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 1/2" DensShield® Gypsum Tile Backer

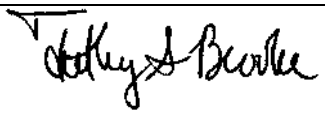
ASTM International Certified Environmental Product Declaration

This document is a Type III environmental product declaration by Georgia-Pacific LLC that is certified by ASTM International (ASTM) as conforming to the requirements of ISO 14025 and ISO 21930. ASTM 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	
Owner of the EPD	Georgia-Pacific Gypsum LLC 133 Peachtree St NE Atlanta, GA 30303
Product Group	Glass Mat Gypsum Panels
Product Name	1/2" DensShield® Gypsum Tile Backer (Brand name) 1/2" Glass Mat Gypsum Tile Backer (Generic name)
Product Definition	1/2" DensShield® Gypsum Tile Backer is an interior panel used in wet areas such as showers and baths as a substrate for ceramic tile. It provides a flat surface substrate for tile along with its fire, moisture and mold resistance. It is manufactured to ASTM C1178 Standard Specification for Glass Mat Water-resistant Gypsum Backing Panel.
Product Category Rule (PCR)	Product Category Rules for North American Glass Mat Gypsum Panels. UNCPC Code 3699, NAICS Code 327420. Program Operator: ASTM 07.2016.
Certification Period	11.29.2016 - 11.29.2021
Declared Unit	1000 square feet, commonly referred to as MSF
ASTM Declaration Number	EPD-047

EPD INFORMATION			
Program Operator		ASTM International	
Declaration Holder		Georgia-Pacific Gypsum LLC	
Product group Glass Mat Gypsum Panels	**Date of Issue** 11.29.2016	**Period of Validity** 5 years	**Declaration Number** EPD-047
Declaration Type A “Cradle-to-gate” EPD for 1/2" DensShield® Gypsum Tile Backer. 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.			

Applicable Countries United States, Canada and Mexico (North America)	
Product Applicability and Characteristics 1/2" DensShield® Gypsum Tile Backer is used in bath and shower wall and ceiling applications.	
Content of the Declaration The declaration follows Section 11, Content of the EPD, Product Category Rules for North American Glass Mat Gypsum Panels. UNCPC Code 3699, NAICS Code 327420. Program Operator: ASTM 07.2016	
This EPD was independently verified by ASTM in accordance with ISO 14025: **Internal** **External** X	 Tim Brooke 100 Barr Harbor Drive, PO Box C700 West Conshohocken, PA 19428-2959, USA www.astm.org/EPDs.htm
EPD PROJECT REPORT INFORMATION	
EPD Project Report	Life Cycle Assessment of various Georgia-Pacific Glass Mat Gypsum Panels, Final report 11/5/2016
Prepared by	Alison Brady Georgia-Pacific LLC 133 Peachtree St NE Atlanta, GA 30303 Alison.brady@gapac.com
This EPD project report was independently verified by in accordance with ISO 14025 and the reference PCR:	Lindita Bushi, Ph.D. Athena Sustainable Materials Institute 119 Ross Avenue, Suite 100 Ottawa, Ontario, K1Y 0N6, Canada lindita.bushi@athenasmi.org
PCR INFORMATION	
Program Operator	ASTM International
Reference PCR	ASTM International, Product Category Rules for North American Glass Mat Gypsum Panels – Gypsum PCR-2016: v1.
Date of Issue	2016
PCR review was conducted by:	Gary Jakubcin, B&G Jakubcin and Associates, LLC (Chair person) email:gary.jakubcin@gmail.com Steven Butler, ACG Materials Mark Flumiani, Innogyps

1 PRODUCT IDENTIFICATION

1.1 PRODUCT DEFINITION

1/2" DensShield® Gypsum Tile Backer is an interior panel used in wet areas such as showers and baths as a substrate for ceramic tile. It provides a flat surface substrate for tile along with its fire, moisture and mold resistance.

1.2 PRODUCT STANDARD

Applicable product standards for glass mat gypsum panels (UNSPSC Code 30161500) include:

- ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- ASTM C1658 Standard Specification for Glass Mat Gypsum Panels
- ASTM C11 Terminology Relating to Gypsum and Related Building Materials and Systems
- ASTM C22 Specification for Gypsum
- ASTM C473 Test Methods for Physical Testing of Gypsum Panel Products
- ASTM C1264 Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products
- ASTM E119 Test Methods for Fire Tests of Building Construction and Materials

2 PRODUCT APPLICATION

1/2" DensShield® Gypsum Tile Backer is used in bath and shower wall and ceiling applications.

3 DECLARED UNIT

The declared unit is 1,000 square feet (MSF) of glass mat gypsum panels. The conversion factor to kilograms is 1.03 ft^2/kg (=1000 ft^2/973 kg).

