Environmental Product Declaration (EPD)

Holcim Construction Materials

Humes Precast Concrete

SA - South Australia - T2D Project Jacking Pipes - 5577763 - 3500 Jacking Pipe (Standard Pipe) - Reinforced concrete pipe

In accordance with ISO 14025 and EN15804:2012+A2:2019/AC:2021
Programme: International EPD System | www.environdec.com
Programme operator: EPD International AB
Regional Programme: EPD Australasia | www.epd-australasia.com
Managed by: Holcim Certified EPD Process
EPD Process Certificate Number: 1011

EPD Registration No.: EPD-IES-0030020:001
Registration date: 16/7/2026
Version date: 16/7/2026
Valid until: 16/7/2031
Version Number: 1
EPD Process Geographical Scope: Australia

AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM

EPD INTERNATIONAL EPD SYSTEM

ECO PLATFORM EPD VERIFIED

An EPD may be updated or depublished if conditions change. To find the latest version for the EPD and to confirm its validity, see www.environdec.com.

SUMMARY OF KEY EPD DATA

EPD Name	SA - South Australia - T2D Project Jacking Pipes - 5577763 - 3500 Jacking Pipe (Standard Pipe) - Reinforced concrete pipe
EPD Registration No	EPD-IES-0030020:001
Version Number	1
Registration Date	16/7/2026
Version Date	16/7/2026
Valid Until	16/7/2031
State	South Australia
Region	South Australia
Range	T2D Project Jacking Pipes
Production Sites	Pooraka
Mix Code	5577763
Strength (MPa)	50 MPa
Mix Description	3500 Jacking Pipe (Standard Pipe)
Applications / intended use	Reinforced concrete pipe
Weight	16741 kg/product
Declared unit	1 product
Recycled aggregates - post-consumer recycled material, percentage of final product by mass (%)	0 %
Material Circularity Indicator (MCI) results (%)	41.60 %
Ready-mix Concrete Delivery Distance (km) - Life Cycle Stage: A2 (If blank batched on site)	10.48 kms
Total Global Warming Potential – Life Cycle Stages A1 to A3 ($kgCO_2e$/product)	5573 $kgCO_2e$/product
Total Global Warming Potential – Life Cycle Stages A4 ($kgCO_2e$/product)	30.12 $kgCO_2e$/product

Programme-related information and verification

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EPD Process Certified by	Epsten Group Suite 2600, 101 Marietta St NW, Atlanta, Georgia 30303, USA Web: www.epstengroup.com Approved by: EPD Australasia	
EPD Registration Number	EPD-IES-0030020:001	
Registration date:	16/7/2026	
Revision Number	1	
Valid Until	16/7/2031	
Product Group Classification	UN CPC 375 (Articles of concrete, cement and plaster)	
Geographical Scope	Australia	
Reference Year for Data	2024 Plant Data, 2026 Mix/Materials Production Data	

CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the core Product Category Rules (PCR)

Product Category Rules	PCR 2019:14 Construction Products, Version 2.0.1, 2025-06-05 c-PCR-003 Concrete and Concrete Elements, 2025-04-08
PCR Review Conducted by	The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact
Independent Third-party Verification of the Declaration and Data, According to ISO 14025:2006	☒ EPD process certification* without a pre-verified LCA/EPD tool * EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.
Process Certification	Epsten Group, Inc., Megan Blizzard, is an approved certification body accountable for third-party verification. Third-party verifier is accredited by: A2LA, Certificate #3142.03
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ Yes ☒ No

Programme-related information and verification:
The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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Version Number	Version date	Description of Changes
1	16/7/2026	

INTRODUCTION

Currently, the building environment account for 39% of global CO_2 emissions, with construction materials comprising 11% of global CO_2 emissions (World Green Building Council). By 2030, the embodied carbon of all construction materials needs to be at least 40% lower. By 2050, all new construction materials need to be net zero (World Green Building Council).

Environmental Product Declarations (EPDs) play a crucial role in promoting transparency and sustainability in the construction industry. By providing comprehensive and standardised information about the environmental performance of products, EPDs enable informed decision-making among stakeholders, including architects, engineers, builders, and consumers.

EPDs include data on a product's life cycle impacts, such as its carbon footprint, energy consumption, and resource use. This transparency empowers stakeholders to make informed selections of products.

EPDs also serve as valuable tools for benchmarking environmental performance and driving the decarbonation of construction materials. Demand for low carbon products backed by an EPD drives and rewards the decarbonisation of the entire supply chain.

As a result, EPDs will play a key role in our mission to decarbonise construction materials and the built environment.

ABOUT HOLCIM

Holcim Australia is a leading supplier of construction materials in Australia, dating back to 1901. Today Holcim continues to supply essential construction materials including aggregates, sand, ready-mix concrete, engineered precast concrete and prestressed concrete solutions to a range of customers and projects throughout Australia.

Holcim operates right across the Australian continent supplying concrete from a network of ready-mix concrete plants, quarries, precast concrete plants, and mobile and on-site project facilities.

Sustainability is at the core of our strategy, with our industry’s first 2050 net-zero targets, endorsed by the Science Based Targets initiative (SBTi).

Globally, Holcim is 45,000 people around the world across 43 markets who are passionate about building progress for people and the planet through four business segments: Cement, Ready-Mix Concrete, Aggregates and Solutions & Products.

ABOUT HUMES

Humes is Australia’s leading provider of engineered concrete solutions for the civil construction industry. For more than 100 years, we have supported the development of Australia’s infrastructure through innovation, manufacturing expertise and strong project partnerships.

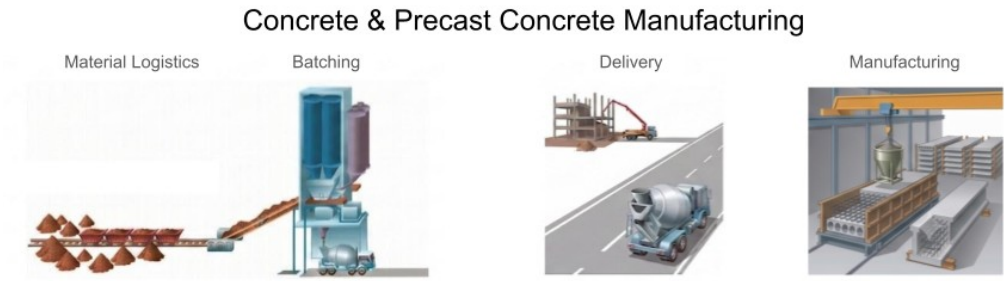
We design, manufacture and supply precast concrete solutions that support transport, water, energy and community infrastructure across the country.

