Environmental Product Declaration

CEMINTEL®

Prefinished Fibre Cement Products
Manufactured by CSR Building Products Limited

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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

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AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021
Program: The International EPD® System — www.environdec.com
Program Operator: EPD International AB
Regional Program: EPD Australasia — www.epd-australasia.com

Project name: Epping West Public School
Architect: Pedavoli Architects
Photography: The Gutherie Project

Contents

Tackling the sustainability challenge in building

As a trusted supplier of building solutions, we are taking on industry challenges to cut carbon emissions and waste, and better manage resources.

The global building industry has a vital role to play in making progress on sustainability goals. With building materials and operations accounting for approximately 37% of greenhouse gas (GHG) emissions globally[1], work to decarbonise products, processes and logistics will be a major factor in moving our sector towards net zero.

Manufacturing building materials and how these are packaged, used and disposed of can have negative impacts on the environment. If our industry is to make progress towards resource efficiency, waste reduction and preserving biodiversity, it's important to understand exactly how our products are having an impact – on our climate and resources, and on nature and communities.

Revealing sustainability opportunities for our industry, business and customers

At CSR, we are committed to leading the much-needed shift to sustainable manufacturing and driving decarbonisation of operations and products. As an innovator for our industry, we believe that finding ways to advance our sustainability agenda supports a better future for our industry, business and customers.

Providing Environmental Product Declarations (EPDs) to our customers enables us to share robust information about the environmental performance of our building materials. This supports them in making informed choices on the solutions that best meet their objectives for quality and sustainability outcomes in building projects.

It also creates an opportunity to establish embodied carbon baselines and identify key material sources of impact at a product level. Knowing where these impacts occur along the value chain will highlight opportunities to maximise material efficiency, reduce embodied carbon and extend product life across our range. This will provide CSR with information we need to innovate in our product design and manufacturing processes with the goal of optimising environmental performance across all our building solutions.

[1] United Nations Environment Program. "Global Status Report for Buildings and Construction", 2022.

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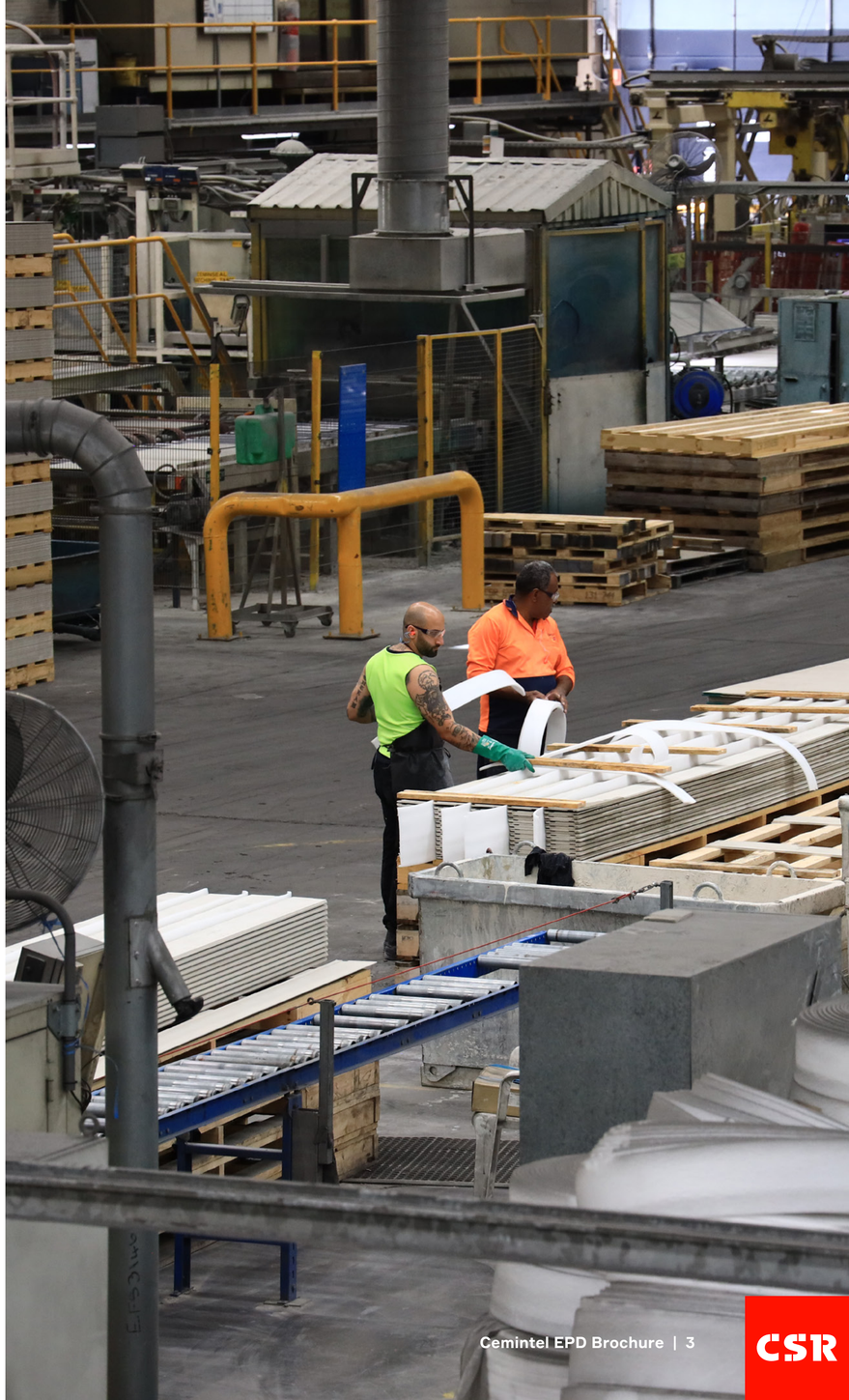

CSR

Building solutions for a better future

CSR offers a unique portfolio of products to provide complete customer solutions that build sustainable places and communities.

