



ES TU MUNDO. CONSTRÚYELO.™



Environmental Product Declaration Cement board

Environmental Product Declaration
In accordance with ISO 14025:2006 and EN 15804:2012



Program:	The International EPD® System EPD registered through the fully aligned regional program/hub: EPD Latin America
Program operator:	EPD International AB
Regional Hub:	EPD Latin America
EPD registration number:	S-P-01424
Issue date:	2019-08-30
Validity date:	2024-08-27 An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com
Revision date:	2019-08-28
Geographical scope:	Mexico

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1. USG



ES TU MUNDO. CONSTRÚYELO.™

USG has been a leading manufacturer of building products and innovative solutions for more than 115 years. Our wall, ceiling, flooring, sheathing and roofing products provide the solutions that enable customers to build the outstanding spaces where people live and do business.

Since 1902, USG has led the manufacturing industry with innovations and products that set new standards for design, productivity and performance for customers all over the globe.

In 2017, we celebrated the 100th anniversary of USG's iconic SHEETROCK® Brand, the landmark product that revolutionized interior construction and enabled the lightweight, fireproof walls we still build today. We are a leading manufacturer of building products and innovative solutions, including wall, ceiling, flooring, sheathing and roofing products, that help the construction industry to build stronger, safer and more sustainable communities.

Innovation:

We manufacture high-quality products that solve real-world challenges and meet our rigorous safety standards. When we look at the issues that our customers and others in the manufacturing industry face, such as labor shortages, water scarcity, or time management, we think about the science, engineering, and technology that is needed to solve them.

USG holds more than 2,400 active U.S. and international patents that represent innovations that improve the way building materials are used in the places we live and do business.

Our Corporate Innovation Center (CIC) is a state-of-the-art research facility committed to develop new-to-market products and to improve our existing portfolio.

Safety:

Safety is our first and most important core value. USG has been committed to the safety of our employees, customers and the communities where we live and do business since we documented our first safety rules more than 100 years ago. In 2016, we earned the National Safety Council's Robert W. Campbell award, one of the world's most respected celebrations of safety-first culture, for our excellence in environmental, health and safety (EHS) management.

Sustainability:

Our vision is to be the world leader in building products and innovative solutions that enable our customers to create sustainable, inspirational and inviting spaces. Living out this vision extends beyond our manufacturing lines to our employees, communities and the environment.

As part of our commitment to the environment, we focus on reducing waste while using resources more efficiently and transforming manufacturing byproducts into valuable resources. Our Ecoblueprint™ strategy is our public commitment to completing three goals by 2020:

- Reduce greenhouse emissions by 20%;
- Reduce operational waste to landfills by 50%; and,
- Conduct life cycle assessments of all product lines.

2. General Information

Product:	Cement Boards
Declaration owner:	<p>USG México, S.A. de C.V. Av. Vasco de Quiroga #4800, Piso 5, Oficina 501, Santa Fe, Cuajimalpa de Morelos. Ciudad de México, México. C.P. 05348. Contact person: Gabriela González Alcaraz e-mail: gagonzalez@usg.com.mx</p>
Description of the construction product:	<p>USG DUROCK® and USG DURACRETE® have a Portland cement core and are laminated with a polymerized fiberglass mesh on both sides. They provide a solid base for ceramic and marble tiles, quarried stones, fine bricks and textured or painted finishes.</p> <p>USG DUROCK® and USG DURACRETE® are the best solution for areas that have high levels of relative humidity or that are in direct contact with water.</p>
Declared Unit:	1 m ² of cement board.
Construction product identification:	Central Product Classification: CPC 54 Construction Services V2
Description of the main product components and/or materials:	USG DUROCK® and USG DURACRETE® cement boards may contain materials such as: Cement, aggregates, gypsum, perlite, polymerized fiberglass mesh and others.
Life cycle stages not considered:	Distribution, installation, use, end of life.
Content of the declaration:	<p>This EPD is based on information modules that do not cover the aspects of use and end of life of the product. It contains in detail, for Module A1, A2 and A3:</p> <ul style="list-style-type: none"> • Product definition and physical data • Information about raw materials and origin • Specifications on product manufacturing • Notes on product processing • LCA based on a declared unit, cradle-to-gate • LCA results • Evidence and verifications
For more information consult:	www.usg.com
Site for which this EPD is representative:	<p>Manufacturing Plant</p> <p>1) USG Monterrey Plant. Carretera a Monclova Km 15, Camino a la Laguna km 2.5, El Carmen, Nuevo León, México.</p>
Public intended:	B2B (Business to Business)

3. Product description

USG DUROCK® and USG DURACRETE® are the best solution for areas that have high levels of relative humidity or that are in direct contact with water.

