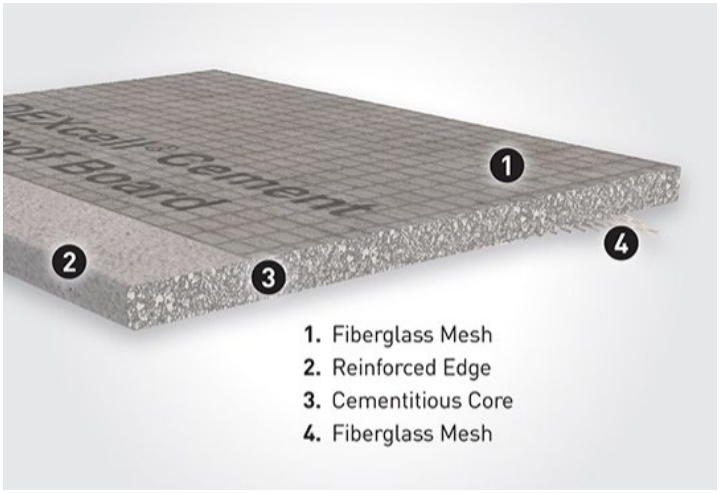
ENVIRONMENTAL PRODUCT DECLARATION

DEXCELL® CEMENT ROOF BOARD (7/16”, 5/8”)



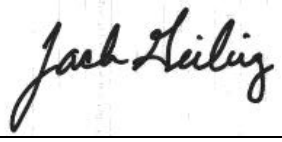
NSF Certified Environmental Product Declaration www.nsf.org

ACCORDING TO ISO 14025 AND ISO 21930
Type III environmental product declaration (EPD) developed according to ISO 14025 and 21930 for DEXcell® Cement Roof Board (7/16”, 5/8”)

National Gypsum®

DEXcell® Roof Board

DEXcell® Cement Roof Board *is manufactured by PermaBASE Building Products, LLC.*
National Gypsum Company is the exclusive service provider for products manufactured by PermaBASE Building Products.

Program Operator	NSF Certification LLC 789 N. Dixboro, Ann Arbor, MI 48105 www.nsf.org
Manufacturer Name and Address	PermaBASE Building Products, LLC 2001 Rexford Road Charlotte, NC 28211
Declaration Number	EPD11020
Declared Product and Declared Unit	92.9 m^2 (1,000 square feet) of DEXcell® Cement Roof Board (7/16", 5/8")
Reference PCR and Version Number	ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
Product's Intended Application and Use	Products are designed to be used in a variety of roofing systems including fully adhered, mechanically attached, and ballasted roofs using single-ply membranes, modified bitumen, fluid applied, built-up roofing, spray foam, and metal.
Product RSL	Lasts lifetime of the roof
Markets of Applicability	North America
Date of Issue	01/31/2025
Period of Validity	5 years from date of issue
EPD Type	Product Specific
Range of Dataset Variability	N/A
EPD Scope	Cradle-to-Gate
Year of reported manufacturer primary data	2022
LCA Software and Version Number	GaBi 10.0.0.71
LCI Database and Version Number	GaBi Database 2023.2
LCIA Methodology and Version Number	TRACI 2.1 and IPCC AR6
The sub-category PCR review was conducted by:	• Thomas P. Gloria, Industrial Ecology Consultants • Bill Stough, Sustainable Research Group • Jack Geibig, EcoForm
This declaration was independently verified in accordance with ISO 14025: 2006. ISO 21930:2017 serves as the core PCR. ☐ Internal ☒External	Jack Geibig – EcoForm jgeibig@ecoform.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Maggie Wildnauer, WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig – EcoForm jgeibig@ecoform.com 

Limitations:
Environmental declarations from different programs (ISO 14025) may not be comparable.
Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, reference service life, and quantified by the same functional unit, and meeting all the conditions in ISO 14025, Section 6.7.2, can be used to assist purchasers and users in making informed comparisons between products.
Full conformance with the PCR for Products 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.
Additional information on the life cycle assessment can be found by contacting National Gypsum directly.

