

NEXGEN

MAXTERRA® PROTERRA®

Environmental Product Declaration



Environmental Product Declaration for mineral-based panel products produced by NEXGEN Building Products, LLC.



International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers mineral-based panel products produced by NEXGEN Building Products, LLC. Declared unit: 1 (one) square meter of mineral-based panel
Declaration Owner:	NEXGEN Building Products, LLC
	1904 Manatee Ave West #300
	Bradenton, FL
	www.nexgenbp.com
Program Operator:	Labeling Sustainability
	11670 W Sunset Blvd.
	Los Angeles, CA
	www.labelingsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services
	PCR Program Operator: International Organization of Standardization
	PCR review was conducted by: Technical Committee: ISO/TC 59/SC 17 Sustainability in buildings and civil engineering works
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006
	Independent verification of the declaration, according to ISO 14025:2006
	Internal External: X
	Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca)
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COMPANY DESCRIPTION

NEXGEN Building Products manufactures the best-in-class Magnesium Oxide (MgO) products available on the market today. NEXGEN's structural MAXTERRA line of products offer certified non-combustibility, and all of their sulfate-based MgO products offer unmatched fire resistance, water resistance, as well as mold and mildew resistance - all without the use of harmful chemicals. NEXGEN enables builders, contractors, and architects to construct High Performance buildings that delight their residential and commercial clients by using the highest certified, most resilient, and eco-friendly Magnesium Oxide-based NEXGEN building products.

NEXGEN Building Products is committed to excellence across all aspects of product performance, including unmatched quality control during production, exceptional performance in application, and sustainable practices. NEXGEN is dedicated to continued improvements via investment in research and development, product certification, and infrastructure.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com. This level of study is in accordance with EPD Product Category Rule (PCR) for Mineral-based Panel published by ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate NEXGEN Building Products, LLC from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of NEXGEN Building Products, LLC by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen NEXGEN Building Products, LLC's license to operate in the community. The intended audience for this LCA report is NEXGEN Building Products, LLC's employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons of other facilities.





DESCRIPTION OF PRODUCT AND SCOPE

NEXGEN's products are composed of fiberglass mesh reinforced magnesium sulfate cement-based sheathing consisting of a proprietary composition of Magnesium Oxide (MgO) and Magnesium Sulfate (MgSO₄) that are reinforced by multiple layers of fiberglass mesh. The boards contain proprietary additives. The boards are manufactured in various lengths, widths and thicknesses. The boards are intended for use as internal wall lining, tile backer board in wet areas, exterior sheathing, structural sheathing, single floor subfloor, underlayment, decorative sheathing, and for use in the manufacturing of Structural Insulated Panels (SIPS).

These mineral-based panels are free from VOCs and quartz silica. Its sulfate-based formulation distinguishes it from traditional chloride-based MgO products, addressing corrosion issues and aligning with future safety and environmental compliance standards.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study.

MINERAL-BASED PANEL DESIGN SUMMARY

The following tables provide a list of the mineral-based panel products considered in this EPD along with key performance parameters.

Table 1: Declared products with all declared considered in this environmental product declaration.

Pro d#	Unique name/ID	Short description	Product type	Unit	Density, dry kg/Unit	bio-carbon content, kg C/FU dry basis	Height (in)	Length (ft)	Width (ft)
1	MAXTERRA® Structural Sheathing (1/2")	Non-Combustible Structural Wall Sheathing Square Edge (12mm)	Magnesium Oxide Board	m2	13.82	0.0691	1/2	8, 10 & 12	4
2	MAXTERRA® Structural Sheathing (5/8")	Non-Combustible Structural Wall Sheathing Square Edge (16mm)	Magnesium Oxide Board	m2	18.43	0.09214	5/8	8, 10 & 12	4
3	PROTERRA™ Structural Sheathing (1/2")	Fire-and Water-Resistant Wall Sheathing -	Magnesium Oxide Board	m2	12.02	0.42063	1/2	8, 10 & 12	4