USG DUROCK® and USG DURACRETE® have a Portland cement core and are laminated with a polymerized fiberglass mesh on both sides. They provide a solid base for ceramic and marble tiles, quarried stones, fine bricks and textured or painted finishes.



4. Content declaration

USG DUROCK® cement boards contain materials shown in Table 1.

Element	Typical content
Cement	55%
Aggregates	26%
Land Plaster	2%
Perlite	7%
Fly Ash	5%
Fiberglass mesh	4%
Others	1%

Table 1. Typical content of USG DUROCK® cement boards

USG DURACRETE® cement boards contain materials shown in Table 2.

Element	Typical content
Cement	46%
Aggregates	43%
Land Plaster	3%
Fly Ash	5%
Fiberglass mesh	3%
Others	>0%

Table 2. Typical content of USG DURACRETE® cement boards

5. LCA Rules

Environmental potential impacts were calculated according to EN 15804:2012 and PCR 2012:01 Construction products and construction services Version 2.3 (2018-11-15). This EPD is in accordance with ISO 14025:2006.

Environmental potential impacts were calculated through the Life Cycle Assessment (LCA) methodology, according to ISO 14040:2006 and ISO 14044:2006. An external third-party verification process of the EPD was conducted according to General Program Instructions for the International EPD® System Version 3.0. Verification includes a documental review and validation of both the underlying LCA study and documents describing additional environmental information that justify data provided in the EPD.

5.1. Declared unit

1m² of cement board.

5.2. System boundary

Potential environmental impacts were calculated according to EN 15804:2012 and PCR 2012:01 Construction products and construction services Version 2.3 (2018-11-15). The declared EPD is a "Cradle-to-gate EPD" according to ISO 14025:2006. The following Table 3 describes the scope of the inventory performed in the LCA.

Life cycle environmental information of USG cement boards							Other environmental information
Product stage			Construction process stage		Use stage	End of life stage	Reuse recovery stage
A1	A2	A3	A4	A5	B1 - B7	C1 - C4	D
Extraction and processing of raw materials, generation of electricity and fuels	Transportation of raw materials to the manufacturing site of cement board and internal transportation	Manufacture of cement board, consumptions of materials for packaging of finished product and auxiliary materials. Air emissions and waste generation	Product distribution	Construction and installation	<ul style="list-style-type: none"> • Use • Maintenance • Repair • Replacement • Refurbishment • Operational energy use • Operational water use 	De-construction, demolition, transport, waste processing, disposal	Re-use-Recovery-Recycling-potential
X	X	X	MND	MND	MND	MND	MND
Cradle-to-gate Declared unit			These stages are not considered in this study, since they are cradle-to-grave stages				

*Included Module = x *MND = Module Not Declared

Table 3. Product system of USG cement boards



A description of information modules is included in Table 4.




		
A1) Raw material supply	A2) Transportation	A3) Manufacturing
<p>Production and processing of cement, aggregate and perlite.</p>	<p>Transportation of cement.</p>	<p>Water consumption.</p>
<p>Production and processing of additives.</p>	<p>Transportation of additives.</p>	<p>Production of maintenance materials such as lubricating oil and textiles.</p>
<p>Fiberglass mesh production.</p>	<p>Transportation of raw materials of finished product packaging.</p>	<p>Production of finished product packaging materials.</p>
<p>Production of packaging materials for raw materials, such as plastic bags, cardboard and wood.</p>	<p>Transportation of natural gas.</p>	<p>Air emissions generated in the manufacturing process of USG.</p>
<p>Generation and distribution of national electricity.</p>	<p>Transportation of auxiliary materials.</p>	<p>Generation of waste for recycling, for confinement and for landfill.</p>
<p>Production and processing of natural gas consumed in manufacturing.</p>		<p>Transportation of waste to final disposal sites.</p>

Table 4. Description of information modules included in this EPD



5.3. Description of the manufacturing process

The manufacturing process is described in Figure 1. The cement boards are manufactured from Portland cement, which is not affected by water and is very resistant; they are made by means of a continuous process of mixing Portland cement with aggregates, reinforced with a fiberglass mesh coated with polymers, which completely covers the edges, as well as the front and back surfaces by means of a patented process. The ends have straight cuts.