At CSR, our products have been used in buildings for almost a century. Our operations span Australia, New Zealand, parts of Asia and Europe and we have the scale and expertise to innovate for the sustainable solutions our customers and communities need to build for a better future.

As a trusted supplier of building solutions, we are taking on industry challenges to cut carbon emissions and waste, and better manage resources. **To set our ambition and ignite our progress, we are committed to 2030 targets across:**

1
Reducing our emissions, waste and water use

2
Increasing uptake of renewable energy

3
Improving biodiversity outcomes

Project name: Integrated Studies Centre
Architect: Mayoh Architects
Photography: Chris Warnes

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Towards net zero
in the built environment

We take a strategic approach to investing in solutions that reduce emissions - from increasing the uptake of renewable energy to exploring emerging technologies across our operations. This includes optimising our manufacturing plants, energy and process efficiencies and building collaborative partnerships across our operations.

CSR targets for 2030[2]

50% **of energy from renewables**

20% **energy reduction per tonne of saleable product manufactured**

30% **reduction greenhouse gas (GHG) emissions per tonne of saleable product manufactured**

As part of an industry that accounts for a high proportion of carbon emissions, we are looking to partner with our peers on the best solutions for a successful net zero transition and reduction of embodied carbon for the built environment.

[2] 2030 targets baseline is 1st July 2019 to 30th June 2020.

Reducing waste and preserving resources to protect our environment

As a major supplier of building solutions, CSR has an important role in becoming a closed loop business to influence a circular economy in the built environment.

We are making it a priority to reduce our use of raw materials, increase regenerative and recycled material and actively seek solutions to reduce waste in the manufacturing, packaging and supply of our products.

Since 2018, our timber pallet recovery program has significantly reduced the amount of timber going to landfill. Being a member of the Australian Packaging Covenant Organisation (APCO) demonstrates our focus on redesigning packaging to minimise plastic use and waste. In collaboration with our suppliers, we are committed to monitoring our progress towards our 2025 sustainable packaging targets, where CSR packaging is closed loop (either 100% reusable, recyclable or compostable) and using an average of 50% recycled content in packaging.

CSR closing the loop goals for 2030[3]

75% **reduction in solid waste to landfill**

30% **reduction of potable water consumed (litre) per tonne of saleable product manufactured**

↑ **enhance biodiversity outcomes on CSR sites and developments**

We continually work to eliminate waste across our business and source the ‘right’ materials to manufacture building products from natural, reused, repurposed and recycled materials. Our approach includes working with our team and suppliers to look beyond energy, water and waste to explore holistic environmental management solutions and influence the wider industry to follow circular principles.

[3] 2030 targets baseline is 1st July 2019 to 30th June 2020.

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Cemintel: the face of design and innovation

Cemintel is bringing industry-leading, Australian made fibre cement cladding solutions to the market.

With more than 25 years' history and built around a team of experts, our shared passion is to provide expertise, compliance and transparency when it comes to building with cladding.

With the built environment industry continuing to evolve, Cemintel is committed to supporting more architects, designers and builders to access the performance and aesthetic benefits fibre cement cladding solutions can offer.

Photography: Marnie Hawson

Closing the loop in fibre cement manufacturing

Cemintel is part of CSR building products group, the name behind some of Australia's most trusted and recognised brands in the construction industry. To help CSR reach its ambition of a sustainable future for the built environment, Cemintel's approach prioritises water management, maximising energy efficiency and increasing the use of renewable energy to reduce the impact of its operations.

Since water is an essential part of the manufacturing process of fibre cement, a responsible approach to water management is critical. Cemintel has deployed initiatives that recycle process-water and reduce overall water usage, including a new clarifier that enables effective water clarification and screening to prevent solid materials from entering the treatment system.

In 2024, the Cemintel factory at Wetherill Park NSW also installed solar panels. The energy generated covers approximately 12% of the total energy used onsite, helping to mitigate its environmental impact.

Fibre cement: a durable and more sustainable choice

Cemintel's fibre cement cladding solutions are known to be hardwearing when exposed to harsh weather conditions, impacts and general wear and tear.

Studies have shown fibre cement can perform at a satisfactory level in humid, subtropical climates and unlike solid natural timber, will not rot nor warp when exposed to moisture or even rain[4]. Given its non-combustible nature, it also provides passive fire protection, making it ideal for the Australian environment.

Reduced impact on the environment

Cemintel's products are made to last, reducing the need for frequent replacements and minimising waste. Fibre cement is one of the most energy efficient materials, offering rapid assembly and construction that consumes less energy when compared to building with other cladding materials, except for timber. It also has significantly lower embodied energy than traditional masonry materials. For prefinished products coated with various sealers, the amount of volatile organic compounds (VOCs) is minimal and in line with levels recommended by the Green Building Council of Australia (GBCA)[5].

Rooted in design and innovation

The unparalleled design flexibility that Cemintel's products offer makes it possible to bring together different design elements to create something truly unique. Whether the preference is for a more natural appearance that mimics timber and stone, or to lean into a more contemporary style, Cemintel's range of solutions has something to offer.