		Square Edge (12mm)							
4	PROTERRA™ Structural Sheathing (5/8")	Fire-and Water-Resistant Wall Sheathing - Square Edge (16mm)	Magnesium Oxide Board	m2	16.02	0.560805	5/8	8, 10 & 12	4
5	MAXTERRA® MgO Floor Panel (3/4")	Non-Combustible Structural Floor Panels T&G (20mm)	Magnesium Oxide Board	m2	24.04	0.120175	3/4	8 & 10	4
6	PROTERRA™ MgO Floor Panel (5/8")	Fire-and Water - Resistant Structural Floor Panel T&G (16mm)	Magnesium Oxide Board	m2	16.82	0.5887	5/8	8 & 10	4
7	PROTERRA™ MgO Floor Panel (3/4")	Fire-and Water - Resistant Structural Floor Panel T&G (20mm)	Magnesium Oxide Board	m2	21.03	0.73605	3/4	8 & 10	4
8	MAXTERRA® MgO Backer Board (1/4")	Fire and Water Resistant Underlayment & Backer Board Square Edge (6mm)	Magnesium Oxide Board	m2	5.41	0.210834	1/4	5, 8, 10 & 12	3 & 4
9	MAXTERRA® MgO Backer Board (3/8")	Fire and Water Resistant Underlayment & Backer Board Square Edge (9mm)	Magnesium Oxide Board	m2	8.11	0.316329	3/8	5, 8, 10 & 12	3 & 4
10	MAXTERRA® MgO Backer Board (1/2")	Fire and Water Resistant Underlayment & Backer Board Square Edge (12mm)	Magnesium Oxide Board	m2	10.82	0.421824	1/2	5, 8, 10 & 12	3 & 4
11	MAXTERRA® MgO Backer Board (5/8")	Fire and Water Resistant Underlayment & Backer Board Square Edge (16mm)	Magnesium Oxide Board	m2	14.42	0.562458	5/8	5, 8, 10 & 12	3 & 4
12	MAXTERRA® MagRock™	Fire and Water Resistant Light Weight Wall	Magnesium Oxide Board	m2	6.49	0.32445	3/8	8, 10 & 12	4





	Wall Board (3/8")	Board Square Edge (9mm)							
13	MAXTERRA® MagRock™ Wall Board (1/2")	Fire and Water Resistant Light Weight Wall Board Tapered Edge (12mm)	Magnesium Oxide Board	m2	8.65	0.43265	1/2	8, 10 & 12	4
14	MAXTERRA® MagRock™ Wall Board (5/8")	Fire and Water Resistant Light Weight Wall Board Tapered Edge (16mm)	Magnesium Oxide Board	m2	11.54	0.5769	5/8	8, 10 & 12	4
15	MAXTERRA® Decorative Board (3/8")	Decorative Fire and Water Resistant Light Weight Wall Board (9mm)	Magnesium Oxide Board	m2	8.27	0.289275	3/8	8, 10 & 12	4



MINERAL-BASED PANEL DESIGN COMPOSITION

The following figures provide mass breakdown (kg per declared unit) of the material composition of each mineral-based panel design considered.