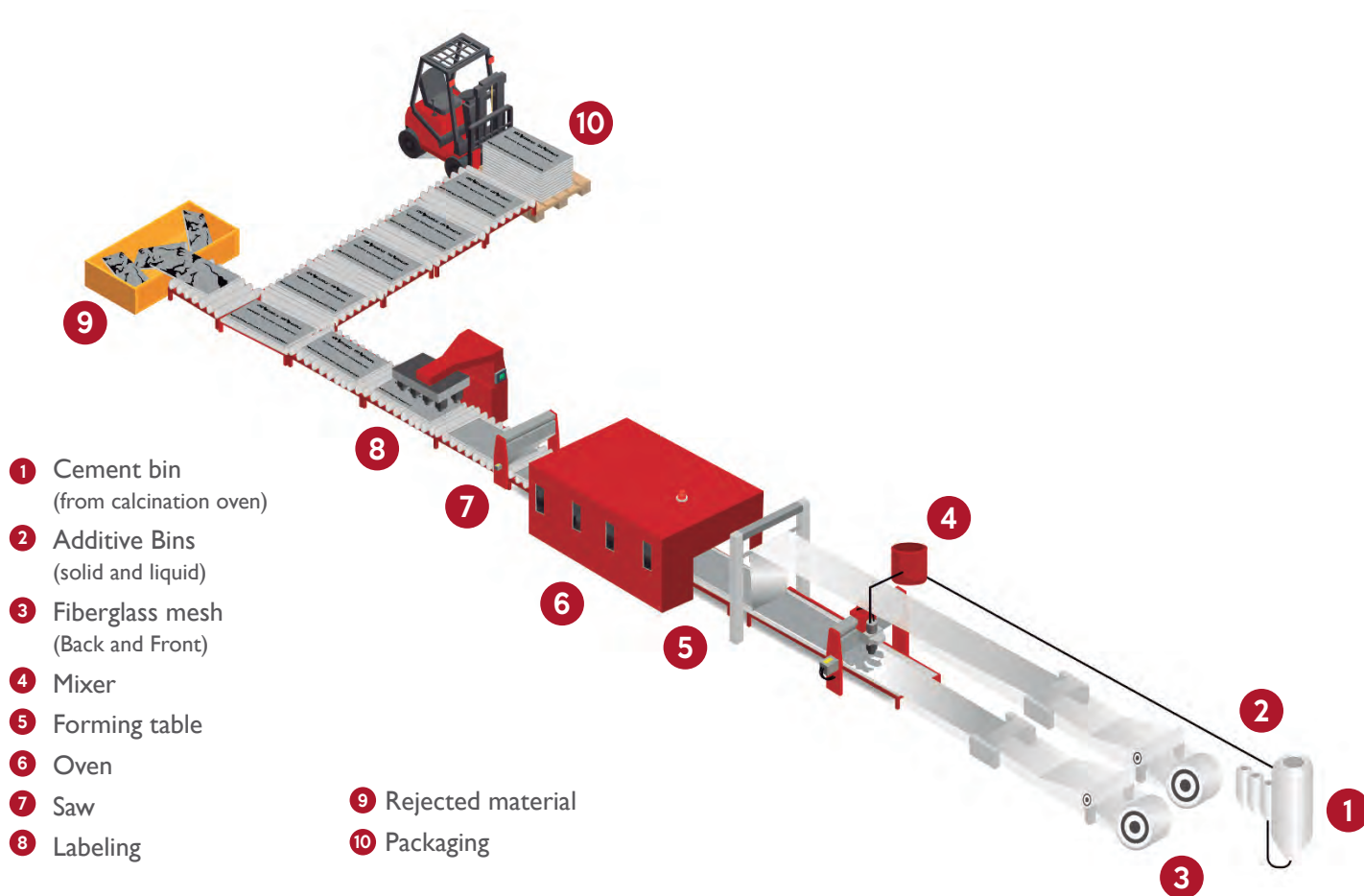


Figure. 1. Flow diagram of cement board's manufacturing process

5.4. Assumptions

The data set for Mexican electricity is part of the Mexicaniuh database and was created by CADIS with direct data from the CFE (Comisión Federal de Electricidad, Mexico's Federal Electricity Company). Electricity generation in Mexico is divided as follows: 36% thermoelectric, 12% coal-fired, 2% geothermal, 1% electric, 12% hydroelectric, 33% combined cycle technology, and 4% nuclear power (SENER, 2017).