[4] Cooke, A.M. "Durability of Autoclaved Cellulose Fibre Cement Composites", 2000. P 27. Durability of Autoclaved Cellulose Fiber Cement Composites (fibrecementconsulting.com)
[5] GBCA provides Australia's largest, voluntary rating system for buildings, Green Star Buildings. This tool enables owners and developers to act on sustainability across 8 categories, from ensuring the building contributes to key environmental issues such as water use, to solutions that address social health in the community.

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Product descriptions

Driven by a strong focus on design and innovation, Cemintel provides durable fibre cement cladding systems that effortlessly combine style and functionality.

By tapping into the latest material and manufacturing technologies, Cemintel's progressive approach enables its products to fulfil a broad range of applications.

Prefinished

Offers prefinished fibre cement cladding that is delivered to site with a final factory finish. No further painting, handling and finishing is required.

Barestone Original - 9mm
Thickness: 9mm
Width: 1200mm
Length: 2400, 3000mm

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Life cycle assessment information

Program Information

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CEN standard EN 15804+A2:2019/AC2021 serves as the Core Product Category Rules (PCR)

Product category rules (PCR):

PCR 2019:14; Construction products (EN 15804+A2) (1.3.4)

PCR review was conducted by:
The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com for a list of members. The review panel may be contacted via info@environdec.com.

Review chair: Claudia A. Peña, University of Concepción, Chile.

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification

☒ EPD verification

Third party verifier:

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Jane Anderson

Approved by: EPD Australasia Ltd

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

An Environmental Product Declaration (EPD) is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a Product Category Rules (PCR). This is a specific EPD. The EPD owner has the sole ownership, liability, and responsibility for this EPD.

EPDs within the same product category but registered in different EPD programs, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company Information

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EPD produced by:

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Key Facts

This EPD provides data for 1m^2 of Prefinished fibre cement products, represented by Barestone Original - 9mm, manufactured in Australia.

This EPD is published in line with EN 15804 and ISO 14025, providing specific information by walling products and detailed by product area.

Product Information

Product description: Cemintel stands for 'Cement Intelligence' and is the CSR brand that is responsible for cladding materials in Australia and New Zealand. With design and innovation as central drivers, Cemintel is focused on a fresh, intuitive approach to cement-based cladding materials such as fibre cement and cement-bonded fibrous wood particle panels. Their passion is to help architects, designers and builders design right and build better.

As part of CSR, the name behind some of Australia's building product brands – Gyprock, PGH Bricks, Bradford, Hebel, AFS, Himmel, Martini and Monier, Cemintel acts as an advisor, providing expertise, compliance and transparency when it comes to building with cladding.

UN CPC code: 375 (articles of concrete, cement, and plaster), according to version 2.1, 2015

ANZSIC code: 2034 (Concrete product manufacturing) according to version 2, 2013

UNSPSC code: 30103619 (Precast concrete element) according to version 26

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TABLE 1 PRODUCT APPLICATIONS

Product	External Cladding	Internal Lining	Eaves	Ceilings	Flooring & Underlays	Feature Walls	Weatherboards
Barestone Original - 9mm	X	X	X	X		X	

TABLE 2 PRODUCTS INCLUDED

Product manufactured at site	Thickness (mm)	Width (mm)	Length (mm)	Product weight in use per m^2 (kg/m^2)
Barestone Original - 9mm	9	1200	2400, 3000	17.80

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LCA Information

TABLE 3 LCA INFORMATION

	Product Characteristics
Declared Unit	1m² Barestone Original - 9mm weighted 17.8kg
Modules Included	A1-A3, A4-A5, C1–C4, D
Technical lifetime	50 years
Geographical Coverage	Australia and New Zealand
Time Period	01 Apr 2022 to 31 Mar 2023

Declared unit:

This EPD provides data for 1m² of installed Barestone Original - 9mm weighted 17.8 kg, manufactured in Australia.

Life Cycle Assessment (LCA) Methodology

This EPD has been produced in conformance with the requirements of PCR2019:14, General Program Instructions (GPI) and four information modules according to ISO 21930 and EN 15804.

Take care when comparing EPD's

EPD's within the same product category but from different programs may not be comparable.

- When comparing EPD data, refer to the comparability requirements in EN 15804, e.g., using equivalent methodology and assumptions such as the same Product Category Rules (PCR).
- The results for EN 15804:2012+A1:2013 compliant EPDs are not comparable with EN 15804:2012+A2:2019 compliant studies as the methodologies are different. EN 15804:2012+A1:2013 compliant results are given in this document to assist comparability across EPDs and support use in tools such as Green Star.
- LCA provides high-level scientific guidance and differences in data should be substantial to be material. Understanding the detail is important in comparisons. Expert analysis is required to ensure data is truly comparable to avoid unintended distortions.

It is discouraged to use the results of modules A1-A3 without considering the results of module C.

The best way to compare products and materiality of differences is to place them into the context of a structure across the whole life cycle.

Background data modelling

The inventory data for the process are entered into the SimaPro (v9.5) LCA software program and linked to the pre-existing data for the upstream feedstocks and services selected in order of preference from:

- For Australia, the Australian Life Cycle Inventory (AusLCI) v1.42 compiled by the Australian Life Cycle Assessment Society (ALCAS, 2023). The AusLCI database at the time of this report was less than a year old.
- Other authoritative sources (e.g., Ecoinvent v3.9.1, (Wernet, et al., 2023), where necessary adapted for relevance to Australian conditions (energy sources, transport distances and modes and so on, and documented to show how the data is adapted for national relevance). At the time of reporting, the Ecoinvent v3.9.1 database was 1 year old.