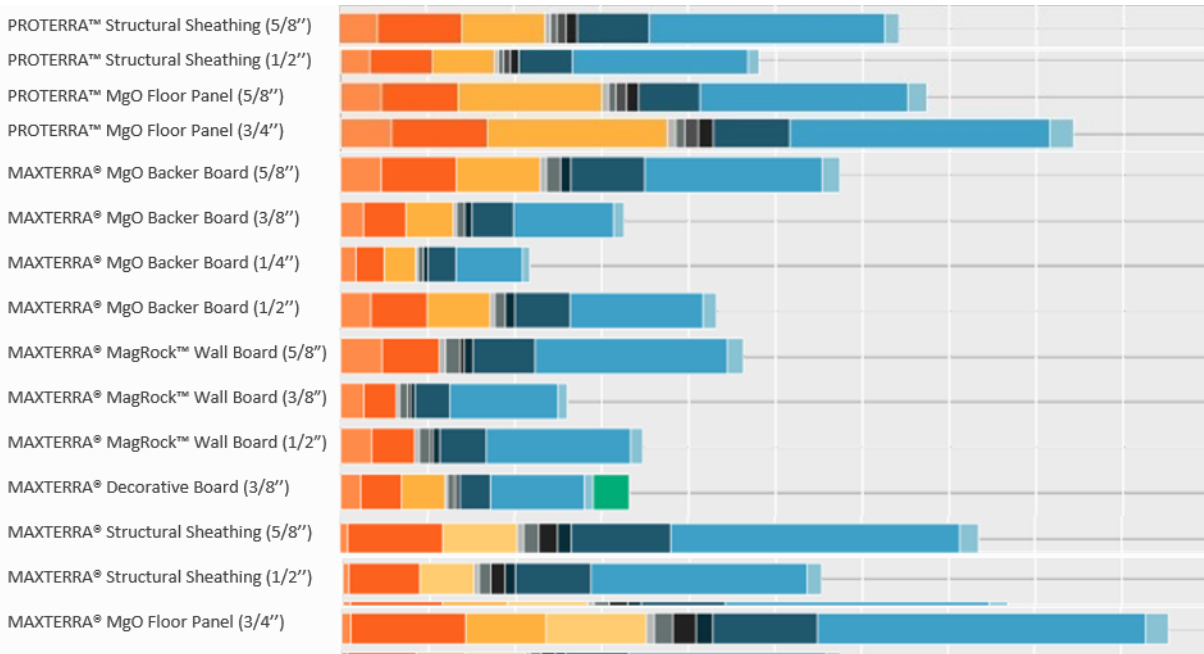


Figure 1: Material composition - All declared products per 1 (one) square meter of mineral-based panel

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 2: Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)

Product name	Mix category	Primary content	Post industrial content	Post consumer content	Material losses
Waste/recycled material	Waste mineral plaster	0%	100%	0%	2%

SYSTEM BOUNDARIES



The following figure depicts the cradle-to-gate system boundary considered in this study:

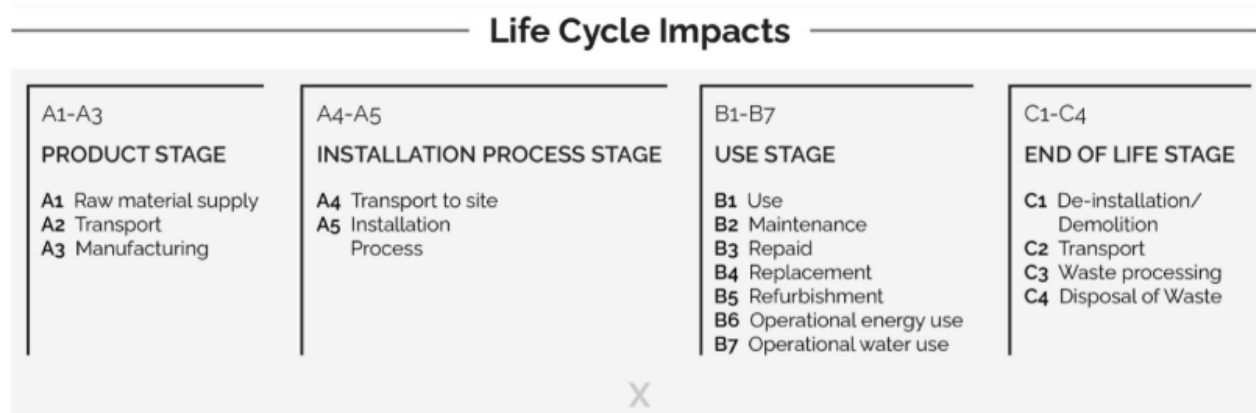


Figure 2: **General life cycle phases for consideration in a construction works system**

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the “gate” of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacture the declared products and to operate the facility.
- A4: Product plant gate-to-site of use logistics

As according to the PCR, the following figure illustrates the general activities and input requirements for producing mineral-based panel products and is not necessarily exhaustive.