In the year 2017, the loss for transmission and distribution of electric energy was 11% (SENER, 2017).

For secondary data and when it was not possible to obtain direct information from the company, the life cycle databases Mexcaniuh and Ecoinvent 3.3, in their Allocation Recycled Content version, were used.

For this study, the generic information obtained from the Ecoinvent 3.3 database has the following characteristics:

- The information is used as a world average, excluding Europe (RoW).
- It is meant to be a technological equivalence to that used by USG providers.

5.5. Cut-off criteria

The PCR document establishes that a minimum of 95% of the total flows (matter and energy) in modules A1 and A3 must be included in the LCI (PCR, 2017). In order to include the relevant data, the minimum established by the PCR was met, leaving out of the scope of this study, the company's infrastructure, the activities related to the transportation of employees and administrative activities developed by employees, as well as substances related to the corrective and preventive maintenance of the production machinery; spare parts and elements of the personal protection equipment are excluded.

5.6. Allocation

No allocations were made to the input or output data of the cement boards since USG does not report co-products during its internal manufacturing processes, or other situations that require allocation.

5.7. Time representativeness

Direct data obtained from USG is representative for 2017.

5.8. Data quality assessment

Data quality assessment per information module is provided in Tables 5, 6 and 7.

Table 5.Raw material supply Module A1 data quality assessment

Data	Temporary coverage	Geographic coverage	Technological coverage	Precision	Completeness	Representativeness	Consistency	Reproducibility	Sources of information	Measured or estimated	Uncertainty
Cement, solid and liquid additives consumption	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Cement production	1996 - 2016	Ecoinvent adapted	Modern	✓	✓	●	✓	✓	Ecoinvent 3.3. adapted	M&E	Uncertainty provided by Ecoinvent database 3.3
Solid and liquid additives production	1980 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3
Fiberglass mesh (upper and lower) consumption	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Production of fiberglass mesh (upper and lower)	1980 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3
Electrical energy consumption for board's manufacture	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Natural gas consumption for board's manufacture	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Fuel consumption and emissions related to the generation and distribution of electricity in Mexico	2017	Mexico	Mix for México	✓	✓	✓	✓	✓	Mexicanuih	M&E	Uncertainty provided by Mexcanuih
Electricity consumption and generation of emissions related to natural gas production in Mexico	2017	Mexico	Mix for Mexico	✓	✓	✓	✓	✓	Mexicanuih	M&E	Uncertainty provided by Mexcanuih
Consumption of raw material packaging materials	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M&E	1.05
Manufacture of raw material's packaging materials	1980-2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3

M&E: Measured and Estimated, M: Measured, E: Estimated

● Data of Ecoinvent ● Worldwide average based on Europe

Table 6. Transportation Module A2 data quality assessment

Data	Temporary coverage	Geographic coverage	Technological coverage	Precision	Completeness	Representativeness	Consistency	Reproducibility	Sources of information	Measured or estimated	Uncertainty
Distance of cement transport, solid and liquid additives	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M	1.05
Distance of fiberglass mesh transportation	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M	1.05
Distance of natural gas transportation	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M	1.05
Distance of transportation of raw materials packaging materials	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M&E	1.05
Distance of transportation of finished product packaging materials	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M&E	1.05
Distance of material transportation for maintenance	2017	Mexico	NA	✓	✓	✓	✓	✓	Company data	M&E	1.05
Materials and energy consumption, and emissions related to the transportation requirements of raw materials and auxiliary inputs	1992 -2014	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3

M&E: Measured and Estimated, M: Measured, E: Estimated

● Worldwide average based on Europe



Table 7. Manufacture Module A3 data quality assessment

Data	Temporary coverage	Geographic coverage	Technological coverage	Precision	Completeness	Representativeness	Consistency	Reproducibility	Sources of information	Measured or estimated	Uncertainty
Water consumption	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Wax paper consumption	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Materials consumption for maintenance	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Finished product packaging materials consumption	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Manufacturing of materials for maintenance	1990 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3
Manufacture of finished product packaging materials	1990 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3
Air emissions	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Waste generation	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Waste treatment processes, consumptions of materials and related energy.	1990 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3
Distance of waste transportation to final disposal site	2017	Mexico	Modern	✓	✓	✓	✓	✓	Company data	M	1.05
Material and energy consumption, and emissions related to waste transportation requirements	1992 - 2014	Worldwide average based on Europe	Worldwide average based on Europe	✓	✓	●	✓	✓	Ecoinvent 3.3	M&E	Uncertainty provided by Ecoinvent database 3.3

M&E: Measured and Estimated, M: Measured, E: Estimated

● Worldwide average based on Europe

6. Environmental performance

SimaPro 8.4 was used for the Life Cycle Impact Assessment. The analysis results of the environmental performance of the USG cement boards are shown below.