Life cycle content information

Description of system boundaries

The scope of this EPD is cradle to gate (modules A1-A3) with options, modules A4-A5, modules C1-C4 and module D. The geographical scope of this EPD is Australia and New Zealand.

Upstream processes

The upstream processes include those involved in Module A1 – Raw material supply. This module includes:

- Extraction, transport and manufacturing of raw materials.
- Generation of electricity from primary and secondary energy resources, also including their extraction, refining and transport for Module A1.
- Processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product.

Core Processes

The core processes include those involved in Module A2 and Module A3, including:

- External transportation of materials to the core processes and internal transport.
- Manufacturing of Cemintel products.
- Packaging.
- Processing of waste to landfill and recycling.

Downstream Processes

The downstream processes include those involved in Module A4 to C4, including:

- Transportation from the production gate to the construction site.
- Transport of waste generated from the construction site.
- Installation of the product on the site.
- Wastage of construction products.
- Waste processing of the waste from product wastage during the construction processes up to the end-of-waste state or disposal of final residues.
- Transport of equipment and use of materials for deconstruction at the end of life.
- Transport of waste generated at the end of life.
- Treatment of waste generated at the end of life.

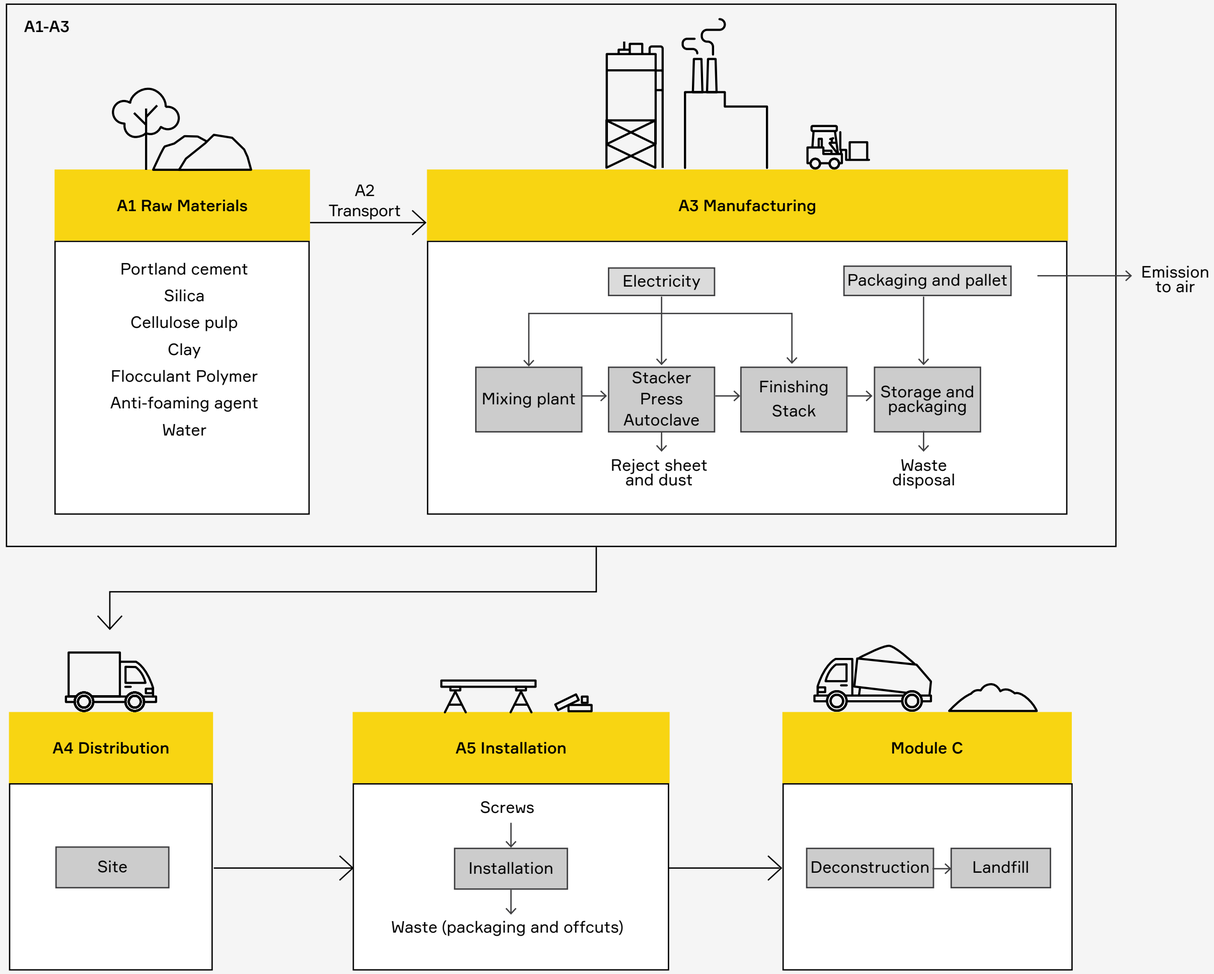

Figure 1: System Diagram

Cradle to Gate (Module A1-A3)

The primary raw materials used by Cemintel in the manufacturing of cement products include cement, cellulose pulp, silica, clay, and water in various proportions. Most raw materials are sourced from Australia, and pulp is imported from overseas via both road and ship to Australia. The manufactured products are then packaged with plastics and pallets.