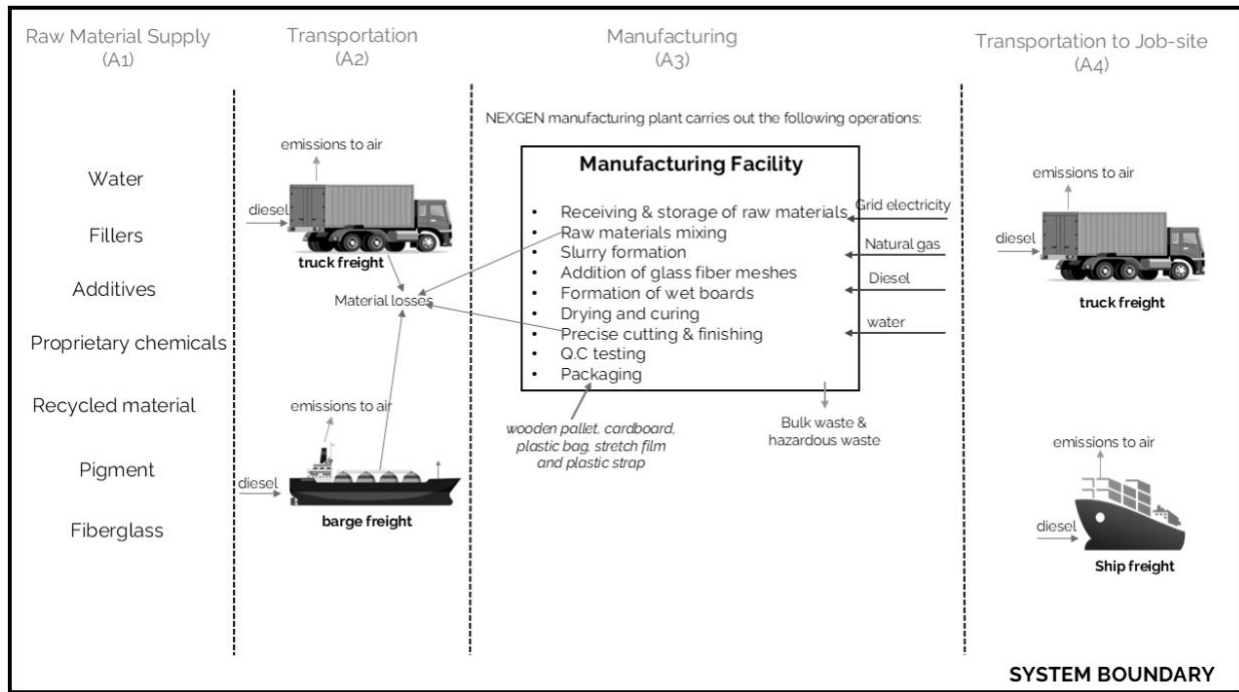


Figure 3: **General system inputs considered in the product system and categorized by modules in scope**

In addition, according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies);
- Energy use is related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by NEXGEN Building Products, LLC, is located at their East Asia facility in China. All operating data is formulated using the actual data from NEXGEN Building Products, LLC's plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from NEXGEN Building Products, LLC were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

No known flows are deliberately excluded from this EPD.





CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

Table 4: Reused or recycled components/materials at the A3 facility site

Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
Production debris	24,708,000	kg	On-site

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: NEXGEN provided all primary information for the reference year 2024, including comprehensive details on raw material consumption and logistics data. This includes a wide range of raw materials such as fillers, glass fiber, water, additives, pigments, and more, used in the manufacturing of mineral-based panels. The transportation of these materials was determined based on the actual distance from the manufacturers or distributors. Logistics for A2 requirements relied on primary data to document transportation specifics, including the exact distance, mode of transport, and location details such as city, state, and country.

Electricity: The reported electricity consumption is based on primary data from NEXGEN's utility bills for the reporting period. Electricity allocation was initially determined by calculating the average electricity consumption value in kWh per declared unit (i.e., kWh/m²). Subsequently, this value was multiplied by the total square meter (m²) production for each product covered in this study

Process/space heating: The facility incorporates natural gas within its production processes. The reported natural gas consumption is based on NEXGEN's primary information derived from utility bills for the reporting period. The conversion factor used for mmBTU to MJ to represent the natural gas heating values in Mega joules (MJ) was, 1 mmBTU equating to 1055.055 MJ.

Fuel required for machinery: Machinery at the facility uses either electricity, as documented in the utility bills, or diesel. Diesel consumption is accurately calculated based on direct purchase records for the reporting period 2024. For diesel, the conversion factor was determined as 1 U.S gallon of diesel ≈ 146 MJ of energy.