6.1. Use of resources

Parameters describing the use of resources were evaluated with the Cumulative Energy Demand method version 1.09 (Frischknecht et al. 2007), except for the indicator of net use of fresh water, that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in Table 8 for USG DUROCK® and Table 9 for USG DURACRETE®.

Table 8. Resource Indicators per 1m² of USG DUROCK® cement board manufactured

Parameter	Unit	Total	A1) Raw material supply	A2) Transportation	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	11.4	2.80	0.17	8.48
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	11.4	2.80	0.17	8.48
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	63	44	14	5
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	63	44	14	5
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Net use of fresh water	m ³	0.04	0.02	2.69E-03	0.01

Table 9. Resource Indicators per 1 m² of USG DURACRETE® cement board manufactured

Parameter	Unit	Total	A1) Raw material supply	A2) Transportation	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	14.1	2.90	0.24	10.9
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	14.1	2.90	0.24	10.9
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	71	46	19	6
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	71	46	19	6
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Net use of fresh water	m ³	0.04	0.02	3.83E-03	0.01

6.2. Potential environmental impact

Parameters describing potential environmental impacts were calculated using the CML-IA method version 3.04 (Guinee et al. 2001; Huijbregts et al. 2003; Wegener et al. 2008), as implemented in SimaPro 8.4. Water scarcity potential was calculated using the AWARE method (Boulay et al. 2018). These categories were included because they are mandatory according to PCR. Water scarcity is important in Mexican context because water availability varies in different regions of the country.

Environmental performance is provided in Figure 2 and Table 10 for USG DUROCK®. Figure 3 and Table 11 provide the environmental performance for USG DURACRETE®.