DESCRIPTION OF COMPANY

National Gypsum Company is the exclusive service provider of reliable, high-performance building products manufactured by its affiliate companies and marketed under the Gold Bond®, ProForm®, and PermaBASE® brands. The National Gypsum name has been synonymous with high-quality, innovative products and exceptional customer service since 1925.

PRODUCT DESCRIPTION

DEXcell® Cement Roof Board is a lightweight, moisture- and mold-resistant panel that provides an exceptionally hard, durable surface that withstands prolonged exposure to moisture. Its composition of Portland cement and lightweight aggregate with heavy-duty fiberglass-mesh facers makes it an excellent fire and thermal barrier. This moisture- and mold-resistant cement panel is a substrate board, thermal barrier, and coverboard for commercial roofing applications. DEXcell® Cement Roof Board complies with ASTM C1325 *Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units*.

Use it for a wide variety of roofing systems, including fully adhered, mechanically attached, and ballasted roofs using single-ply membranes, modified bitumen, fluid-applied, built-up roofing, spray foam, and metal.

As a coverboard in roofing assemblies, DEXcell® Cement Roof Board protects and supports the roof membrane; provides increased fire, moisture, and mold resistance; and reduces the potential for penetration damage to the membrane. It can also be used to sheathe the roof side of parapet and penthouse walls and is ideal for green roofs and photovoltaic systems.

Product Features:

- Excellent bond/pull-through/uplift values.
- Impact-resistant, extremely durable, and dimensionally stable.
- High compressive strength.
- Lightweight, cementitious core.
- Superior moisture resistance.
- Exceptional freeze/thaw resistance.
- Scores and snaps easily.
- Meets ASTM C1325.
- Meets UL Class 1 and UL Class A fire ratings for roofing systems up to unlimited slope per UL 790 and ULC CAN-S107.
- Use in accordance with a rated system, and DEXcell® Cement Roof Board provides a thermal barrier meeting IBC Section 2603.
- Resists the growth of mold per ASTM D3273 with a score of 10, the best possible score.

This EPD includes representative products manufactured by National Gypsum's affiliate, PermaBASE® Building Products and Unifix, Inc., produced at the facilities shown in the table below. The facilities shown below produce DEXcell® Cement Roof Boards in all thicknesses covered under this study: 7/16" and 5/8". A weighted average of each manufacturing input (energy, water, waste, etc.) was utilized based on 2022 production as products are made at multiple facilities.

Table 1: Manufacturing Facilities

Manufacturing Plants
Bromont, Quebec
Cleburne, Texas
Clinton, Indiana
Jacksonville, Florida

All products in this review are considered cement board products. The CSI code for these products is 07 50 00.

APPLICABLE PRODUCT STANDARDS

Applicable product standards for cement boards include:

- ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products
- ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- ASTM C947 Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber-Reinforced Concrete (Using Simple Beam with Third-Point Loading)
- ASTM C1325 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units
- ASTM D1037 Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
- ASTM D2394 Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring
- ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
- ASTM E661 Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads
- ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

TECHNICAL DATA

Table 2 shows the technical specifications of the products. The Gypsum Panel PCR was referenced when determining technical specifications to include herein.

Table 2: Technical Details

Parameter	DEXcell® Cement Roof Board
Performance	Cementitious roof board, mold- and moisture-resistant, heavy-duty fiberglass-mesh facers
Mold Resistance	The product scored a 10 when tested in accordance with ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental
Edge(s)	EdgeTech® Reinforced Edge
Thickness	7/16” and 5/8”
Widths	48”
Color	Grey
Relevant ASTM Standard	ASTM C1325

MANUFACTURING

DEXcell® Cement Roof Boards are produced on a continuous conveyor belt with a glass fiber mesh on the bottom. A cementitious core mixture with expanded polystyrene aggregate is gravity fed to the forming belt. The combination of saturated bottom mesh and core material passes under a forming roll which compresses the composite to the desired thickness. A second glass fiber mesh is laid on top and embedded into the core material. The board then passes through a curing oven to cure the board so that it may be handled. At the dryer exit, the finished product is cut to length, stacked on pallets, and wrapped in plastic film for moisture retention. All manufacturing sites follow the same manufacturing processes.