Waste generation: Waste calculations were calculated using primary information from NEXGEN's records or vendor bills, which include bulk waste and hazardous waste. No additional waste is attributed to the products, as all waste generated during the manufacturing process is fully recyclable



and can be reintegrated into the production of MgO panels. Transportation defaults were used because the driver’s route and ultimate final destination are unknown. Therefore, the exact mileage could not be confirmed by the waste hauler.

Recovered energy: No on-site energy is recovered on site.

Recycled/reused material/components: All the process output waste generated during the manufacturing process at the facility is utilized as input for other products.

Module A1 material losses: Default material losses, 2%, were used.

Direct A3 emissions accounting: Direct emissions on-site were modeled with the best available ecoinvent processes (see LCI list).

A4 Product transport requirements: NEXGEN reported the average job-site distance based on the records for shipping and the number of purchase orders. NEXGEN products are manufactured at its East Asia plant located in China. These products are transported from the plant to the Shanghai port via truck freight. From there, shipments are dispatched to Long Beach Port, CA, and Newark Port, NJ. Finally, the products are delivered to job sites or warehouses by trucks.

A5 product installation: A5 module out of scope.

B product use phase: Module B out of scope.

C product end-of-life: Module C out of scope.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 5: LCI inputs assumed for module A1 (i.e. raw material supply). Data Quality Assessment Key Fair=1, Good=2, Very Good =3.

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Wood shavings	shavings, hardwood, measured as dry mass to generic market for residual wood, dry/residual wood, dry/RoW/m3	ecoinvent v3.10 in 2024	Shandong	2024	2	3	2	3	3
Proprietary additive 2	aluminium sulfate production, powder/aluminium sulfate, powder/RoW/kg	ecoinvent v3.10 in 2024	Shandong	2024	2	3	2	3	3



Magnesium sulfate	magnesium sulfate production/magnesium sulfate/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Pumice	pumice quarry operation/pumice/RoW/kg	ecoinvent v3.10 in 2024	Anhui	2024	2	3	2	3	3
Decorative layer	kraft paper production/kraft paper/RoW/kg	ecoinvent v3.10 in 2024	Zhejiang	2024	1	3	2	3	3
Water	tap water production, conventional treatment/tap water/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Perlite	perlite quarry operation/perlite/RoW/kg	ecoinvent v3.10 in 2024	Henan	2024	2	3	2	3	3
EPS	polystyrene production, expandable/polystyrene, expandable/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Magnesium oxide	magnesium oxide production/magnesium oxide/RoW/kg	ecoinvent v3.10 in 2024	Liaoning	2024	2	3	2	3	3
Pigment	chemical production, inorganic/chemical, inorganic/GLO/kg	ecoinvent v3.10 in 2024	Shandong	2024	2	3	2	3	3
Decorative layer	phenolic resin production/phenolic resin/RoW/kg	ecoinvent v3.10 in 2024	Zhejiang	2024	1	3	2	3	3
Proprietary additive 1	Withheld	ecoinvent v3.10 in 2024	Shandong	2024	2	3	2	3	3
Non-woven fiberglass	glass fibre production/glass fibre/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Waste/recycled material	waste-input, produced on-site	See A3 inputs	Jiangsu	See A3 inputs	2	A3	2	A3	A3

Table 6: LCI inputs assumed for module A2 (i.e. transport of A1 inputs). Data Quality Assessment Key Fair=1, Good=2, Very Good =3.

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Decorative layer-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3



EPS- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Glassfiber- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Magnesium oxide- freight transport via Barge	market group for transport, freight, inland waterways, barge/transport, freight, inland waterways, barge/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
Magnesium oxide- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Magnesium sulfate- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Non-woven fiberglass- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Perlite- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Pigment- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Proprietary additive 1- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Proprietary additive 2- freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3



Pumice-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
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Table 7: LCI inputs assumed for module A3. Data Quality Assessment Key Fair=1, Good=2, Very Good =3.