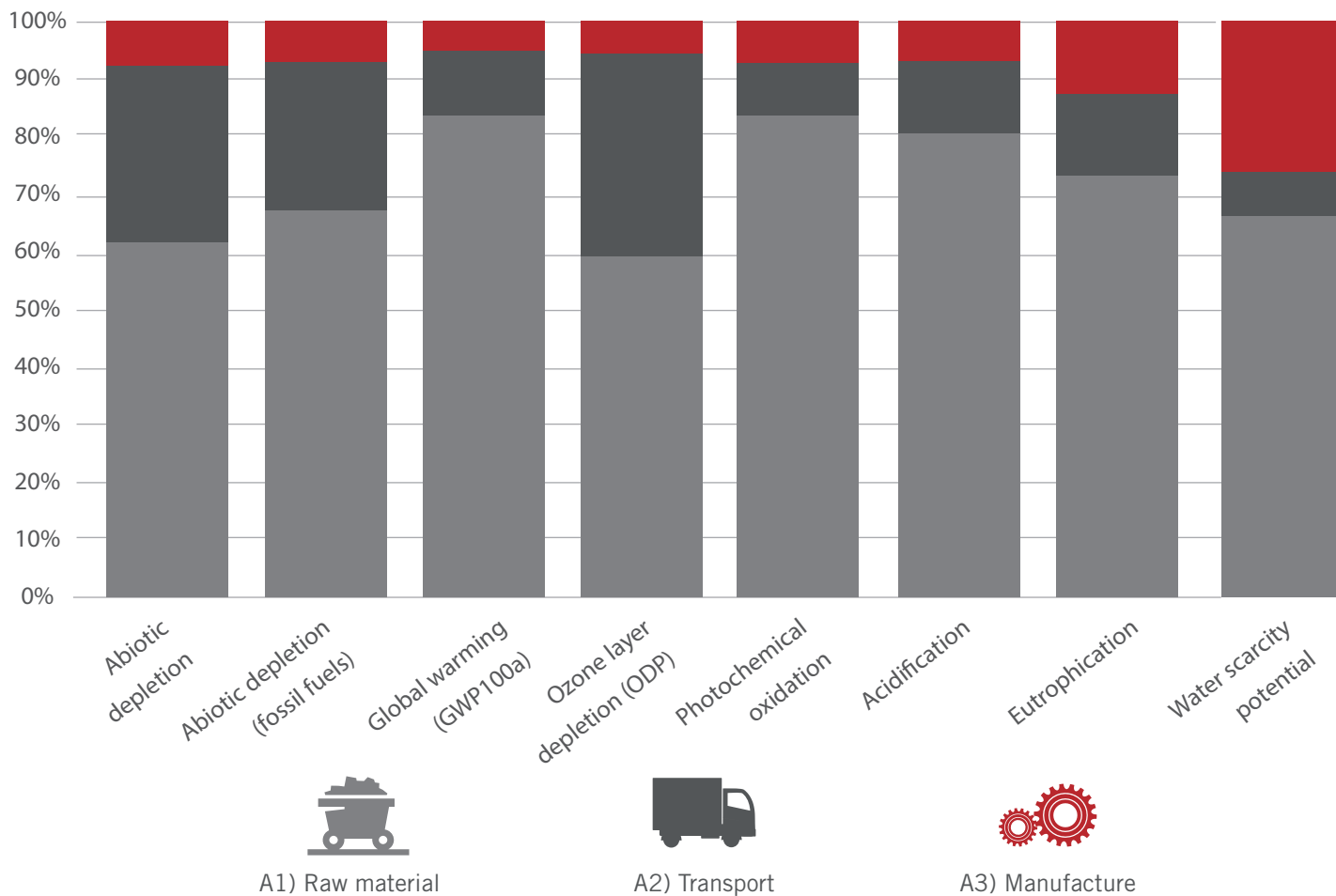


Figure 2. USG DUROCK® environmental performance

Table 10. USG DUROCK® environmental performance

Impact Category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total A1 - A3	Module A4-D
Abiotic depletion	kg Sb eq	4.85E-06	2.10E-06	6.27E-07	7.58E-06	MND
Abiotic depletion (fossil fuels)	MJ	41.7	13.5	5.12	60.3	
Global warming (GWP100a)	kg CO ₂ eq	6.54	0.84	0.36	7.74	
Ozone layer depletion (ODP)	kg CFC-11 eq	2.74E-07	1.58E-07	2.38E-08	4.55E-07	
Photochemical oxidation	kg C ₂ H ₄ eq	1.68E-03	1.45E-04	1.40E-04	1.96E-03	
Acidification	kg SO ₂ eq	0.02	3.43E-03	1.75E-03	0.03	
Eutrophication	kg PO ₄ ³⁻ eq	3.98E-03	7.67E-04	7.10E-04	5.46E-03	
Water scarcity potential	m ³ eq	1.09	0.04	0.47	1.60	
	%	64.0	27.7	8.3	100	
	%	69	22	8	100	