MATERIAL COMPOSITION

Unique product compositions were provided for each product and manufacturing site. The average compositions across all manufacturing sites were utilized in the study and are shown in Table 3 below. The raw materials for the product were obtained from various suppliers across North America. The products under review are placed on pallets and packaged with plastic pallet wraps before distribution.

Table 3: Material Composition

Material	DEXcell Cement Roof Board 7/16”	DEXcell Cement Roof Board 5/8”
Silica Sand	15 – 20%	15 – 20%
Fly Ash*	40 – 50%	40 – 50%
Portland Cement	5 – 15%	10 – 20%
Water	5 – 15%	5 – 15%
Calcium Aluminate Cement	0 – 5%	0 – 5%
Slag	0 – 5%	0 – 5%
Other Materials	0 – 5%	0 – 5%
***Fly ash is categorized as a hazardous waste under the Resource Conservation and Recovery Act; however, after manufacturing the finished product is not considered hazardous.** See the product SDS on National Gypsum’s website for more information.		

This study does not include the impacts associated with installation, use, maintenance, repair, operational energy and water use, replacement, refurbishment, or disposal; however, Table 4 presents the biogenic carbon from packaging that would leave the system in module A5, were it within the scope of the assessment.

Table 4: Biogenic carbon contained in the products leaving the system

Packaging	Biogenic carbon leaving in A5 kg C (kg CO2-eq)
Packaging – Tear Tape	1.03E-01 (3.78E-01)
Packaging – Pallet [kg]	7.25E+00 (2.66E+01)

LIFE CYCLE ASSESSMENT BACKGROUND INFORMATION

DECLARED UNIT

The LCA methodology utilized was chosen to directly align with the NSF PCR for Gypsum Panel Products. As such, this EPD is a cradle-to-gate EPD and includes the sourcing of raw materials, transportation of raw materials to the manufacturing facility, and the manufacturing and packaging of the product. These are the required modules, according to ISO 21930 (LCA modules A1-A3). As this study is a cradle-to-gate LCA, no reference service life is declared.

The declared unit was chosen to be 92.9 m^2 (1,000 square feet) of cement board. Table 4 shows additional details related to the declared unit. DEXcell® Cement Roof Board is a lightweight, moisture- and mold-resistant panel that provides an exceptionally hard, durable surface that withstands prolonged exposure to moisture. Use it as a substrate board, thermal barrier, and coverboard for commercial roofing applications.

Table 5: Declared Unit

	DEXcell Cement Roof Board 7/16”	DEXcell Cement Roof Board 5/8”
Mass per declared unit [kg]	953	1,316

SYSTEM BOUNDARY

This LCA is a Cradle-to-Gate study. An overview of the system boundary is shown in Figure 1 and a summary of the life cycle modules included in this EPD is presented in Table 5. Infrastructure flows have been excluded.