Humes provides a comprehensive range of engineered precast concrete solutions that support critical infrastructure across Australia. From hydraulic systems to transport and energy infrastructure, our products are designed to perform in demanding environments and meet evolving project requirements.

To achieve EPD Process Certification, Holcim integrated Life Cycle Assessment (LCA) processes and procedures into its Management Systems. We then undergo ongoing rigorous third-party verification in accordance with internationally recognized ISO standards and guidelines.

This EPD has been developed using Holcim’s EPD Process Certification with production occurring at the listed production sites.

HUMES PRECAST CONCRETE



We offer a range of solutions for bridges and platforms, road and rail infrastructure, tunnels and shafts, retaining walls, pipeline systems, water treatment, reuse and detention, and traffic management. We can customise our solutions to ensure they create maximum value for your project, accommodating your site conditions, design requirements and construction factors. Humes has been involved in many major projects through which the business has demonstrated an ability to deliver to client specifications. Humes' reputation is well established in the civil construction and engineering market as a valuable and reliable partner

Our portfolio includes:

- FutureCast® – lower-carbon precast concrete with minimum 25% SCM and third-party verified EPDs
- Reinforced Concrete Pipes (RCP) – designed for long service life in drainage and sewer applications
- Precast box culverts and arches – engineered for structural performance and flood resilience
- Stormwater quality and detention systems
- Custom precast structural elements

We combine national manufacturing capability with local technical support to deliver reliable outcomes on complex projects.

The life cycle of precast concrete products within Holcim encompasses three main stages:

1. Aggregate Production
   - Load & Haul: Raw materials are extracted and transported within the quarry.
   - Crushing & Screening: Materials are mechanically crushed and sorted into graded aggregate sizes.
   - Distribution: Finished aggregates are stockpiled and transported to the batching plant.

2. Concrete Batching
   - Logistics & Batching: Raw materials (aggregates, cement, water, and admixtures) are received, measured, and thoroughly mixed to create a uniform concrete blend.

3. Precast Manufacturing
   - Delivery & Casting: The fresh concrete is transported and poured into precision moulds containing any required reinforcement.
   - Curing & Storage: Products undergo controlled curing to maximize strength, followed by demoulding and storage, ready for site delivery.

LCA INFORMATION

Declared Unit
1 precast concrete product.

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

Technical Lifetime
The reference service life is not specified as the scope of Holcim's operational control is from cradle to delivery This differs from mix to mix depending on the specification requirements. AS 3600, the Australian Standard for concrete structures, typically specifies a design life of 50 years. For structures with a 100-year design life, like bridges, AS 5100 is the relevant standard.

Time Representativeness
The plant data for the LCA is based on 2024 production data. The product mix data for the LCA is based on 2026 year production data.

LCA Methodology
This EPD has been produced in conformance with the requirements of:
- c-PCR-003 Concrete and concrete element
- Product Category Rules (PCR) 2019:14 v2.0.1.
- EN 15804+A2
- General Program Instructions (GPI) v5.0.1
- Instructions of EPD Australasia v4.2
- EN 14040 and EN 14044

Databases and LCA Software Used
SimaPro® LCA software (v10.2) was used for the LCA modelling which developed the LCA Calculator, used as per the certified EPD Process. It uses background data with the following preferences:
1. Product specific EPDs for cements, admixtures, pigments and fibres
2. The Australian National Life Cycle Inventory Database (AusLCI v2.45) (2025)
3. Ecoinvent 3.11 and EN15804+A2 package (2024).

The environmental impacts modelled from the existing EPDs do not include impacts for EN15804+A1, and the additional Green Star (v1.3) impact categories included in the environmental impact tables. These indicators are modelled separately based on generic processes. The following impact categories were calculated manually for the foreground data:
- Use of renewable primary energy resources used as raw materials
- Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
- Use of secondary material
- Use of renewable secondary fuels
- Use of non-renewable secondary fuels

Allocation
Allocation was necessary to proportion inputs and outputs to intermediate flows at the quarry and processes at the batching plant level. As much as possible, intermediate flows were allocated physically based on weight (quarries), m^3 of concrete (at the batching plant) or per precast concrete product. The impacts of fly ash, granulated blast furnace slag, and silica fume are allocated based on the economic values. Please refer to the "Recycled Material" section for further detail.

Cut-Off Criteria
In accordance with the PCR 2019:14 v2.0.1, the following system boundaries are applied to manufacturing equipment and employees:
- The infrastructure associated with electricity and heating supply in Module A3, and infrastructure in the manufacturing site operated by Holcim, where impacts such as those from the construction of power plants and manufacturing plants, are included.
- Environmental impact from other 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. (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.

Based on this guidance, no energy or mass flows, except packaging of materials were excluded. All materials required for manufacturing are delivered via trucks and ships without packaging.