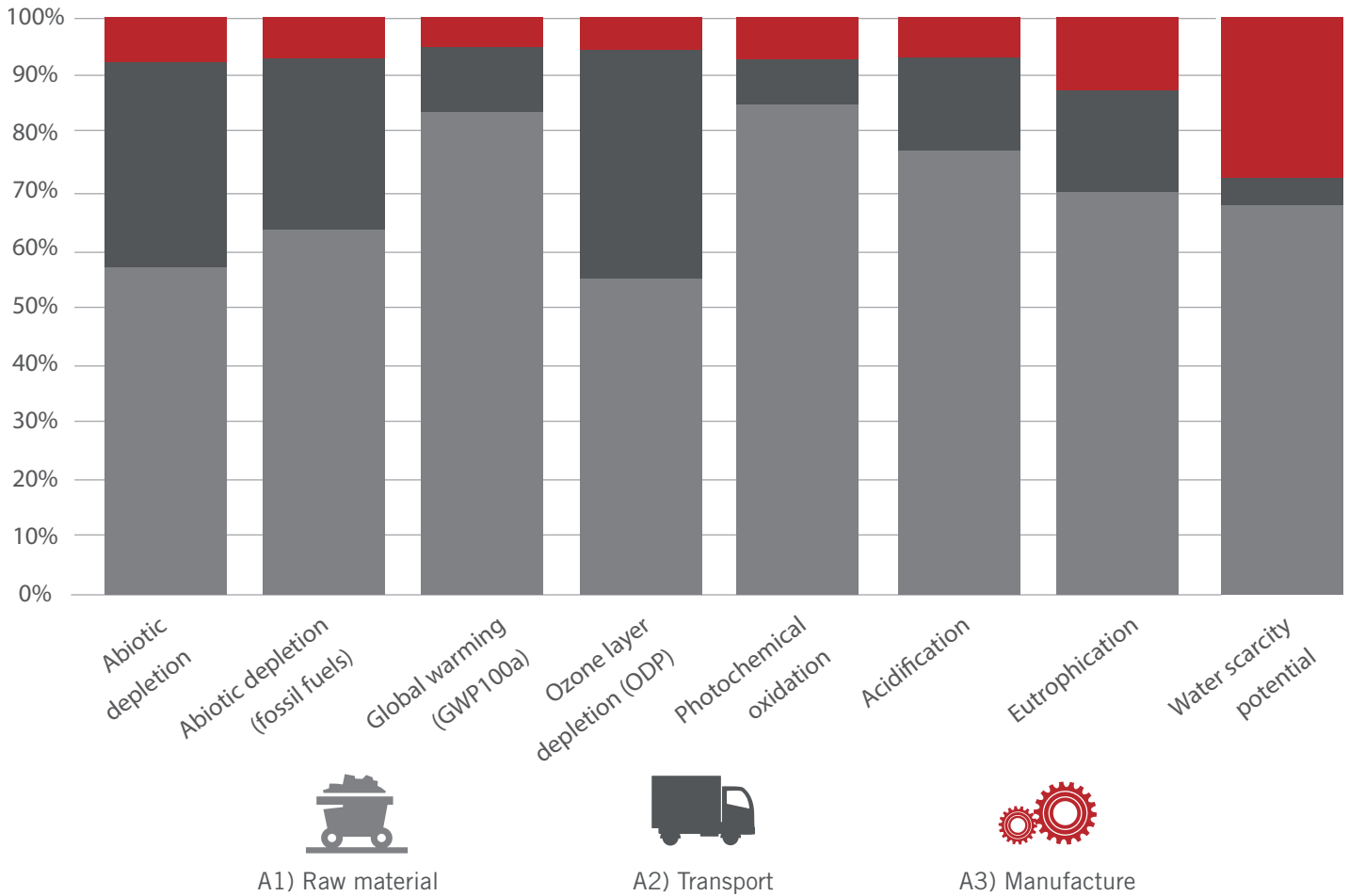


Figure 3. USG DURACRETE® environmental performance

Table 11. USG DURACRETE® environmental performance						
Impact Category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total A1 - A3	Module A4-D
Abiotic depletion	kg Sb eq	4.77E-06	2.63E-06	7.20E-07	8.12E-06	MND
Abiotic depletion (fossil fuels)	MJ	44.4	18.9	5.33	68.6	
Global warming (GWP100a)	kg CO ₂ eq	7.34	1.16	0.40	8.90	
Ozone layer depletion (ODP)	kg CFC-11 eq	2.95E-07	2.19E-07	2.75E-08	5.42E-07	
Photochemical oxidation	kg C ₂ H ₄ eq	1.79E-03	2.00E-04	1.57E-04	2.14E-03	
Acidification	kg SO ₂ eq	0.02	4.73E-03	2.02E-03	0.03	
Eutrophication	kg PO ₄ ³⁻ eq	4.30E-03	1.06E-03	8.22E-04	6.18E-03	
Water scarcity potential	m ³ eq	1.16	0.07	0.47	1.69	
	%	68.3	4.01	27.7	100	

6.3. Waste production

Environmental indicators describing waste generation were obtained from the LCI, except for background information, which was calculated using the EDIP 2003 method (Hauschild and Potting, 2005). Tables 12 and 13 show waste and other outputs generated during each information module.