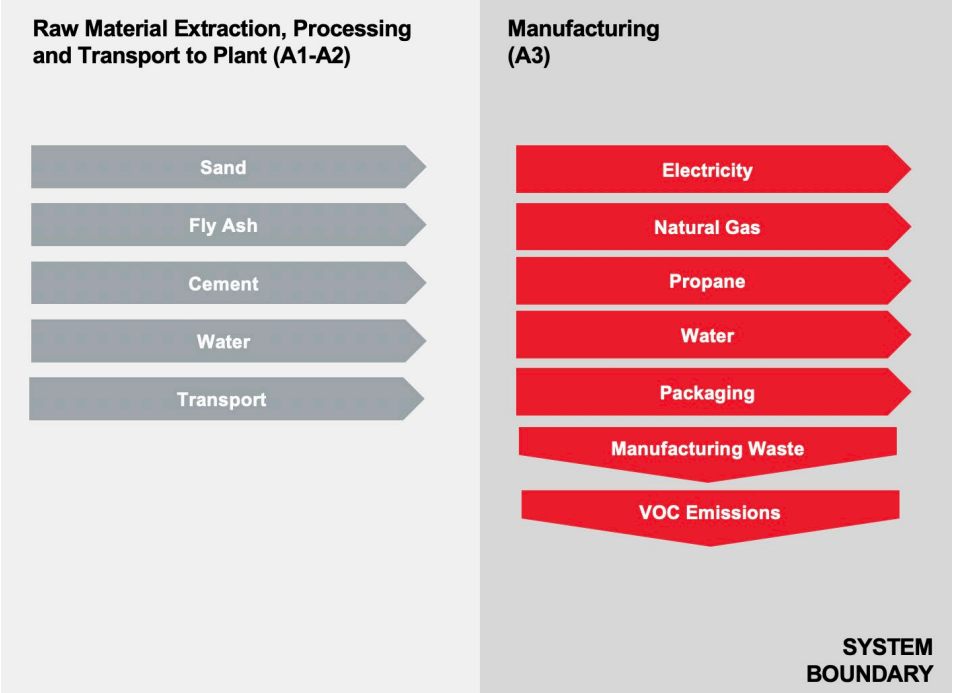


Figure 1: System Boundary

Table 6: Life Cycle Stages Included in the Study

Production			Construction		Use							End of Life				Benefits & Loads Beyond 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 to Site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction	Transport	Waste Processing	Disposal	Reuse, Recovery, Recycling Potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

CUT-OFF CRITERIA

Material or energy inputs greater than 1% (based on total mass and energy input of the final product) were included within the scope of the analysis. Material and energy inputs less than 1% were included if sufficient data were available to warrant inclusion and/or the material input was thought to have significant

environmental impact. Cumulative excluded material and energy inputs and environmental impacts are less than 5% based on total weight of the declared unit. No known flows were deliberately excluded from this EPD.

ALLOCATION

General principles of allocation were based on ISO 14040/44.

To derive a per-unit value for the manufacturing inputs/outputs, mass allocation based on total production at each manufacturing facility was adopted. For all plants that make the reviewed products, the total consumption during 2022 was divided by the total production mass during 2022 to derive a weighted-average use-per-production unit value. PermaBASE® Building Products' associates determined the best way to allocate inputs. This allocation methodology was used for the following inputs:

- Electricity
- Thermal Energy from Natural Gas
- Propane
- Water
- Waste

Discussions with PermaBASE® Building Products' staff revealed this was a representative way to allocate the manufacturing inputs/outputs due to the fact that all products created at the facilities are similar in nature. As a default, secondary GaBi datasets use a physical mass basis for allocation.

LIFE CYCLE ASSESSMENT RESULTS

All results are given per declared unit, which is 92.9 m^2 (1,000 square feet) of cement board. Environmental impacts were calculated using the GaBi software platform. Impact results have been calculated using the TRACI 2.1 and IPCC AR6 impact assessment methodologies. Results presented in this report are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Table 7: LCIA Indicators

Abbreviation	Parameter	Unit
CML 2001 – Jan 2016		
ADPF	Abiotic depletion potential for fossil resources	MJ, net calorific value
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO_2 eq
EP	Eutrophication potential	kg N eq
GWP*	Global warming potential (100 years, includes biogenic CO_2)	kg CO_2 eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
Resources	Depletion of non-renewable fossil fuels	MJ, surplus energy
SFP	Smog formation potential	kg O_3 eq
IPCC AR6		
GWP, excl*	GWP100, excl biogenic carbon [kg CO2 eq.]	kg CO_2 eq
GWP, incl*	GWP100, incl biogenic carbon [kg CO2 eq.]	kg CO_2 eq
*GWP emissions from land-use change were deemed insignificant and therefore, were not included.		