During the manufacturing stage, wastes including but not limited to general solid waste, metal, cardboard, plastic, and wastewater are generated which are sent for recycling and disposal. The amount of material inputs and waste are subjected to the thickness of product.

Cemintel manufactures all its products in Australia, in one location in Wetherill Park, NSW. Local electricity mix (marked as electricity (fossil) in the report) was used, of which primary energy sources of energy in NSW region during the assessment period are black coal (75%), photovoltaic (17%) and other sources (8%) with emission of 0.72 kg CO_2 eq./kWh (GWP-GHG).

Typical packaging is made up of shrink-wrap and wooden pallets.

None of the products contain one or more substances that are listed in the “Candidate List of Substances of Very High Concern for authorisation”. Based on available information and safety data sheets, Cemintel products are not classified as hazardous according to criteria of Safe Work Australia GHS 7.

TABLE 4 CONTENT DECLARATION

Table 4 lists the main materials used to produce fibre cement and reports the biogenic carbon content in products and their packaging. Product packaging is made up of 0.1kg plastic film and 0.1kg pallets per 1m^2. This makes up less than 2% of the product weight during delivery to customers.

Representative product: Barestone Original - 9mm		
Material Input	**Weight, %**	**Post-consumer recycled material, weight, %**
Silica	56%	0
Cement	33%	0
Cellulose pulp	9%	0
Clay	2%	0
Other materials	<1%	0
Sum	100%	0
Packaging materials	**Weight, %**	**Post-consumer recycled material, weight, %**
Plastic film	<1%	0
Pallet	<1%	0
Sum	<1%	0

TABLE 5 BIOGENIC CARBON OF 1m^2 OF CEMINTEL PAINT-ON-SITE PRODUCTS

Biogenic content, kg C/m^2	Barestone Original - 9mm
Cellulose pulp	0.718
Packaging - Pallet	0.045

Transport (Module A4)

Cemintel products are delivered to both Australia and New Zealand. All Cemintel products transported within Australia is by road, and products delivered to New Zealand are transported to Sydney port and then shipped to the ports in New Zealand. The transport distances from manufacturing gate were calculated based on primary data from percentage of total products shipped to each location.

TABLE 6 AVERAGE DISTANCE TRAVELED TO CUSTOMER

Product	Average distance by truck (km)	Average distance by ship (km)
Barestone Original - 9mm	786	3

Installation (Module A5)

Products require 0.1kg of screws per 1m^2 for installation. 15% of the delivered product is discarded during installation as off-cuts and goes to landfill. Product packaging is discarded – plastic packaging goes to landfill and pallets go to recycling.

Disposal / Reuse / Recycling (Module C1-C4)

Following the use of Cemintel products, CSR has limited evidence of the end-of-life fate for their products. The recommended cradle to grave environmental profile will be based on the most common scenario as construction products are deconstructed and transported to material recovery facilities.

At end-of-life, products are removed, transported to waste processing, and landfilled. 100% of the products and their installation material (screws) end up in landfill.

C2 (transport to end-of-life) was assumed at a distance of 50km since there was no primary data available.

Scope of Declaration

The scope of this EPD is cradle-to-gate (modules A1-A3) with options, modules A4-A5, modules C1-C4 and module D. The scope of this declaration is according to the General Program Instructions (GPI) and four information modules according to ISO 21930 and EN 15804 as given in Table 7.

TABLE 7 THE LIFE CYCLE OF A BUILDING PRODUCT

	Upstream		Core	Downstream												Other environmental information
	Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Material emissions from usage	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction and demolition	Transport	Waste processing	Disposal	Reuse, recycle or recovery
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	x	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x
Geography	AU, NZ	AU	AU	AU, NZ	AU, NZ	x	x	x	x	x	x	x	AU, NZ	AU, NZ	AU, NZ	AU, NZ	AU, NZ
Specific data used			21%			-	-	-	-	-	-	-	-	-	-	-	-
Variation - products			0%			-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites			0%			-	-	-	-	-	-	-	-	-	-	-	-

ND = Not Declared
The following life cycle stages are deemed not applicable for Cemintel: Usage (B1); Maintenance (B2); Repair (B3); Replacement (B4); Refurbishment (B5), Operational energy use (B6), and Operational water use (B7) over the stated RSL. The scenarios included are currently in use and are representative for one of the most likely scenario alternatives.

Cut-off rules

It is common practice in LCA/LCI protocols to propose exclusion limits for inputs and outputs that fall below a threshold % of the total, but with the exception that where the input/output has a “significant” impact it should be included. According to the PCR 2019:14 v1.3.4, Life cycle inventory data shall according to EN 15804+A2 include a minimum of 95% of total inflows (mass and energy) per module. Inflows not included in the LCA shall be documented in the EPD. Data gaps in included stages in the downstream modules shall be reported in the EPD, including an evaluation of their significance. In accordance with the PCR 2019:14 v1.3.4, the following system boundaries are applied to manufacturing equipment and employees:

- Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Capital equipment and buildings typically account for less than a few percent of nearly all LCIs and this is usually smaller than the error in the inventory data itself. For this project, it is assumed that capital equipment makes a negligible contribution to the impacts as per Frischknecht et al. (Frischknecht, 2007) with no further investigation.
- Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCI. The impacts of employees are also excluded from inventory impacts on the basis that if they were not employed for this production or service function, they would be employed for another. It is very hard to decide what proportion of the impacts from their whole lives should count towards their employment. For this project, the impacts of employees are excluded in this EPD.
- The transport of scissor lift to and from the installation site is excluded.
- Besides these exclusions, no energy or mass flows were excluded in this LCA report.