Table 12. Waste and other outputs per 1m² of USG DUROCK® board raw material

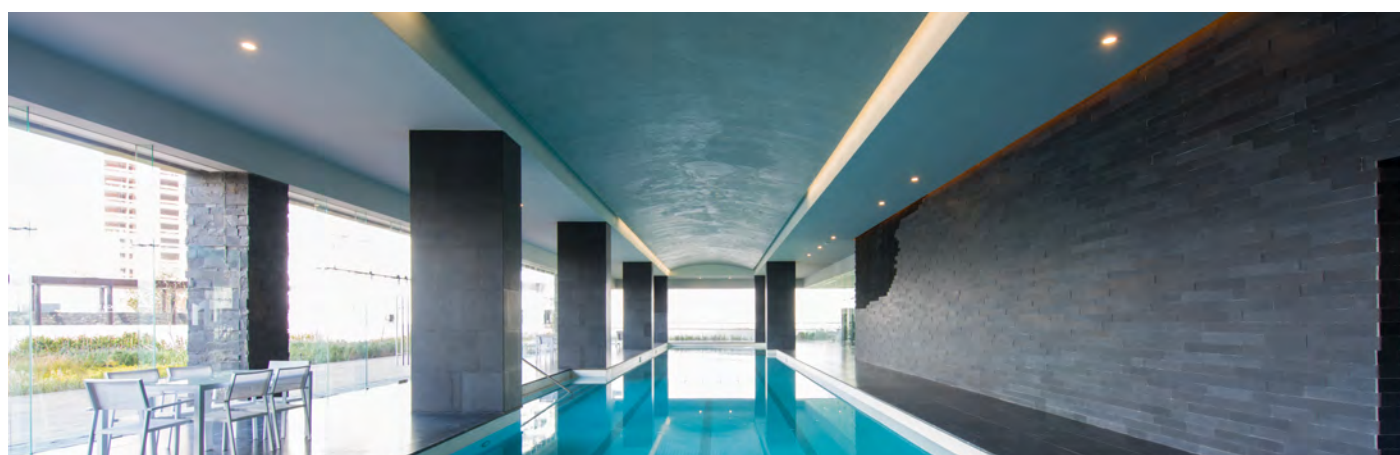
Output parameter	Unit	Total	A1) Raw material supply	A2) Transportation	A3) Manufacturing
Hazardous waste	kg	5.75E-04	2.59E-05	7.68E-06	5.41E-04
Non hazardous waste	kg	1.32	0.17	0.80	0.35
Radioactive waste*	kg	2.12E-04	1.13E-04	8.75E-05	1.11E-05
Components for reuse	kg	0	0	0	0
Materials for recycling	kg	0.10	0	0	0.10
Materials for energy recovery	kg	0	0	0	0
Exported electricity	MJ	0	0	0	0
Exported heat	MJ	0	0	0	0

*No radioactive waste is produced during USG operation.



Table 13. Waste and other outputs per 1m² of USG DURACRETE® board raw material

Output parameter	Unit	Total	A1) Raw material supply	A2) Transportation	A3) Manufacturing
Hazardous waste	kg	5.82E-04	2.71E-05	1.06E-05	5.44E-04
Non hazardous waste	kg	1.81	0.18	1.27	0.36
Radioactive waste*	kg	2.61E-04	1.25E-04	1.22E-04	1.33E-05
Components for reuse	kg	0	0	0	0
Materials for recycling	kg	0.10	0	0	0.10
Materials for energy recovery	kg	0	0	0	0
Exported electricity	MJ	0	0	0	0
Exported heat	MJ	0	0	0	0

*No radioactive waste is produced during USG operation.



7. Verification and registration

GEN standard EN 15804 served as the core PCR	
Program:	International EPD® System www.environdec.com  EPD registered through the fully aligned regional program/hub: EPD Latin America www.epdlatinamerica.com 
Program operator:	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden EPD Latin America Chile: Alonso de Ercilla 2996, Ñuñoa, Santiago Chile. Mexico: Av. Convento de Actopan 24 Int. 7A, Colonia Jardines de Santa Mónica, Tlalnepantla de Baz, Estado de México, México, C.P. 54050
EPD registration number:	S-P-01424
Issue date:	2019-08-30
Validity date:	2024-08-27
Revision date:	2019-08-28
Reference year of data:	2017
Geographical scope:	Mexico
Product group classification:	Central Product Classification: CPC 54 Construction Services V2
PCR:	PCR 2012:01 construction products and construction services. Version 2.3 (2018-11-15)
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration data, according to ISO 14025:2006.	EPD process certification (Internal) <input type="checkbox"/> EPD verification (External) <input checked="" type="checkbox"/>
Third-party verifier:	Rubén Carnerero Acosta r.carnerero@ik-ingenieria.com
Accredited or approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier:	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
LCA:	This environmental product declaration was carried out based on the Life Cycle Assessment study of Cement Boards (González M, Chargoy JP, Luque C, Vulling M, Martínez A, Hernández M, 2019).

EPDs within the same product category but from different programmes may not be comparable. The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs of construction products may not be comparable if they do not comply with EN 15804.

8. Contact information

EPD owner:



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