Table 8: Biogenic Carbon Indicators

Abbreviation	Parameter	Unit
BCRP	Biogenic Carbon Removal from Product	[kg CO2]
BCEP	Biogenic Carbon Emission from Product	[kg CO2]
BCRK	Biogenic Carbon Removal from Packaging	[kg CO2]
BCEK	Biogenic Carbon Emission from Packaging	[kg CO2]
BCEW	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	[kg CO2]
CCE	Calcination Carbon Emissions	[kg CO2]
CCR	Carbonation Carbon Removals	[kg CO2]
CWNR	Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	[kg CO2]

Table 9: Resource Use, Waste, and Output Flow Indicators

Abbreviation	Parameter	Unit
Resource Use Parameters		
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV)
RPR_M	Use of renewable primary energy resources used as raw materials	MJ, net calorific value
RPR_T	Total use of renewable primary energy resources	MJ, net calorific value
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value

Abbreviation	Parameter	Unit
$NRPR_M$	Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value
$NRPR_T$	Total use of non-renewable primary energy resources	MJ, net calorific value
SM	Use of secondary materials	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
RE	Recovered energy	MJ, net calorific value
FW	Net use of fresh water	m^3
Waste Parameters and Output Flows		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste, conditioned, to final repository	kg
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
CRU	Components for reuse	kg
MR	Materials for recycling	kg
MER	Materials for energy recovery	kg
EEE	Exported electrical energy	MJ
EET	Exported thermal energy	MJ

The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the variability of the final results and make comparisons misleading. Without understanding the specific variability, the user is therefore, not encouraged to compare EPDs.

DEXCELL® CEMENT ROOF BOARD (7/16")

The LCIA results presented below are for 92.9 m^2 (1,000 square feet) of cement board.

Impact Category	Total A1-A3	A1	A2	A3
CML LCIA Impacts (Europe, Rest of World)				
ADPF [MJ]	**4340**	3180	706	460
TRACI LCIA Impacts (North America)				
AP [kg SO_2 eq]	**0.805**	0.505	0.250	0.050
EP [kg N eq]	**0.0673**	0.0395	0.0222	0.0057
GWP, incl biogenic carbon [kg CO_2 eq]	**372**	306	53.2	13.3
ODP [kg CFC 11 eq]	**0.0000002**	0.0000002	0.0000000000002	0.0000000000110
Resources [MJ]	**436**	274	101	60.1
SFP [kg O_3 eq]	**18.3**	11.50	5.75	1.02
IPCC AR6				
GWP100, excl biogenic carbon [kg CO2 eq.]	**397**	313	53.9	30.1
GWP100, incl biogenic carbon [kg CO2 eq.]	**355**	293	51.1	10.6
Carbon Emissions and Uptake				
BCRP [kg CO_2]	**-**	-	-	-
BCEP [kg CO_2]	**-**	-	-	-
BCRK [kg CO_2]	**27.0**	-	-	27.0
BCEK [kg CO_2]	**-**	-	-	-
BCEW [kg CO_2]	**-**	-	-	-
CCE [kg CO_2]	**-**	-	-	-
CCR [kg CO_2]	**-**	-	-	-
CWNR [kg CO_2]	**-**	-	-	-

Impact Category	Total A1-A3	A1	A2	A3
Resource Use Indicators				
RPR_E [MJ]	**213**	169	32	12
RPR_M [MJ]	**218**	-	-	218
RPR_T [MJ]	**431**	169	32	230
$NRPR_E$ [MJ]	**3910**	2720	712	471
$NRPR_M$ [MJ]	**590**	551	-	39
$NRPR_T$ [MJ]	**4500**	3270	712	510
SM [kg]	**-**	-	-	-
RSF [MJ]	**-**	-	-	-
NRSF [MJ]	**-**	-	-	-
RE [MJ]	**-**	-	-	-
FW [m^3]	**0.845**	0.594	0.105	0.146
Output Flows and Waste Categories				
HWD [kg]	**0.0000006**	0.0000004	0.0000001	0.0000002
NHWD [kg]	**11.4**	11.0	0.0709	0.393

Impact Category	Total A1-A3	A1	A2	A3
HLRW [kg]	**0.000061**	0.000038	0.000003	0.000020
ILLRW [kg]	**0.0527**	0.0341	0.00214	0.0165
CRU [kg]	**-**	-	-	-
MR [kg]	**-**	-	-	-
MER [kg]	**-**	-	-	-
EEE [MJ]	**-**	-	-	-
EET [MJ]	**-**	-	-	-

DEXCELL® CEMENT ROOF BOARD (5/8")

The LCIA results presented below are for 92.9 m^2 (1,000 square feet) of cement board.