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Bulk waste	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Cardboard corner	corrugated board box production/corrugated board box/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Diesel	diesel, burned in building machine/diesel, burned in building machine/GLO/MJ	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Electricity	market group for electricity, medium voltage/electricity, medium voltage/CN/kWh	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Hazardous waste	process-specific burdens, hazardous waste incineration plant/process-specific burdens, hazardous waste incineration plant/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Natural gas	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Plastic bag	extrusion, plastic film/extrusion, plastic film/RoW/kg	ecoinvent v3.10 in 2024	Shandong	2024	2	3	2	3	3
Plastic strap	polyethylene terephthalate production, granulate, amorphous, recycled/polyethylene terephthalate, granulate, amorphous, recycled/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3



Plastic stretch film	packaging film production, low density polyethylene/packaging film, low density polyethylene/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Bulk water-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Cardboard corner-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Wooden pallet-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Plastic bag-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Plastic strap-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Plastic stretch film-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Hazardous waste-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3



Table 8: LCI inputs assumed across modules A4 (i.e. from plant gate-to-job-site). Data Quality Assessment Key Fair=1, Good=2, Very Good =3.

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
A4. Ocean freight (China to US) - CA Port	transport, freight, sea, bulk carrier for dry goods/transport, freight, sea, bulk carrier for dry goods/GLO/tkm	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
A4. Ocean freight (China to US) - NJ Port	transport, freight, sea, bulk carrier for dry goods/transport, freight, sea, bulk carrier for dry goods/GLO/tkm	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
A4. Product to Job-site	Product-to-site transport requirements	See A4 transport requirements	California	2023-11-01 to 2024-11-01	2	3	2	3	3
A4. Product to Job-site-freight transport via Truck	market for transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
A4. Road freight - manufacturer to port	transport, freight, lorry 16-32 metric ton, EURO6/transport, freight, lorry 16-32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the data quality achieved relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent



the specified and declared products. Most relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 input were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered Mineral-based Panel materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Cross checks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Mineral-based Panel LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Mineral-based Panel product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2023-11-01 to 2024-11-01.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.



ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table g: Life cycle impact categories and life cycle inventory metrics

ID	LCIA indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP	kg CO ₂ -eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO ₂ -eq
4	Eutrophication: eutrophication potential	EP	kg N-eq
5	Smog formation potential	SFP	kg O ₃ -eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADP _{fossil}	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	MJ
11	Inventory indicators ISO21930: use of secondary material	SM	kg
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m ³
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg
17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EE _{el}	MJ
22	Inventory indicators ISO21930: exported energy - heat	EE _{heat}	MJ

It should be noted that emerging LCA impact categories and inventory items are still under



development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system



TOTAL IMPACT SUMMARY

Interpretation

This life cycle study represents the environmental impacts of 1 m² of MgO-based panels, available in a range of thicknesses (1/4", 3/8", 1/2", 5/8", 3/4"). The study revealed specific key contributors or, environmental hotspots, that contribute significantly to the products' carbon footprint. The findings are as follows:

The most significant A1 contributors to the MgOBoard products' carbon footprint, measured in kg CO₂ eq, were (raw materials), magnesium oxide, and proprietary additive 1, contributing between 14.7%-33.9% and 1.3%-6% of the total environmental impacts, respectively, depending on the quantity used per declared unit. Following this, A3 (manufacturing processes)—which involve Electricity, Natural Gas, and Diesel, accounts for 15%-32%, 8%-18%, and 6%-13% of the total impacts, respectively. The (distribution phase) A4 plays a crucial role in the overall products' carbon footprint, contributing 5% to 12% of the total emissions. While other components and stages contribute to the overall global warming potential (GWP), their impact is comparatively smaller.

Mitigation Strategies

These findings highlight the need to adopt sustainable practices to mitigate the overall carbon footprint of the products. The mitigation strategies are as follows:

- Exploring alternative materials and sustainable approaches. This involves identifying lower-impact sources or optimizing material usage to reduce quantity without compromising product quality.
- Transitioning to renewable energy sources for electricity can further reduce emissions.
- Furthermore, implementing advanced manufacturing technologies to optimize the utilization of A3 utilities requirements, along with incorporating strategies to enhance energy efficiency, and minimizing waste from production processes.
- Optimize and streamline logistics to reduce transportation impacts attributed to the distribution phase.