Allocation

According to EN 15804+A2, in a process step where more than one type of product is generated, it is necessary to allocate the environmental stressors (inputs and outputs) from the process to the different products (functional outputs) in order to get product-based inventory data instead of process-based data. An allocation problem also occurs for multi-input processes. In an allocation procedure, the sum of the allocated inputs and outputs to the products shall be equal to the unallocated inputs and outputs of the unit process.

The following stepwise allocation principles shall be applied for multi-input/output allocations:

- The initial allocation step includes dividing up the system sub-processes and collecting the input and output data related to these sub-processes.
- The first (preferably) allocation procedure step for each sub-process is to partition the inputs and outputs of the system into their different products in a way that reflects the underlying physical relationships between them.
- The second (worst case) allocation procedure step is needed when physical relationship alone cannot be established or used as the basis for allocation. In this case, the remaining environmental inputs and outputs from a sub-process must be allocated between the products in a way that reflects other relationships between them, such as the economic value of the products.

Water and waste values were provided in lump sums per material, and were allocated to each product according to the percentage of total product produced in one year.

Data Quality and Validation

The primary data used for the study is based on direct utility bills or feedstock quantities from Cemintel's procurement records. Edge used contribution analysis to focus on the key pieces of data contributing to the environmental impact categories. The data was benchmarked against relevant benchmark data in Ecoinvent. Edge considers the data to be of high quality for primary data used in this study.

For the background data, the quality was considered high when processes chosen were geographically, temporal, and technologically relevant. For data that was based on assumptions, quality was considered medium, unless based on official reports.

TABLE 8 ASSUMPTIONS OR LIMITATIONS DATA ASSESSMENT SCHEME

Assumption or limitation	Impact on LCA results	Discussion
Raw material data for the products are based on generic information	Significant	The EN 15804 standard permits generic data for upstream processes, however, this is where the main impacts are for panels across the life cycle. Supplier specific data was only used in shipping and transport of raw materials.
Exclusion of employees, capital good and infrastructure	Minor	Allowed/required as per EPD rules, see section 3.3.3.
Amount of silage wrap and pallets for packaging	Minor	Assumptions on the amount of silage wrap and pallets used for packaging was received by Cemintel. Overall, packaging contributes very little to the environmental impact of each product, so these assumptions is presumed to be minor.
Transport distance for end of life processing	Minor	50 km was used as the transport distance to end of life processing. It is expected that any installation site will be 50 km or less from a waste processing plant. This module has very low environmental impact overall.

Compliance with Standards

The methodology and report format has been modified to comply with:

- ISO 14040:2006 and ISO14044:2006+A1:2018 which describe the principles, framework, requirements and provides guidelines for life cycle assessment (LCA).
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations -- Principles and procedures, which establishes the principles and specifies the procedures for developing Type III environmental declaration programs and Type III environmental declarations.
- EN 15804:2012+A1:2013; Sustainability of construction works — Environmental product declarations.
- EN 15804:2012+A2:2019; Sustainability of construction works — Environmental product declarations.
- Product Category Rules (PCR) 2019:14, v1.3.4 – Construction products – Hereafter referred to as PCR 2019:14.
- General Program Instructions (GPI) for the International EPD System V5.0 – containing instructions regarding methodology and the content that must be included in EPDs registered under the International EPD System.
- Instructions of EPD Australasia V4.2 – a regional annex to the general program instructions of the International EPD System.

Environmental Impact Indicators

The potential environmental impacts, use of resources and waste categories included in this EPD were calculated using the SimaPro v9.5 tool and are listed in Table 9.
They are aligned to and adopted from Environmental Footprint 3.1.

TABLE 9 LIFE CYCLE IMPACT, RESOURCE AND WASTE ASSESSMENT CATEGORIES, MEASUREMENTS AND METHODS ACCORDANCE WITH EN 15804+A2

Impact Category	Abbreviation	Measurement Unit	Assessment Method and Implementation
Potential environmental impacts			
Total global warming potential	GWPT	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (fossil)	GWPF	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (biogenic)	GWPB	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (land use and land transformation)	GWPL	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Acidification potential	AP	mol H^+ eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
Eutrophication - aquatic freshwater	EP-freshwater	kg P equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication - aquatic marine	EP-marine	kg N equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication - terrestrial	EP-terrestrial	mol N equivalent	Accumulated Exceedance, Seppälä et al. 2006, Posch et al.
Photochemical ozone creation potential	POCP	kg NMVOC equivalents	LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe
Abiotic depletion potential (elements)*	ADPE	kg Sb equivalents	CML (v4.8)
Abiotic depletion potential (fossil fuels)*	ADPF	MJ net calorific value	CML (v4.8)
Ozone depletion potential	ODP	kg CFC 11 equivalents	Steady-state ODPs, WMO 2014
Water Depletion Potential*	WDP	m^3 equivalent deprived	Available WAter REmaining (AWARE) Boulay et al., 2016 (includes Australia flows calculated using 36 Australian catchments)
Resource use			
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, net calorific value	Manual for direct inputs
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value	Manual for direct inputs[8]
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value	ecoinvent version 3.8 and expanded by PRé Consultants[9]
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value	Manual for direct inputs
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value	Manual for direct inputs[10]

* Disclaimer: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.
** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

[8] Calculated based on the lower hearing value of renewable raw materials.
[9] Calculated as sum of renewables, biomass; renewable, wind, solar and geothermal, and renewable, water.
[10] Calculated based on the lower hearing value of non-renewables raw materials.

Impact Category	Abbreviation	Measurement Unit	Assessment Method and Implementation
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value	ecoinvent version 3.8 and expanded by PRé Consultants[11]
Use of secondary material	SM	kg	Manual for direct inputs
Use of renewable secondary fuels	RSF	MJ, net calorific value	Manual for direct inputs
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value	Manual for direct inputs
Use of net fresh water	FW	m^3	ReCiPe 2016
Output flow categories			
Components for re-use	CRU	kg	Manual for direct inputs
Material for recycling	MFR	kg	Manual for direct inputs
Materials for energy recovery	MERE	kg	Manual for direct inputs
Exported energy - electricity	EE - e	MJ per energy carrier	Manual for direct inputs
Exported energy - thermal	EE - t	MJ per energy carrier	Manual for direct inputs
Waste categories			
Hazardous waste disposed	HWD	kg	EDIP 2003 (v1.05)
Non-hazardous waste disposed	NHWD	kg	EDIP 2003 (v1.05)[12]
Radioactive waste disposed/stored	RWD	kg	EDIP 2003 (v1.05)

[11] Calculated as sum of non-renewables, fossil and non-renewable, nuclear.
[12] Calculated as sum of Bulk waste and Slags/ash.

Impact Category	Abbreviation	Measurement Unit	Assessment Method and Implementation
Additional environmental impact indicators			
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021[13]
Particulate matter	Potential incidence of disease due to PM emissions (PM)	Disease incidence	SETAC-UNEP, Fantke et al. 2016
Ionising radiation - human health**	Potential Human exposure efficiency relative to U235 (IRP)	kBq U-235 eq	Human Health Effect model
Eco-toxicity (freshwater)*	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	USEtox
Human toxicity potential - cancer effects*	Potential Comparative Toxic Unit for humans (HTP-c)	CTUh	USEtox
Human toxicity potential - non cancer effects*	Potential Comparative Toxic Unit for humans (HTP-nc)	CTUh	USEtox
Soil quality*	Potential soil quality index (SQP)	dimensionless	Soil quality index (LANCA®)
Potential Environmental Impacts – Indicators According to EN 15804+A1			
Global warming (GWP100a) - A1	GWP (A1)	kg CO_2 equivalents	CML (v4.02) based on IPCC AR4
Ozone layer depletion (ODP) - A1	ODP (A1)	kg CFC-11 equivalents	CML (v4.02) based on WMO 1999
Acidification - A1	AP (A1)	kg SO_2 equivalents	CML (v4.02)
Eutrophication - A1	EP (A1)	kg PO_4^{3-} equivalents	CML (v4.02)
Photochemical oxidation - A1	POCP (A1)	kg C_2H_4 equivalents	CML (v4.02)
Abiotic depletion - A1	ADPE (A1)	kg Sb equivalents	CML (v4.02)
Abiotic depletion (fossil fuels) - A1	ADPF (A1)	MJ, net calorific value	CML (v4.02)

* Disclaimer: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.
** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

[13] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero. `

Environmental Performance

The interpretation of results is presented in the following sections. Note that the use of results of modules A1-A3 or A1-A5, without considering the results of module C may mislead the communication and decision-making. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Environment Performance Indicators per m² of installed Barestone Original - 9mm

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Potential environmental impacts									
GWP-total	kg CO_2 eq.	7.69E+00	2.00E+00	2.58E+00	0.00E+00	1.26E-01	0.00E+00	3.09E+00	0.00E+00
GWP-fossil	kg CO_2 eq.	1.08E+01	2.00E+00	2.40E+00	0.00E+00	1.25E-01	0.00E+00	8.72E-02	0.00E+00
GWP-biogenic	kg CO_2 eq.	-3.07E+00	1.57E-04	1.79E-01	0.00E+00	9.83E-06	0.00E+00	3.01E+00	0.00E+00
GWP-luluc	kg CO_2 eq.	8.36E-03	2.61E-05	1.74E-03	0.00E+00	1.64E-06	0.00E+00	3.39E-04	0.00E+00
ODP	kg CFC 11 eq.	2.46E-07	4.62E-07	1.28E-07	0.00E+00	2.89E-08	0.00E+00	1.79E-08	0.00E+00
AP	mol H+ eq.	4.79E-02	7.12E-03	1.10E-02	0.00E+00	4.45E-04	0.00E+00	7.21E-04	0.00E+00
EP-freshwater	kg P eq.	4.48E-04	3.87E-05	2.27E-04	0.00E+00	2.43E-06	0.00E+00	2.86E-06	0.00E+00
EP-marine	kg N eq.	1.32E-02	2.24E-03	2.82E-03	0.00E+00	1.40E-04	0.00E+00	3.05E-04	0.00E+00
EP-terrestrial	mol N eq.	1.39E-01	2.46E-02	2.98E-02	0.00E+00	1.54E-03	0.00E+00	3.32E-03	0.00E+00
POCP	kg NMVOC eq.	3.56E-02	6.69E-03	7.97E-03	0.00E+00	4.19E-04	0.00E+00	9.07E-04	0.00E+00
ADP-minerals & metals	kg Sb eq.	1.50E-05	1.67E-07	1.31E-05	0.00E+00	1.04E-08	0.00E+00	6.04E-09	0.00E+00
ADP-fossil	MJ	8.51E+01	2.81E+01	2.23E+01	0.00E+00	1.76E+00	0.00E+00	1.19E+00	0.00E+00
WDP	m^3	1.69E+01	1.11E-02	2.70E+00	0.00E+00	6.93E-04	0.00E+00	7.12E-04	0.00E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption;								

Environment Performance Indicators per m² of installed Barestone Original - 9mm (Cont.)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Use of resources									
PERE	MJ	6.36E+00	3.64E-02	2.17E+00	0.00E+00	2.28E-03	0.00E+00	1.10E-02	0.00E+00
PERM	MJ	1.12E+01	0.00E+00	-1.41E+00	0.00E+00	0.00E+00	0.00E+00	-9.80E+00	0.00E+00
PERT	MJ	1.76E+01	3.64E-02	7.53E-01	0.00E+00	2.28E-03	0.00E+00	-9.79E+00	0.00E+00
PENRE	MJ	8.51E+01	2.81E+01	2.23E+01	0.00E+00	1.76E+00	0.00E+00	1.19E+00	0.00E+00
PENRM	MJ	3.76E+00	0.00E+00	-3.76E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	8.88E+01	2.81E+01	1.85E+01	0.00E+00	1.76E+00	0.00E+00	1.19E+00	0.00E+00
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.70E-01	5.69E-04	5.96E-02	0.00E+00	3.57E-05	0.00E+00	4.20E-05	0.00E+00
Waste categories									
Hazardous waste disposed	kg	4.30E-03	7.46E-05	6.60E-04	0.00E+00	4.67E-06	0.00E+00	3.11E-06	0.00E+00
Non-hazardous waste disposed	kg	6.38E-01	8.03E-03	3.36E+00	0.00E+00	5.03E-04	0.00E+00	1.77E+01	0.00E+00
Radioactive waste disposed/stored	kg	1.05E-04	1.97E-04	5.75E-05	0.00E+00	1.23E-05	0.00E+00	8.28E-06	0.00E+00
Output flows									
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.51E+00	0.00E+00	3.76E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy - electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy - thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non- renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Environment Performance Indicators per m² of installed Barestone Original - 9mm (Cont.)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Additional environmental impact indicators									
GWP-GHG	kg CO_2 eq	1.09E+01	2.00E+00	2.42E+00	0.00E+00	1.26E-01	0.00E+00	8.76E-02	0.00E+00
Particulate matter	disease incidence	4.00E-07	1.46E-07	1.22E-07	0.00E+00	9.16E-09	0.00E+00	1.70E-08	0.00E+00
Ionising radiation - human health	kBq U-235 eq	1.47E-01	1.20E-01	7.17E-02	0.00E+00	7.55E-03	0.00E+00	5.25E-03	0.00E+00
Ecotoxicity - freshwater	CTUe	7.44E+01	1.28E+01	2.62E+01	0.00E+00	8.03E-01	0.00E+00	5.96E-01	0.00E+00
Human toxicity potential - cancer effects	CTUh	7.88E-09	1.70E-10	1.25E-08	0.00E+00	1.07E-11	0.00E+00	1.14E-11	0.00E+00
Human toxicity potential - non cancer effects	CTUh	6.56E-08	1.89E-08	2.33E-08	0.00E+00	1.19E-09	0.00E+00	9.19E-10	0.00E+00
Soil quality	Pt	4.40E+01	1.50E-01	8.13E+00	0.00E+00	9.41E-03	0.00E+00	7.55E-01	0.00E+00
Potential Environmental Impacts – Indicators According to EN 15804+A1									
Global warming (GWP100a) - A1	kg CO_2 eq	1.07E+01	1.99E+00	2.38E+00	0.00E+00	1.25E-01	0.00E+00	8.65E-02	0.00E+00
Ozone layer depletion (ODP) - A1	kg CFC-11 eq	1.98E-07	3.65E-07	1.03E-07	0.00E+00	2.29E-08	0.00E+00	1.41E-08	0.00E+00
Acidification - A1	kg SO_2 eq	2.84E-02	5.48E-03	7.33E-03	0.00E+00	3.43E-04	0.00E+00	5.21E-04	0.00E+00
Eutrophication - A1	kg PO_4--- eq	6.40E-03	9.01E-04	1.74E-03	0.00E+00	5.64E-05	0.00E+00	1.12E-04	0.00E+00
Photochemical oxidation - A1	kg C_2H_4 eq	1.05E-03	1.98E-04	2.95E-04	0.00E+00	1.24E-05	0.00E+00	1.83E-05	0.00E+00
Abiotic depletion - A1	kg Sb eq	1.50E-05	1.67E-07	1.31E-05	0.00E+00	1.04E-08	0.00E+00	6.24E-09	0.00E+00
Abiotic depletion (fossil fuels) - A1	MJ	1.06E+02	2.77E+01	2.64E+01	0.00E+00	1.73E+00	0.00E+00	1.17E+00	0.00E+00
Acronyms	GWP-GHG = Global warming potential, excluding biogenic uptake, emissions and storage								

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Environmental Product Declaration

CEMINTEL®

In accordance with ISO 14025:2016 and EN 15804:2012+A2:2019/AC:2021

Prefinished Fibre Cement Products Manufactured by CSR Building Products Limited

Program: The International EPD® System — www.environdec.com
Program Operator: EPD International AB
Regional Program: EPD Australasia — www.epd-australasia.com
EPD Registration No. EPD-IES-0018187

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