Impact Category	Total A1-A3	A1	A2	A3
CML LCIA Impacts (Europe, Rest of World)				
ADPF [MJ]	**6800**	5340	996	460
TRACI LCIA Impacts (North America)				
AP [kg SO_2 eq]	**1.27**	0.870	0.353	0.050
EP [kg N eq]	**0.1020**	0.0647	0.0313	0.0057
GWP, incl biogenic carbon [kg CO_2 eq]	**588**	499	75.1	13.3
ODP [kg CFC 11 eq]	**0.0000008**	0.0000008	0.0000000000002	0.0000000000110
Resources [MJ]	**694.0**	491.0	143.0	60.1
SFP [kg O_3 eq]	**28.50**	19.40	8.11	1.02
IPCC AR6				
GWP100, excl biogenic carbon [kg CO2 eq.]	**618**	512	76.0	30.1
GWP100, incl biogenic carbon [kg CO2 eq.]	**561**	478	72.2	10.6
Carbon Emissions and Uptake				
BCRP [kg CO_2]	**-**	-	-	-
BCEP [kg CO_2]	**-**	-	-	-
BCRK [kg CO_2]	**27.0**	-	-	27.0
BCEK [kg CO_2]	**-**	-	-	-
BCEW [kg CO_2]	**-**	-	-	-
CCE [kg CO_2]	**-**	-	-	-
CCR [kg CO_2]	**-**	-	-	-
CWNR [kg CO_2]	**-**	-	-	-

Impact Category	Total A1-A3	A1	A	A3
Resource Use Indicators				
RPR_E [MJ]	**361**	304	4	12
RPR_M [MJ]	**218**	-	-	218
RPR_T [MJ]	**579**	304	4	230
$NRPR_E$ [MJ]	**6180**	4710	1	471
$NRPR_M$ [MJ]	**865**	826	-	39

Impact Category	Total A1-A3	A1	A	A3
$NRPR_T$ [MJ]	**7050**	5530	1	510
SM [kg]	**-**	-	-	-
RSF [MJ]	**-**	-	-	-
NRSF [MJ]	**-**	-	-	-
RE [MJ]	**-**	-	-	-
FW [m^3]	**1.360**	1.060	0	0.146
Output Flows and Waste Categories				
HWD [kg]	**0.0003**	0.0003	0	0.0000002
NHWD [kg]	**19.6**	19.10	0	0.393
HLRW [kg]	**0.000105**	0.000082	0	0.000020
ILLRW [kg]	**0.0879**	0.0685	0	0.0165
CRU [kg]	**-**	-	-	-
MR [kg]	**-**	-	-	-
MER [kg]	**-**	-	-	-
EEE [MJ]	**-**	-	-	-
EET [MJ]	**-**	-	-	-

LIFE CYCLE ASSESSMENT INTERPRETATION

A dominance analysis was performed for all products in the LCA to show which of the life cycle modules contributes to the majority of the impacts. Due to the relevance of this impact category to the product type and the manufacturer's interests, this dominance analysis is provided for IPCC AR6 Global Warming Potential (GWP) 100, excluding biogenic carbon results.

Global warming potential (GWP) is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specified time horizon and measured relative to carbon dioxide.