By focusing on these key areas significant reductions in global warming potential (GWP) and overall environmental impact can be achieved across these products.

The following table reports the total LCA results for each product produced at the given mineral-based panel facility on a per 1 (one) square meter of mineral-based panel basis



Table 10: Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 1 (one) square meter of mineral-based panel basis

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP	ODP	AP	EP	SFP	ADP _{fossil}
Unit	kg CO ₂ -eq	kg CFC-11-eq	kg SO ₂ -eq	kg N-eq	kg O ₃ -eq	MJ
Minimum	26.6	2.65E-07	0.116	0.0493	2.36	289
Maximum	57.4	5.53E-07	0.244	0.101	4.34	557
Mean	39.91	0.00	0.17	0.07	3.22	405.53
Median	40.3	3.89E-07	0.172	0.0745	3.2	405
MAXTERRA® Structural Sheathing (1/2")	42.7	4.03e-07	0.18	0.0754	3.35	424
MAXTERRA® Structural Sheathing (5/8")	51	4.81e-07	0.214	0.0899	3.88	496
PROTERRA™ Structural Sheathing (1/2")	37.3	3.46e-07	0.157	0.0637	3.03	378
PROTERRA™ Structural Sheathing (5/8")	44.1	4.07e-07	0.185	0.0748	3.48	438
MAXTERRA® MgO Floor Panel (3/4")	57.4	5.53e-07	0.244	0.101	4.34	557
PROTERRA™ MgO Floor Panel (5/8")	43.4	4.11e-07	0.186	0.0745	3.51	439
PROTERRA™ MgO Floor Panel (3/4")	49.3	4.65e-07	0.211	0.0838	3.89	490
MAXTERRA® MgO Backer Board (1/4")	26.6	2.65e-07	0.116	0.0493	2.36	289
MAXTERRA® MgO Backer Board (3/8")	31.2	3.12e-07	0.136	0.0582	2.67	330
MAXTERRA® MgO Backer Board (1/2")	35.8	3.59e-07	0.157	0.0671	2.98	371
MAXTERRA® MgO Backer Board (5/8")	41.8	4.21e-07	0.184	0.0789	3.39	425
MAXTERRA® MagRock™ Wall Board (3/8")	30.5	2.95e-07	0.13	0.0559	2.57	320
MAXTERRA® MagRock™ Wall Board (1/2")	34.6	3.34e-07	0.148	0.0636	2.83	356
MAXTERRA® MagRock™ Wall Board (5/8")	40.3	3.89e-07	0.172	0.0744	3.2	405
MAXTERRA® Decorative Board (3/8")	32.6	3.45e-07	0.142	0.0839	2.78	365



b) Resource Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	MJ	kg	MJ	MJ	m3
Minimum	32.2	9.48	32.4	1.29	0.105	0.00457	0.0905	0.0791
Maximum	71.7	62	71.6	11.8	0.197	0.00915	0.339	0.191
Mean	51.87	39.70	52.12	3.43	0.14	0.01	0.19	0.12
Median	49.6	41.7	49.9	2.92	0.141	0.00664	0.208	0.118
MAXTERRA® Structural Sheathing (1/2")	32.2	9.48	32.4	2.54	0.149	0.00664	0.219	0.131
MAXTERRA® Structural Sheathing (5/8")	39.8	12.8	40	3.27	0.173	0.00835	0.287	0.162
PROTERRA™ Structural Sheathing (1/2")	46.4	40.9	46.6	1.29	0.134	0.00595	0.167	0.0959
PROTERRA™ Structural Sheathing (5/8")	60.2	56.9	60.5	1.61	0.154	0.00678	0.219	0.117
MAXTERRA® MgO Floor Panel (3/4")	46.9	16.5	47.2	4.16	0.197	0.00915	0.339	0.191
PROTERRA™ MgO Floor Panel (5/8")	63.4	62	63.8	1.66	0.157	0.00664	0.208	0.118
PROTERRA™ MgO Floor Panel (3/4")	61.6	54.3	61.9	1.97	0.176	0.00698	0.253	0.137
MAXTERRA® MgO Backer Board (1/4")	32.3	23.2	32.4	1.63	0.105	0.00457	0.0905	0.0791
MAXTERRA® MgO Backer Board (3/8")	43	33.9	43.2	2.27	0.119	0.00622	0.129	0.101
MAXTERRA® MgO Backer Board (1/2")	54	45.3	54.3	2.92	0.134	0.00668	0.167	0.122
MAXTERRA® MgO Backer Board (5/8")	68.6	60.3	69.1	3.78	0.152	0.00767	0.219	0.151
MAXTERRA® MagRock™ Wall Board (3/8")	42.2	35.1	42.4	3.17	0.113	0.00512	0.124	0.0938
MAXTERRA® MagRock™ Wall Board (1/2")	49.6	41.7	49.9	4.07	0.124	0.00566	0.16	0.113
MAXTERRA® MagRock™ Wall Board (5/8")	66.1	60.7	66.5	5.35	0.141	0.00648	0.209	0.138