Table 1: Product data summary

PRODUCT	THICKNESS (INCHES)	SPECIFIC DENSITY (LB/MSF)	CORE TYPE	ASTM STANDARD
1/2" DensShield® Gypsum Tile Backer	1/2”	2145	Regular	C1178

3.1 TECHNICAL DATA

See table 2 for a summary of technical data for 1/2" DensShield® Gypsum Tile Backer.

Table 2: Technical Data

TECHNICAL DATA	VALUE AND UNITS/TEST RESULTS/STATEMENT	REFERENCED DOCUMENTS
"R" factor – thermal resistance in US unit [SI unit]	.56R	ASTM C1177
Safety Data Sheet	Yes	Available at gpgypsum.com
Mold resistance	Yes	ASTM C3273
Surface Water Absorption	0.5g after 2 hours 1.6g after 2 hours	ASTM C1178 ASTM C1658
Water Absorption	5% 10%	ASTM C1178, ASTN C1658 ASTM C1177
Surface burning characteristics (if applicable)	See flame spread and smoke development	ASTM E84
Flame Spread	0	ASTM E84
Smoke Developed	0	ASTM E84
Water Vapor transmission Water Method Test	27	ASTM E96
Abuse/Impact resistance test (if applicable)	Where applicable	ASTM C1629
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 Dens® Brand Fiberglass Mat Gypsum Panel SDS: Calcium sulfate dihydrate (Gypsum), Fiberglass mats, Continuous filament glass fibers (fiberglass), Crystalline silica (Quartz), Boric acid

The material content for 1/2" DensShield® Gypsum Tile Backer is represented by the following quantities:

- Core (natural gypsum ore and FGD) – 47.5%
- Glass Mat (facing and backing) – 3.3%
- Additives (dry and wet) – 0.4%
- Water – 48.8%

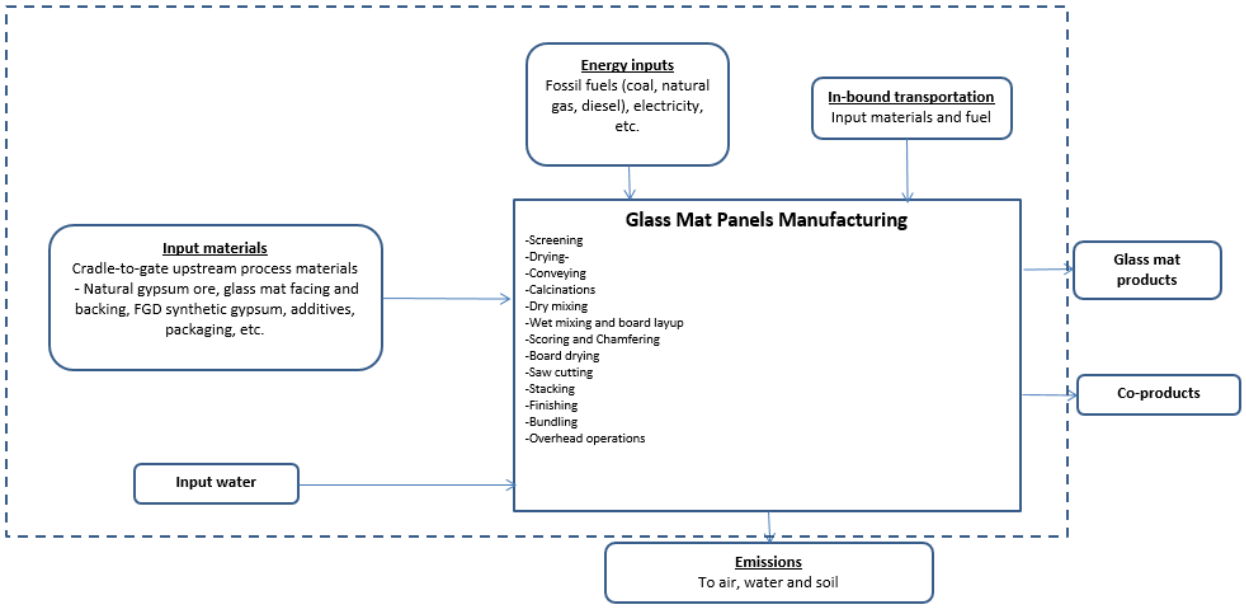
4.2 PACKAGING

Packaging consists of gypsum board end tape (bundling tape) constructed of paper and containing water- and oil-based ink; 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 glass mat 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 form gypsum panel manufacturing, emissions to air, water and soil, and any solid waste or wastewater. Figure 1 below illustrates the product stage system boundary.

Figure 1: System boundary for glass mat gypsum panels study



6 LIFE CYCLE INVENTORY

6.1 CUTOFF CRITERIA

The cut-off criteria follows the guidelines presented in the PCR for North American Glass Mat Gypsum panels and was applied to 1/2" DensShield® Gypsum Tile Backer EPD. All data collected at the facility level including energy, mass and environmental flows were included. This includes data for gypsum rock and glass mat panel manufacturing. There was not an exclusion of data from those production processes. All hazardous and toxic substances were included in the study.

6.2 DATA QUALITY

GP gypsum quarry and panel facilities estimated, calculated, or measured the collected primary data for the production of natural gypsum 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 glass mat panel PCR are considered and modeled to represent 11 different gypsum glass mat products produced at Georgia-Pacific LLC. The

background process data were supplied by the USLCI database, PE INTERNATIONAL LCI database and the US adjusted Eco invent v 2.2 LCI database and modeled in GaBi 6.4, November 2014.

6.3 REPRESENTATIVENESS

The 2012 production data from 2 facilities for 1/2" DensShield® Gypsum Tile Backer represents 100% of total GP production in 2012 for that product. Secondary data from appropriate LCI datasets range from 2010-2013.

6.4 ALLOCATION

Allocation is necessary for the glass mat gypsum products because the mill produces other panel products. The allocation rules for the LCA follow the PCR allocation rules for glass mat gypsum products.

Plant generic formulations were used for 1/2" DensShield® Gypsum Tile Backer. For total water intake and mill level emissions (air, water, solid), the amounts were allocated by mass by total amount of product produced at the facility.

FGD gypsum was performed according to the system expansion approach. The glass mat gypsum panels are debited for the dewatering and transportation of the FGD gypsum and credited for avoided landfilling of FGD gypsum. The coal-fired power generation process is debited for the FGD gypsum landfilling.

7 LIFE CYCLE ASSESSMENT

7.1 RESULTS OF THE LIFE CYCLE ASSESSMENT

The LCA results for 1/2" DensShield® Gypsum Tile Backer are shown below. 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 3. Impact indicators used are global warming potential (GWP), acidification potential, eutrophication potential, smog potential, and ozone depletion potential.

For each Georgia-Pacific Dens® product, the range of impact indicator results (minimum and maximum values) are calculated and documented in the LCA report. This information is deemed confidential and not presented in the EPD document.

FGD as recovered material is not included in the non-renewable materials (NRMR) category indicator as it is not required to be included by the Glass Mat Gypsum Panel PCR, and GP has deemed the FGD content in Dens® products confidential.

Table 3: EPD Summary Results – 1 MSF of 1/2" DensShield® Gypsum Tile Backer

CATEGORY INDICATOR	UNIT	TOTAL
Global warming potential, GWP	kg CO_2 equiv.	299
Ozone depletion potential, ODP	kg CFC-11 equiv.	1.69E-05
Acidification potential, AP	kg SO_2 equiv.	2.1
Eutrophication potential, EP	kg N equiv.	5.58E-01
Smog creation potential, POCP	kg O_3 equiv.	17
Total primary energy consumption		
Non-renewable, fossil, PENR-fossil	MJ, HHV	4,228
Non-renewable, nuclear, PENR-nuclear	MJ, HHV	409
Renewable, solar, wind, hydroelectric, and geothermal, PER-SWHG	MJ, HHV	66
Renewable, biomass, PER-biomass	MJ, HHV	56
Material resources consumption		
Non-renewable materials, NRMR	kg	849
Renewable materials, RMR	kg	2.2
Net fresh water consumption, NFW	L	1,753
Waste generated		
Hazardous waste, HW	kg	6.64E-02
Nonhazardous waste, NHW	kg	0.50

7.2 INTERPRETATION

The LCA study results found that the raw material supply stage has the highest contribution to overall impacts for all impact indicators for 1/2" DensShield® Gypsum Tile Backer. Manufacturing has the second highest contribution for all selected impact indicators, with the exception of smog creation potential. The conservative dataset for glass wool mat (eco invent v3.1) is included in the raw material supply, which has a high contribution to all impact indicators for the raw material supply.

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 of glass mat gypsum panels 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 glass mat gypsum panels 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).

11 EPD EXPLANATORY MATERIAL

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

ASTM International
Environmental Product Declarations
100 Barr Harbor Drive,
West Conshohocken,
PA 19428-2959, http://www.astm.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, 2007.
5. EN 15804 :2012 Sustainability of construction works-Environmental product declarations – Core rules for the product category of construction products.
6. GaBi 6.4 thinkstep, Professional version.
7. Eco invent data v3.1.
8. TRACI, http://www.epa.gov/nrmrl/std/sab/traci/
9. Product Category Rules for North American Glass Mat Gypsum Panels. UNCPC Code 3699, NAICS Code 327420. Program Operator: ASTM 07.2016
10. The ASTM Program Operator for Product Category Rules (PCRs) and Environmental Product Declarations (EPDs), General Program Instructions; Version 7.0, 08.2016
11. Gypsum Association LCA Final report: 2016, An Industry Average cradle-to-gate Life Cycle Assessment Glass Mat Gypsum Panels for the USA and Canadian Markets. Athena Institute.