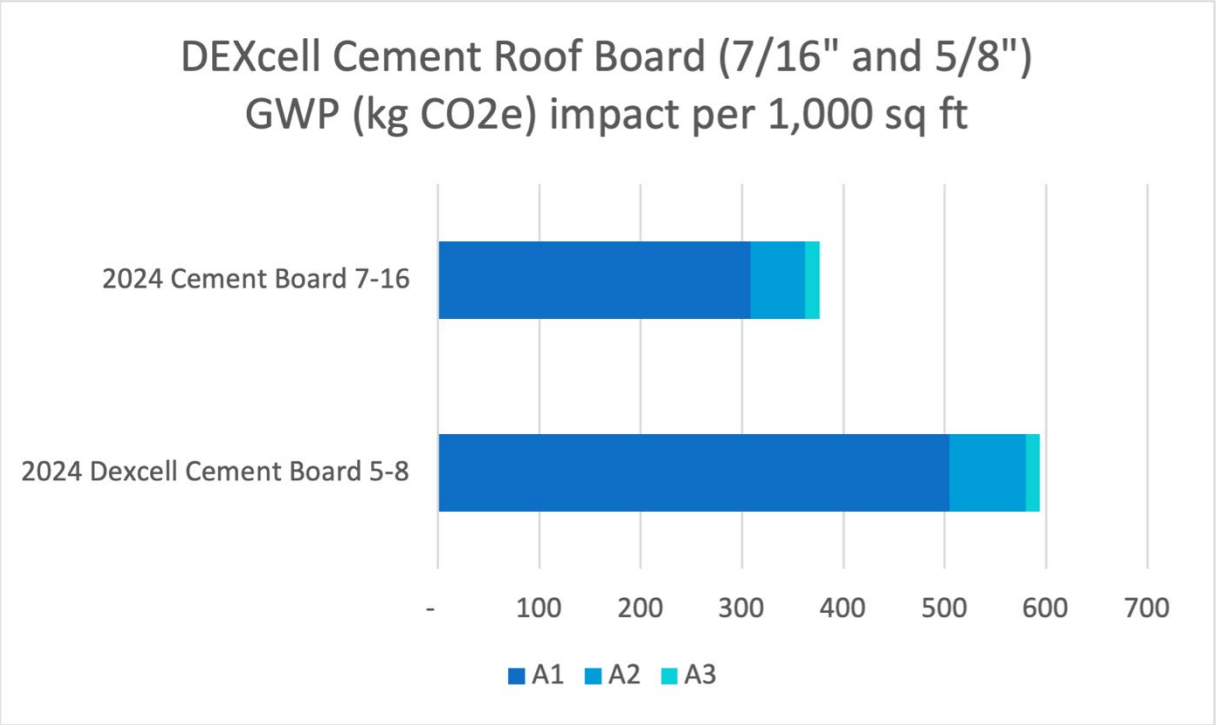


Figure 2: GWP dominance analysis for DEXcell Cement Roof Board (7/16" and 5/8" thick panels)

The dominance analysis shows that the impacts from raw material extraction (A1) and transportation (A2) are most impactful at 82% and 14%, respectively, while impacts from manufacturing (A3) are significantly lower (4%) for the 7/16" board. For the 5/8" board they are 85%, 13%, and 2% for A1, A2, and A3 respectively. At a more granular level, we find cement and fly ash are the largest contributors to A1 impacts and comprise more than half of the overall impact. The emissions sources contributing the most within the manufacturing stage (A3) are waste, natural gas, and electricity.

Some limitations to the study have been identified as follows:

- Only facility-level data were provided for manufacturing processes. Sub-metering of specific product lines would allow for more accurate manufacturing impacts to be modeled.

- The study represents an average of four manufacturing sites; therefore, site-specific results may differ.
- Availability of geographically more accurate datasets would have improved the accuracy of the study.
- Only known and quantifiable environmental impacts are considered.
- Due to the assumptions and value choices listed above, these do not reflect real-life scenarios and hence they cannot assess actual and exact impacts, but only potential environmental impacts.

ADDITIONAL ENVIRONMENTAL INFORMATION

ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

DEXcell® Cement Roof Board products are UL GREENGUARD Gold certified. Additionally, a Health Product Declaration ("HPD") is published for DEXcell® Cement Roof Board (7/16" and 5/8").

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