MAXTERRA® Decorative Board (3/8")	71.7	42.4	71.6	11.8	0.127	0.00508	0.131	0.104
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c) Waste/output Inventory Metrics:

Indicator/LCI Metric	HWD	NHW D	HLRW	ILLRW	MR	MER	EEel	EEheat
Unit	kg	kg	kg	kg	kg	kg	MJ	MJ
Minimum	1.51	22.1	3.96E-05	0.000107	0.00935	8.14E-05	0.0196	0.0704
Maximum	2.59	54.3	7.83E-05	0.000194	0.016	0.000335	0.0614	0.275
Mean	1.98	34.79	0.00	0.00	0.01	0.00	0.04	0.16
Median	2.04	33.3	5.85E-05	0.000149	0.012	0.000199	0.0399	0.165
MAXTERRA® Structural Sheathing (1/2")	2.06	37	5.99e-05	0.000152	0.0126	0.000215	0.0409	0.177
MAXTERRA® Structural Sheathing (5/8")	2.36	46.2	7.12e-05	0.000177	0.0144	0.000284	0.0531	0.232
PROTERRA™ Structural Sheathing (1/2")	1.83	26.6	5.12e-05	0.000132	0.0116	0.000163	0.0314	0.134
PROTERRA™ Structural Sheathing (5/8")	2.06	32.7	6e-05	0.000152	0.013	0.000216	0.0407	0.177
MAXTERRA® MgO Floor Panel (3/4")	2.59	54.3	7.83e-05	0.000194	0.016	0.000335	0.0614	0.275
PROTERRA™ MgO Floor Panel (5/8")	2.06	33.3	6.07e-05	0.000153	0.0133	0.000199	0.0414	0.165
PROTERRA™ MgO Floor Panel (3/4")	2.25	38.7	6.8e-05	0.000169	0.0143	0.000244	0.0494	0.202
MAXTERRA® MgO Backer Board (1/4")	1.51	22.1	3.96e-05	0.000107	0.00935	8.14e-05	0.0196	0.0704
MAXTERRA® MgO Backer Board (3/8")	1.69	28.5	4.66e-05	0.000123	0.0104	0.000119	0.0271	0.101
MAXTERRA® MgO Backer Board (1/2")	1.88	35	5.36e-05	0.000138	0.0115	0.000156	0.0347	0.132
MAXTERRA® MgO Backer Board (5/8")	2.11	43.7	6.28e-05	0.000159	0.0129	0.000206	0.0448	0.173
MAXTERRA® MagRock™ Wall Board (3/8")	1.66	25.7	4.43e-05	0.000117	0.00995	0.000118	0.0245	0.0985





MAXTERRA® MagRock™ Wall Board (1/2")	1.82	31.1	5.01e-05	0.00013	0.0108	0.000154	0.0309	0.128
MAXTERRA® MagRock™ Wall Board (5/8")	2.04	38.5	5.85e-05	0.000149	0.012	0.000203	0.0399	0.167
MAXTERRA® Decorative Board (3/8")	1.82	28.5	5.17e-05	0.000135	0.0108	0.000109	0.0337	0.0965

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.



REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements.
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products.

Other References:

- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products
- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf