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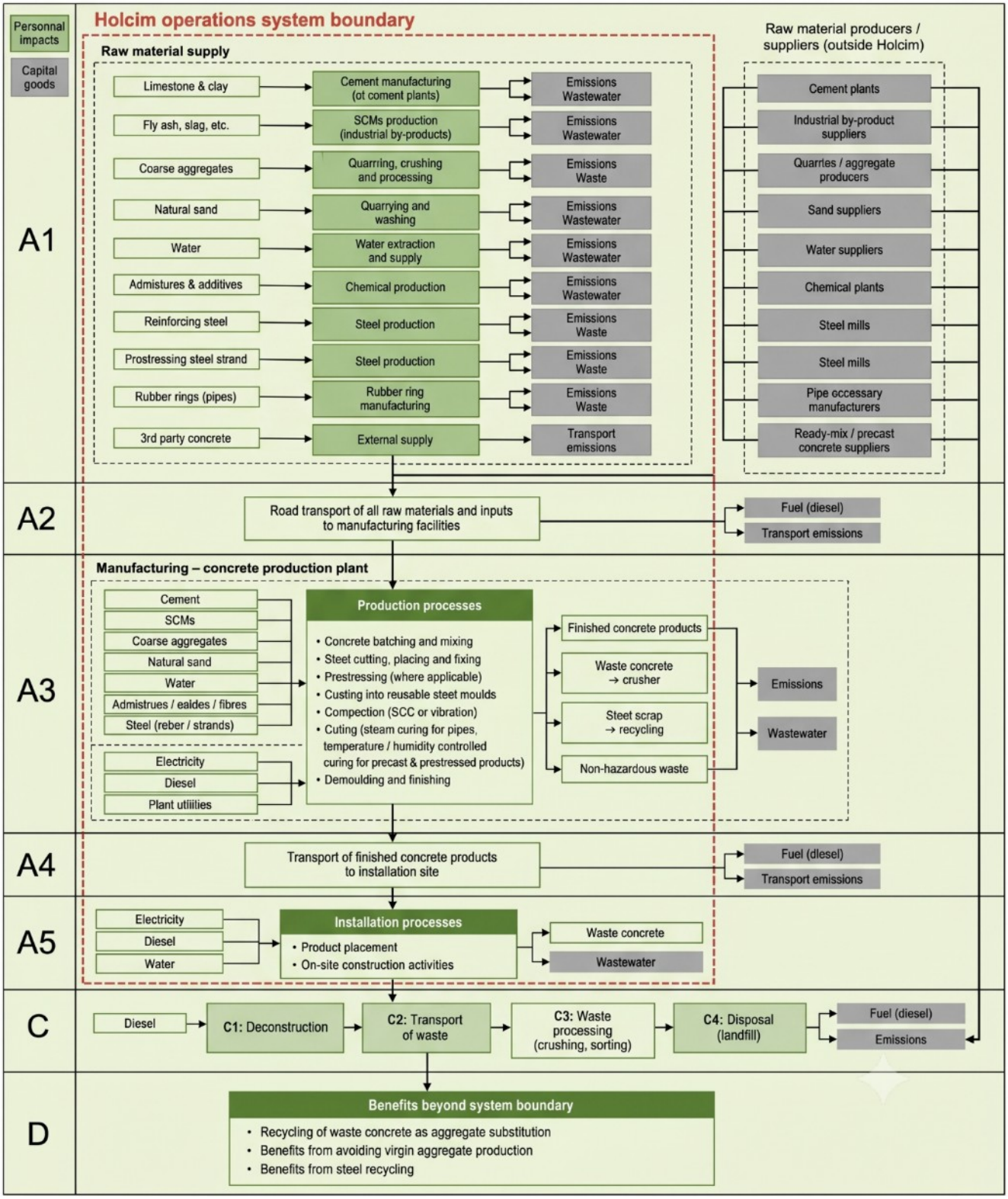
Data Quality

Data quality was assessed in terms of geographic, technical and temporal representativeness. All data sources were scored good or very good. Background data sources were also assessed with respect to their timeliness, with all data sources being updated within the 3 years required under PCR 2019:14. Please note all A1 ingredients are used in all pre-cast concrete production and are only used in applicable products.

Module	Input/outputs	Sub-processes	Data source & LCA Factor	Temporal scope	Technical scope	Geographic scope
A1	Cementitious materials	Cement	Supplier data and EPD factors	Very good	Very good	Very good
		Supplementary cementitious materials	Supplier data and database factors	Very good	Good	Good
	Coarse aggregate	Electricity	Invoices and database factors	Very good	Very good	Very good
		Diesel	Invoices and database factors	Very good	Good	Good
		LPG	Invoices and database factors	Very good	Good	Good
		Pollutants	National Pollution Inventory (NPI) data and database factors	Very good	Very good	Very good
	Manufactured sand	Mains water	Invoices and database factors	Very good	Very good	Very good
		Water – other sources	Metered and database factors	Very good	Very good	Very good
	Fine aggregate	Water discharge from site	Metered and database factors	Very good	Very good	Very good
		Explosives	Supplier data and database factors	Very good	Good	Good
		Gravel	Production data	Very good	Very good	Very good
	Other aggregates	Recycled aggregates	Database factors	Very good	Good	Good
	Admixture	Admixtures	Supplier data and database factors	Very good	Good	Good
	Oxide	Oxides	Invoices and database / EPD factors	Very good	Good	Good
	Fibre	Plastic and steel fibres	Invoices and database / EPD factors	Very good	Good	Good
	3rd party ready-mix concrete	3rd party Concrete 50 MPa	Invoices and database factors	Very good	Good	Good
	Metal	Average rebar & mesh	Invoices and database factors	Very good	Good	Good
		Domestic rebar & mesh	Invoices and database factors	Very good	Good	Good
		Imported bar & mesh	Invoices and database factors	Very good	Good	Good
		Stainless steel 304	Database / EPD factors	Very good	Good	Good
	Plastic	PET (Polyethylene Terephthalate)	Invoices and database factors	Very good	Good	Good
	Carbon Filter	Granulated activated carbon	Invoices and database factors	Very good	Good	Good
	Epoxy	Megapoxy (Epoxy resin/Polymer grout)	Invoices and database factors	Very good	Good	Good
	Polyurethane	Polyurethane	Invoices and database factors	Very good	Good	Good
	Fibreglass	Fibreglass	Invoices and database factors	Very good	Good	Good
	Rubber	Rubber	Invoices and database factors	Very good	Good	Good
A2	Raw material transport	Background data used to model	Holcim and supplier actual transport distances and loads per trip and database factors	Very good	Good	Good
A3	Site manufacturing impact (including concrete batching)	Electricity	Invoices and database factors	Very good	Very good	Very good
		Diesel	Invoices and database factors	Very good	Good	Good
		Mains water	Water meters, with utility invoices as a back-up and database factors	Very good	Very good	Very good
		Water – other sources	Estimate based on water balance and database factors	Very good	Very good	Very good
		Water discharge from site	Estimate based on Holcim site performance metrics and database factors	Very good	Very good	Very good
		Lubricating oil	Invoices and database factors	Very good	Good	Good
		Conveyor belt				
	Concrete mix designs	Background data used to model	Holcim internal technical database containing mix designs	Very good	Good	Good
A4	Distribution	Background data used to model	Actual transport data and database factors	Very good	Good	Good
A5	Installation	Electricity, Diesel, Water, Ancillary materials, Ready-mixed or cast-on-site concrete, Formwork and falsework, Output material	Typical scenario & database factors	Very good	Good	Good
A5	Installation	Electricity	Typical scenario & database factors	Very good	Good	Good
C1	Deconstruction	Excavation	Typical scenario & database factors	Very good	Good	Good
C2	Transport	Background data used to model	Typical scenario & database factors	Very good	Good	Good
C3	Waste processing	Concrete recycling	Typical scenario & database factors	Very good	Good	Good
C4	Final disposal	Inert waste landfilling	Typical scenario & database factors	Very good	Good	Good
D	Benefits and loads beyond	Crushed gravel	Typical scenario & database factors	Very good	Good	Good

System Diagram

The processes included in the LCA are presented in a process diagram in the figure below.



Description of System Boundaries and Excluded Lifecycle Stages

The scope of the LCA and EPD is from cradle to gate (A1-A3) with options, modules A4-A5, modules C1-C4 and module D. The following life cycle stages have not been declared (marked as ND), as they are deemed not applicable for Holcim's ready-mix concrete ranges: Material emissions from usage (B1); Maintenance (B2); Repair (B3); Replacement (B4); Refurbishment (B5); Operational energy use (B6), and Operational water use (B7).

	Product Stage			Construction Stage		Usage Stage							End of Life Stage				Benefits & loads for the next product system
	Raw Material Supply	Transport	Manufacturing	Transport	Construction/installation process	Use	Maintenance incl.	Repair incl. transport	Replacement incl.	Refurbishment incl.	Operational Energy Use	Operational Water Use	De-construction & demolition	Transport	Re-use recycling	Final Disposal	Reuse, Recovery Recycling potential
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	GLO	AU	AU	AU	AU	-	-	-	-	-	-	-	AU	AU	AU	AU	AU
Share of specific data*	17.5 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

* The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.
* The reported share of primary data is associated with uncertainty, as several EPDs used as data source lack information on the share of primary data.

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 Modules A1.

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 concrete
- Treatment of waste and wastewater generated from the manufacturing processes.

Downstream Processes

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

- Distribution of the product
- Installation of the product on the site.
- Wastage of construction products (This is accounted for in module A5. This includes waste concrete on site).
- 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.

Other Environmental Information

Other environmental information includes process involved in Module D. This module indicates the environmental benefits from reuse, recovery, and recycling of wastes.

EPD PRODUCT DESCRIPTION AND USE

SA - South Australia - T2D Project Jacking Pipes - 5577763 - 3500 Jacking Pipe (Standard Pipe) - Reinforced concrete pipe

UN CPC code: 375 (articles of concrete, cement and plaster). ANZSIC Classification: 2033 Ready Mix Concrete Manufacturing.

Product lifespan: The reference service life is not specified as the scope of Holcim's operational control is from cradle to delivery. Instead, AS 3600, the Australian Standard for concrete structures, typically specifies a design life of 50 years. For structures with a 100-year design life, like bridges, AS 5100 is the relevant standard.

Product description: A generic description has been provided on page 5. A detailed breakdown of the functional properties of the product, is provided below.

Product environmental information should only be compared when the products are functionally equivalent and used in the same context.

Strength (MPa)	Mix Code	Weight (kg/product)	Mix Description	Applications / intended use
50	5577763	16741	3500 Jacking Pipe (Standard Pipe)	Reinforced concrete pipe

Production Sites
Pooraka

Content Declaration

The gross weight of this declared material is 16741 kg per unit makes up a minimum of 99% of the products covered by this EPD. The following table provides a summary of the materials included in the product and their relative composition by weight.

Material	% by weight	Post-consumer recycled material, weight % of product	Biogenic material, weight-% of product	Biogenic material, kg
Aggregate	65.42	0	0	0
Total cementitious materials	20.63	0	0	0
Water	7.015	0	0	0
Admixtures	0.1200	0	0	0
Fibres (steel or plastic)	0.09378	0	0	0
Oxides	0	0	0	0
Reinforcing steel	6.717		0	0
Additional precast materials	0	0	0	0

Holcim concrete is classified as Non-Dangerous Goods according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. The safety data sheet for pre-mixed concrete lists all associated hazard phrases. None of the products contain one or more substances that are listed in the "Candidate List of Substances of Very High Concern for authorisation". According to the PCR 2019:14, if one or more substances of the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" are present in a product and their total content exceeds 0.1% of the weight of the product, they need to be reported.

Packaging

Holcim concrete is delivered in bulk with no packaging.

Supplementary Cementitious Materials (SCMs) co-products

BS EN 16757:2022 specifically lists the following materials relevant to the study as co-products:

- Fly ash,
- Ground granulated blast furnace slag; and
- Silica fume.

As such, the above materials are considered as co-products of their production process and the impacts for their production process are allocated according to PCR 2019:14 Construction Products and Construction Services (co-produced goods, multi-output allocation).

According to PCR 2019:14, economic allocation shall be used for processes producing co-products for use in cement and concrete. It should be based on market prices, preferably in long-term averages (≥3 years). While assessing the environmental burden of the high value co-products (e.g., steel, electricity, silicon). Therefore, the economic allocation method is applied to the below materials:

- Fly ash: It is sourced directly from coal fired electricity generation. The environmental impact of fly ash is derived from coal-fired electricity, converted from the heating value of coal on a per-kWh basis. There is currently insufficient publicly available information to define fly ash as a co-product - rather than waste - due to the confidential nature of the power station revenue data. As 50-90% of collected fly ash in Australia is disposed in storage dams or ponds (CS Energy 2024; ADAA 2024), economic allocation at $0/t is applicable at point of generation. The GWP-GHG of fly ash is thus 0 kg CO_2e/t.
- Ground granulated blast furnace slag: The environmental impact is allocated to blast furnace slag at the point of generation during pig iron production, based on both production volumes and market prices. However, the specific energy and processing impacts associated with grinding the slag into ground granulated blast furnace slag are included in stage A1. For information: using AusLCI data and this allocation factor, the GWP-GHG of BFS – at point of generation – is 180 kgCO_2e/t.
- Silica fume: It is sourced as a co-product of ferrosilicon production. The raw material impact of silica fume is allocated directly from ferrosilicon, considering the relative production volumes and market prices. AusLCI has been used for Australian silica fume. For information: using AusLCI data, the GWP-GHG of Silica Fume – at end-of waste point – is 1400 kg CO_2e/t. Ecoinvent data has been used for imported Silica fume.

Since SCM market price fluctuate and full datasets are often confidential and not disclosed by upstream suppliers, economic allocation has been based on the mix of primary and secondary data, from Holcim internal records, the AusLCI database, and using the approach outlined in the 2025 draft EPD Australasia Technical Advisory Group Guidance Supplementary Cementitious Material. The AusLCI dataset conforms to EN 15804+A2 when applying allocation to its various processes and sub-processes.

Please Note that the above information is provided for all SCMs co-products as general background data, this does not necessary mean that all SCMs are included in this specific mix.

Cradle to Gate (Modules A1 – A3)

Raw materials for producing Holcim's products may include cementitious materials, aggregates, admixtures, oxides, fibres, water, ice, reinforcing steel and additional precast materials. These raw materials are generally transported from various locations around Australia, China, Japan, other parts of Asia, Indonesia, Europe and North America. The raw materials are stored in silos, hoppers, ground bins or tanks. The materials are feed to batching plant hopper with calibrated scale. The fresh concrete is transported and poured into precision moulds containing any required reinforcement. Products undergo controlled curing to maximize strength, followed by demoulding and storage, ready for site delivery.

Holcim's concrete products is manufactured across ACT, NSW, QLD, SA, VIC and WA, Australia. State-specific residual electricity mix available in the AusLCI database is used to model electricity in the foreground processes. The AusLCI dataset was last updated in 2025 to reflect the latest residual electricity mix source from the FY2023.

State	Energy source in residual electricity mix	GWP-GHG (kg CO_2 eq./kWh)
NSW&ACT	69% black coal, 12% solar, 6% wind, 5% hydro, and 8% others	0.75
QLD	71% black coal, 13% solar, 10% natural gas, and 6% others	0.54
SA	34% wind, 31% natural gas, 24% solar, 9% brown coal, and 2% others	0.77
VIC	64% brown coal, 15% wind, 8% solar, 7% hydro, and 6% others	0.44
WA	44% natural gas, 30% black coal, 13% solar, 13% wind, and <1% others	0.99

Gate to Site (Module A4)

Distribution is dependent on the market requirements of concrete products.

Vehicle	Fuel use (L/tkm)	Fuel type	Carrying capacity	Density of products	Average load factor	Volume capacity utilization factor
EURO 5 Truck	0.0232	Diesel	28 t – 32 t	16741 kg/product	50%	<1

Installation (Module A5)

For Holcim precast concrete and pipe products, installation activities differ fundamentally from ready-mix concrete, as the products are manufactured off-site and installed as finished elements. The assumes A5 scenario is either installed above ground (e.g. bridge beams) or installed in ground. The A5 installation scenario modelled for this EPD is Put_in_ground.

For both scenarios, no concrete pouring during installation, and no installation-stage product waste is assumed.

For in ground installation of Holcim's reinforced concrete pipes and other precast elements is modelled using a typical trench installation scenario, consistent with AS/NZS 3725 and the assumptions documented in the Humes Blacktown EPD. Installation processes include:

- Excavation of trenches;
- Placement and compaction of bedding materials;
- Placement and alignment of precast pipes or elements; and
- Backfilling and compaction of the trench.

Transport of imported bedding materials and removal of surplus excavated material are included in the installation scenario. Energy use during installation is primarily associated with diesel consumption for excavation and placement equipment. Water use during installation is negligible and not explicitly modelled. The construction inputs and outputs per tonne of installed Humes concrete and pipe products are summarised below. Pre-installation activities, such as broader site works and project-specific earthworks beyond the immediate installation zone, are excluded from the system boundary.

Construction inputs and waste	Value	Unit
Trench installation (type H1) for DN600 pipe - Backfill	0.513	m3 /tonne
Trench installation (type H1) for DN600 pipe – Sand		
(Sand, at mine/CH U/AusSD U) for bed zone and haunch zone. The sand is assumed to be imported over a distance of 50 km (transport, truck, 16 to 28t, fleet average/AU U)	171	kg/tonne
Water use – assume n/a	0	L/tonne
Diesel for installation equipment (Excavation, hydraulic digger/RER U): assumed 0.13 L/t for excavation of the trench and 0.13 L/t diesel for placing of the pipe.	0.26	L/tonne

Deconstruction and End of Life (Modules C1 – C4)

EN 15804 (chapter 7.2.3.3) and applicable PCRs discourage the use of the results of modules A1-A3 & (A1-A5 for services) without considering the results of module C.

The C modules for Humes products are modelled differently depending on the application and end-of-life scenario:

- Precast concrete products used above ground (e.g. bridge beams): At end of life, the products are assumed to be deconstructed, crushed, and processed such that both concrete and reinforcing steel are recycled. Deconstruction activities are modelled using a hydraulic excavator, consistent with ecoinvent v3.11 (2024). Transport assumptions are consistent with those applied to ready-mix concrete.
- Precast concrete products installed below ground and removed at end of life: These products are assumed to be excavated, removed from the ground, crushed, and processed for recycling of both concrete and steel. Deconstruction, transport, and recycling processes are modelled consistently with above-ground precast products.
- Precast concrete products installed below ground and left in situ: For products that remain in the ground at end of life, no deconstruction, transport, or waste processing activities are assumed. As a result, no impacts are modelled for Modules C1–C4 for this scenario.

The end of life scenario for this EPD is Recycle .

The following assumptions have been used to model deconstruction and end of life scenarios for recycling Holcim's concrete products:

- Deconstruction is modelled as the physical process of drilling and removing the concrete. Hydraulic excavator is assumed as the operating tool for deconstruction. This process is based on ecoinvent v3.11 (2024) database and the diesel used is extracted from the process.
- 100% of the products (16741 kg) are assumed to be separately collected during deconstruction.
- 25 km delivery distance to landfilling as well as reprocessing facility is assumed for waste collection process since there was no primary data available.
- This EPD assumes 84% of the product is reprocessed/recycled as Module C3 and Module D. The National Waste and Resource Recovery Report 2024 (DCCEEW, 2025) notes that the 2022–23 resource recovery rate for building and demolition materials was 84%. As per PCR 2.0.1 additional tables for two boundary scenarios, 100% recycling (Scenario 1) and 100% landfill (Scenario 2) are included in the additional scenarios section.
- The remaining waste concrete undergoes inert waste landfill as Module C4.

Module	Parameter	If left in ground (EOL 0% recycling)	If recycled (EOL 84% recyclei ng)	Unit
C1 – Deconstruction	Diesel	0	0.26	L
C2 – Transportation	Distance to processing	0	50	km
C3 – Waste processing	Concrete recycling	0	84	%
C4 – Final disposal	Inert waste landfill	100	16	%

C2 – Transportation if applicable					
Vehicle	Fuel use (L/tkm)	Fuel type	Carrying capacity	Average load factor	Volume capacity utilization factor
EURO 5 Truck	2.2E-02	Diesel	40 t	50%	<1

Benefits and loads beyond the system boundary (Module D)

The end-of-life recyclers process the waste concrete into a recycled aggregate, which can be replaced with virgin coarse aggregate for a range of applications depending on the product's performance requirements. This EPD assumes 84% of the product is reprocessed/recycled as Module C3 and Module D. The National Waste and Resource Recovery Report 2024 (DCCEEW, 2025) notes that the 2022–23 resource recovery rate for building and demolition materials was 84%. As per PCR 2.0.1 additional tables for two boundary scenarios, 100% recycling (Scenario 1) and 100% landfill (Scenario 2) are included in the additional scenarios section.

For Holcim’s internal aggregate production, waste concrete coarse and fine aggregates can be recycled and repurposed as recycled coarse aggregate and sand. The environmental benefits from avoiding the use of virgin materials are fully accounted for.

In the consideration of Module C, the end-of-life recyclers process the waste concrete into a recycled aggregate, which can be replaced with virgin coarse aggregate for a range of applications depending on the products performance requirements.

ENVIRONMENTAL PERFORMANCE

The environmental impacts considered in this EPD are listed in the table below. EN 15804+A2 reference package based on EF 3.1 (Environmental Footprint) or a later version has been used. All further tables from this point will contain abbreviation only.

Impact Category	Abbreviation	Measurement Unit
Potential Environmental Impact indicators		
Total global warming potential	GWP – T	kg CO_2 equivalents (GWP100)
Global warming potential (fossil)	GWP – F	kg CO_2 equivalents (GWP100)
Global warming potential (biogenic)	GWP – B	kg CO_2 equivalents (GWP100)
Global warming potential (land use/ land transformation)	GWP – Luluc	kg CO_2 equivalents (GWP100)
Ozone depletion potential	ODP	kg CFC 11 equivalents
Acidification potential	AP	mol H+ eq.
Eutrophication – aquatic freshwater	EP – freshwater	kg P equivalent
Eutrophication – aquatic marine	EP - marine	kg N equivalent
Eutrophication – terrestrial	EP – terrestrial	mol N equivalent
Photochemical ozone creation potential	POCP	kg NMVOC equivalents
Abiotic depletion potential (elements)*	ADPE	kg Sb equivalents
Abiotic depletion potential (fossil fuels)*	ADPF	MJ net calorific value
Water Depletion Potential*	WDP	m^3 equivalent deprived
Resource use indicators		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, net calorific value
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, net calorific value
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value
Use of net fresh water	FW	m^3

Impact Category	Abbreviation	Measurement Unit
Waste categories and Output flows indicators		
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed/stored	RWD	kg
Components for reuse	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MFER	kg
Exported energy	EE - e	MJ per energy carrier
Exported energy, thermal	EE - t	MJ per energy carrier
Additional environmental impact indicators		
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 equivalents (GWP100)
Global warming potential, aligned with the IPCC 2013 Fifth Assessment Report *	GWP-GHG (AR5)	kg CO_2 equivalents (GWP100)
Particulate matter	PM	disease incidence
Ionising radiation – human health	IRP	kBq U-235 eq
Eco-toxicity (freshwater)*	ETP-fw	CTUe
Human toxicity potential – cancer effects*	HTP-c	CTUh
Human toxicity potential – non cancer effects*	HTP-nc	CTUh
Soil quality*	SQP	dimensionless
Potential environmental Impact Indicators (EN15804+A1)		
Global warming (GWP100a) – A1	GWP (A1)	kg CO_2 equivalents
Ozone layer depletion (ODP) – A1	ODP (A1)	kg CFC-11 equivalents
Acidification – A1	AP (A1)	kg SO_2 equivalents
Eutrophication – A1	EP (A1)	kg PO_4^{3-} equivalents
Photochemical oxidation – A1	POCP (A1)	kg C_2H_4 equivalents
Abiotic depletion – A1	ADPE (A1)	kg Sb equivalents
Abiotic depletion (fossil fuels) – A1	ADPF (A1)	MJ, net calorific value
Global warming (GWP100a) – A1	GWP (A1)	kg CO_2 equivalents
Additional Greenstar v1.3 Indicators		
Human Toxicity cancer Green Star	HTc (GS)	CTUh
Human Toxicity non-cancer Green Star	HTnc (GS)	CTUh
Land use Green Star	LU (GS)	kg C deficit equivalents
Ionising radiation Green Star	IR (GS)	kBq U-235 equivalents
Particulate Matter Green Star	PM (GS)	kg PM2.5 equivalents
WSI Green Star	WSI (GS)	m^3 equivalents

**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.*

**** - GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14). It excludes biogenic carbon and indirect radiative forcing.*

3500 Jacking Pipe (Standard Pipe)

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.

PRIMARY ENVIRONMENTAL INDICATORS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-Total	kg CO_2 eq.	5573	30.12	94.26	8.735	116.1	62.37	7.496	-1722
GWP-Fossil	kg CO_2 eq.	5567	30.12	94.24	8.734	116.1	62.27	7.495	-1722
GWP-Biogenic	kg CO_2 eq.	3.930	0.001046	0.01374	0.0003729	0.004041	0.05240	0.0006953	-0.1751
GWP-Luluc	kg CO_2 eq.	1.306	0.0007712	0.01003	0.0003074	0.002980	0.04944	0.0003781	-0.5852
ODP	kg CFC 11 eq.	0.00003215	3.971E-07	1.223E-06	1.306E-07	1.534E-06	1.545E-08	1.879E-09	-4.077E-06
AP	mol H+ eq.	23.51	0.1562	0.7087	0.08225	0.8539	0.5460	0.06741	-7.008
EP-F	kg P eq.	0.4229	0.00002232	0.0003747	7.913E-06	0.00008624	0.0001449	0.00002462	-0.06426
EP-M	kg N eq.	4.517	0.04101	0.2571	0.03865	0.2944	0.2321	0.03074	-1.371
EP-T	mol N eq.	62.07	0.4577	2.815	0.4235	3.222	2.541	0.3369	-15.64
POCP	kg NMVOC eq.	18.87	0.1727	0.9243	0.1253	1.094	0.7561	0.1022	-5.119
ADPE	kg Sb eq.	0.005509	1.012E-06	3.832E-06	3.595E-07	3.909E-06	0.00001068	2.492E-07	-0.01215
ADPF	MJ	53501	391.3	1225	115.3	1512	726.7	95.83	-15472
WDP	m^3 equivalent deprived	1049	0.1426	172.8	0.1549	0.5508	14.49	0.08461	-527.7

RESOURCE USE PARAMETERS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3223	0.6549	10.80	0.2163	2.530	28.36	0.4508	-307.0
PERM	MJ	15.46	0	0	0	0	0	0	0
PERT	MJ	3238	0.6549	10.80	0.2163	2.530	28.36	0.4508	-307.0
PENRE	MJ	53846	391.3	1225	115.3	1512	726.7	95.83	-15472
PENRM	MJ	0	0	0	0	0	0	0	0
PENRT	MJ	53846	391.3	1225	115.3	1512	726.7	95.83	-15472
SM	kg	1601	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	706.7	0	0	0	0	0	0	0
FW	m^3	33.03	0.004975	4.033	0.003723	0.01922	0.2506	0.003241	-8.510

WASTE CATEGORIES AND OUTPUT FLOWS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	577.6	0.002679	0.6281	0.01257	0.01035	0.5411	0.01645	-0.1395
NHWD	kg	6342	0.01005	15.24	0.3897	0.03882	5.130	0.09743	-7.973
RWD	kg	0.01627	0.00001480	0.0001973	4.576E-06	0.00005717	0	0	0.006552
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	170.7	0	0	0	0	13995	0	0
MFER	kg	0	0	0	0	0	0	0	0
EE - e	MJ	0	0	0	0	0	0	0	0
EE - t	MJ	0	0	0	0	0	0	0	0

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	5751	30.12	94.26	8.735	116.1	62.37	7.496	-1722
GWP-GHG (AR5)	kg CO_2 eq.	5852	30.16	94.41	8.749	116.3	62.46	7.509	-1727
PM	disease incidence	0.0005725	2.728E-06	7.850E-06	2.357E-06	5.326E-06	0.00001419	1.911E-06	-0.0001366
IRP	kBq U-235 eq	6015	0.02854	0.3785	0.008800	0.1103	0.07260	0.009492	10.52
ETP-fw	CTUe	82798	14.58	56.29	4.229	52.61	31.39	3.661	-4640
HTP-c	CTUh	0.0002517	1.207E-09	1.456E-08	6.048E-10	2.792E-09	5.231E-09	5.164E-10	9.349E-07
HTP-nc	CTUh	0.0001235	6.093E-08	1.253E-07	8.613E-09	1.183E-07	1.072E-07	9.897E-09	-1.842E-06
SQP	dimensionless	7748	0.5824	86.79	0.2218	2.250	191.5	113.1	-3677

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS (in accordance with EN 15804:2012**+A1**:2013) – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP (A1)	kg CO_2 eq.	5855	30.12	94.27	8.737	116.1	62.33	7.498	-1724
ODP (A1)	kg CFC 11 eq.	0.00001793	3.138E-07	9.677E-07	1.032E-07	1.212E-06	1.639E-08	1.964E-09	-3.815E-06
AP (A1)	kg SO_2 eq.	17.45	0.07165	0.4073	0.05762	0.4474	0.3452	0.04765	-5.732
EP (A1)	kg PO_4^{3-} eq.	2.713	0.01422	0.08786	0.01304	0.09948	0.07886	0.01044	-0.6874
POCP (A1)	kg C_2H_4 eq.	1.254		0.02612	0.001467	0.03339	0.009099	0.002153	-0.6939
ADPE (A1)	kg Sb eq.	0.005458	1.014E-06	3.837E-06	3.595E-07	3.918E-06	0.00001069	2.502E-07	-0.01214
ADPF (A1)	MJ	40986	4.013	54.78	0.9089	15.50	138.6	5.889	-19569

ADDITIONAL GREEN STAR (V1.3) IMPACT INDICATORS – **1 precast product**

Abbreviation	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HTc (GS)	CTUh	2.024E-07	2.817E-10	8.325E-10	6.035E-11	8.465E-10	6.334E-10	8.049E-11	-9.537E-08
HTnc (GS)	CTUh	1.596E-08	3.086E-11	5.356E-11	3.476E-12	6.434E-11	2.921E-11	3.480E-12	-7.950E-09
LU (GS)	kg C deficit eq.	2451	0.3210	452.5	0.1066	1.240	17.85	8.089	-3618
IR (GS)	kBq U235 eq.	26.24	0.02868	0.3788	0.008800	0.1108	0.07293	0.009535	10.44
PM (GS)	kg PM2.5 eq.	0.0005725	2.728E-06	7.850E-06	2.357E-06	5.326E-06	0.00001419	1.911E-06	-0.0001366
WSI (GS)	m^3	42.84	0.004845	5.601	0.005175	0.01872	0.7305	0.004037	-19.49

RESULTS FOR ADDITIONAL SCENARIOS

The latest standard requires reporting additional environmental information for two boundary scenarios, 100% recycling (Scenario 1) and 100% landfill (Scenario 2), whenever the declared end-of-life scenario is not 100%. In such cases, only the results for Modules C3, C4, and D are adjusted, while the impacts associated with all other modules remain unchanged.

PRIMARY ENVIRONMENTAL INDICATORS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

		Scenario 1: Recycling			Scenario 2: Landfill		
Abbreviation	Unit	C3	C4	D	C3	C4	D
GWP-Total	kg CO_2 eq.	74.60	0	-2060	0	45.71	-0.07701
GWP-Fossil	kg CO_2 eq.	74.48	0	-2059	0	45.70	-0.07689
GWP-Biogenic	kg CO_2 eq.	0.06268	0	-0.2094	0	0.004240	-0.00005917
GWP-Luluc	kg CO_2 eq.	0.05914	0	-0.7000	0	0.002306	-0.00006712
ODP	kg CFC 11 eq.	1.848E-08	0	-4.876E-06	0	1.146E-08	-5.604E-10
AP	mol H+ eq.	0.6532	0	-8.383	0	0.4110	-0.0004271
EP-F	kg P eq.	0.0001733	0	-0.07686	0	0.0001501	-2.708E-06
EP-M	kg N eq.	0.2776	0	-1.640	0	0.1874	-0.0001076
EP-T	mol N eq.	3.039	0	-18.71	0	2.054	-0.001182
POCP	kg NMVOC eq.	0.9045	0	-6.123	0	0.6234	-0.0003756
ADPE	kg Sb eq.	0.00001277	0	-0.01453	0	1.519E-06	-8.540E-09
ADPF	MJ	869.2	0	-18506	0	584.3	-0.9767
WDP	m^3 equivalent deprived	17.33	0	-631.2	0	0.5159	-0.1355

RESOURCE USE PARAMETERS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

		Scenario 1: Recycling			Scenario 2: Landfill		
Abbreviation	Unit	C3	C4	D	C3	C4	D
PERE	MJ	33.92	0	-367.3	0	2.749	-0.09323
PERM	MJ	0	0	0	0	0	0
PERT	MJ	33.92	0	-367.3	0	2.749	-0.09323
PENRE	MJ	869.2	0	-18506	0	584.3	-0.9767
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	869.2	0	-18506	0	584.3	-0.9767
SM	kg	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m^3	0.2997	0	-10.18	0	0.01976	-0.003211

WASTE CATEGORIES AND OUTPUT FLOWS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

		Scenario 1: Recycling			Scenario 2: Landfill		
Abbreviation	Unit	C3	C4	D	C3	C4	D
HWD	kg	0.6473	0	-0.1668	0	0.1003	-0.0001840
NHWD	kg	6.136	0	-9.537	0	0.5941	-7.939E-07
RWD	kg	0	0	0.007837	0	0	0
CRU	kg	0	0	0	0	0	0
MFR	kg	16741	0	0	0	0	0
MFER	kg	0	0	0	0	0	0
EE - e	MJ	0	0	0	0	0	0
EE - t	MJ	0	0	0	0	0	0

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS (in accordance with EN 15804:2012**+A2**:2019) – **1 precast product**

		Scenario 1: Recycling			Scenario 2: Landfill		
Abbreviation	Unit	C3	C4	D	C3	C4	D
GWP-GHG	kg CO_2 eq.	74.60	0	-2060	0	45.71	-0.07701
GWP-GHG (AR5)	kg CO_2 eq.	74.71	0	-2066	0	45.79	-0.07717
PM	disease incidence	0.00001698	0	-0.0001635	0	0.00001165	-6.489E-09
IRP	kBq U-235 eq	0.08685	0	12.58	0	0.05788	-0.003269
ETP-fw	CTUe	37.55	0	-5550	0	22.32	-0.1311
HTP-c	CTUh	6.258E-09	0	1.118E-06	0	3.149E-09	-8.587E-12
HTP-nc	CTUh	1.283E-07	0	-2.203E-06	0	6.034E-08	-3.361E-10
SQP	dimensionless	229.0	0	-4398	0	689.4	-0.6325

ADDITIONAL ENVIRONMENTAL INFORMATION

Material Circularity Indicator (MCI) results

The Material Circularity Indicator (MCI) is a framework used to evaluate a product's performance within a circular economy, consistent with ISO 59020. It assesses how effectively materials are retained within a product system while preserving their highest possible value over time.

MCI offers a standardised metric that can be applied across a broad range of circular economy approaches, including material avoidance, product durability, reuse, remanufacturing, recycling, regenerative sourcing, composting, and energy recovery. Results can be expressed either as an MCI Score or as a percentage of circularity (% MCI).

The Material Circularity Indicator (MCI) for the product was calculated in accordance with the Circularity Indicators: An Approach to Measuring Circularity methodology developed by the Ellen MacArthur Foundation and Granta Design (2015, updated in 2019). A value of 84% is used for the MCI recycling and recovery rate of waste aggregate and concrete based on the National Waste and Resource Recovery Report 2024 (DCCEEW, 2025). Under the current calculation boundaries, fly ash and slag are excluded as recycled inputs; however, they are likely to be included in future updates to better reflect the product's total avoidance of virgin material.

Benefits of MCI

Integrating MCI scores into Environmental Product Declarations (EPDs) strongly complements traditional Life Cycle Assessment (LCA) data. While an EPD provides transparent, third-party verified information on environmental impacts throughout a product's life cycle, the MCI provides a dedicated metric focusing specifically on the circulation and utility of material flows.

Both the Infrastructure Sustainability rating scheme and the Green Building Council of Australia Ratings tool recognise and reward projects that use products with a Material Circularity Indicator (MCI) score.

% MCI result

The percentage circularity (% MCI) is derived using the same methodology and assumptions as the MCI Score but presents the outcome on a more intuitive scale ranging from 0% (fully linear) to 100% (fully circular).

A result of 0% reflects a fully linear system that relies entirely on virgin inputs and generates a product or waste stream that is entirely unrecovered. At the other end of the scale, a result of 100% indicates an ideal circular system using only recovered or sustained resources while ensuring all output flows are fully recovered. The MCI result for 5577763 is 41.60 %.

Product	% MCI result
5577763	41.60 %

OTHER LIFE CYCLE STAGES NOT INCLUDED IN THIS EPD

While the LCA study and EPD only consider the cradle to gate (modules A1-A3) with options modules A4-A5, modules C1-C4 and module D of the environmental impacts of Holcim's ready-mix concrete, practitioners using the EPD for the purpose of whole-of-life building studies or the functional comparison of different building products on a whole-of-life basis will consider concrete's other life cycle stages. Some of the environmental impacts of benefits associated with other life cycle stages not included in this EPD are described in the following sections.

Lifetime absorption of CO_2

Carbonation is a natural process whereby concrete absorbs carbon dioxide (CO_2) from the atmosphere through a chemical reaction between the CO_2 in the ambient air and hydration products within the concrete ($CaOH_2$). Ready-mix concrete can be subject to carbonation from the use stage onward (i.e. after construction and curing). From a life cycle impact accounting perspective, this process can also be referred to as 'reabsorption', since the CO_2 emitted during the cement manufacturing process can be partly offset by the lifetime absorption of CO_2, therefore reducing the net CO_2 emissions associated with concrete over its lifetime.

The carbonisation process is a commonly known process in building design and is typically taken into consideration by engineers when specifying special-class concrete.

The total amount of CO_2 absorption during the life cycle of concrete is subject to a range of factors and varies over time. The calculation has been standardised in the British and European Standard BS EN 16757:2017 *Sustainability of construction works – Environmental Product Declarations – Product Category Rules for concrete and concrete elements.* It is recommended that practitioners make use of this standard when conducting whole-of-life building studies and if the building materials include substantial amounts of concrete. Please note that CO_2 absorption has not been considered in this EPD and is not reflected in the EPD results tables.

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