INFORMATION

### 8.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

The following environmental abatement pollution equipment were installed at the surveyed GP facilities to control particulate matter (PM) emissions:

- Fabric Filter – high temperature and low temperature baghouses
- Bin Vents
- Precipitator
- Water Sprinklers for Dust Control

## 9 DECLARATION TYPE AND PRODUCT AVERAGE DECLARATION

The type of EPD is defined as a “Cradle-to-gate” EPD covering the product stage and is intended for use in Business-to-Business communication. This EPD represents an average performance for the product(s) included in the EPD, manufactured at Georgia-Pacific facilities.

## 10 DECLARATION COMPARABILITY LIMITATION STATEMENT

Environmental declarations from different programs may not be comparable. The comparison of the environmental performance of gypsum wallboards using the EPD information shall be based on the product's use in and its impact on or within the building and shall consider the complete life cycle (all information modules). EPDs are only comparable if they comply with the NSF PCR for Gypsum Product Panels 2019 v1, include all relevant information modules, and are based on equivalent scenarios with respect to the context of construction works. EPDs prepared from cradle-to-grave life cycle results and based on the same function, RSL, quantified by the same functional unit, and meeting all the conditions for comparability listed in ISO 14025:2006 and ISO 21930:2017 can be used for comparison between products. EPDs without a functional unit may not be compared.

## 11 EPD EXPLANATORY MATERIAL

For any explanatory material, in regard to this EPD, please contact Georgia-Pacific.

Barry Reid  
GP Gypsum  
133 Peachtree St. NE  
Atlanta, GA 30303  
[bsreid@gapac.com](mailto:bsreid@gapac.com)

For any explanatory material, in regard to this PCR or the verification of this EPD, please contact the program operator.

NSF International  
789 N. Dixboro  
Ann Arbor, MI 48105  
[www.nsf.org](http://www.nsf.org)

## 12 REFERENCES

- 1) ISO 14040 Environmental management – life cycle assessment – Principles and framework: International Organization for Standardization; Geneva, 2006.
- 2) ISO 14044 Environmental management – life cycle assessment – Requirements and guidelines; International Organization for Standardization; Geneva, 2006.
- 3) ISO 14025 Environmental labels and declarations– Type III environmental declarations – Principals and procedures; International Organization for Standardization; Geneva, 2006.
- 4) ISO 21930 Sustainability in building construction – Environmental declaration of building products; International Organization for Standardization; Geneva, 2017.
- 5) EN 15804 :2012 Sustainability of construction works-Environmental product declarations – Core rules for the product category of construction products
- 6) GaBi 9 thinkstep, Professional version
- 7) ecoinvent data v2.2
- 8) TRACI v2.1, <http://www.epa.gov/nrmrl/std/sab/traci/>
- 9) Product Category Rules for Gypsum Product Panels. 2019 v1. Program Operator: NSF International