

Boral SA Region Pre-mix Concrete EPD

ENVIRONMENTAL PRODUCT DECLARATION



Contents

Program Information & Verification	3
About Boral	5
Geographical Scope	9
Declared Products	11
Pre-mix Concrete Production	14
Cradle-to-gate Life Cycle	15
Life Cycle Assessment (LCA) Methodology	18
Product Composition	20
Declared Unit	21
Environmental indicators	22
Environmental profiles	23
Adelaide Metro Region	24
Adelaide East & Hills Region	40
Other Environmental Information	56
Our Approach to Climate Related Risks	57
References	59

Program information and verification

An Environmental Product Declaration (EPD) is a standardised way of quantifying the potential environmental impacts of a product or system. EPDs are produced according to a consistent set of rules – Product Category Rules (PCR) – that define the requirements within a given product category.



These rules are a key part of ISO 14025, ISO 14040 and ISO 14044 as they enable transparency and comparability between EPDs. This EPD provides environmental indicators for Boral ENVISIA®, Envirocrete®, Envirocrete® Plus, products for special applications and our normal class of pre-mix concrete products manufactured in Australia. This EPD is a “cradle-to-gate” declaration covering production of the concrete and its supply chain.

This EPD is verified to be compliant with EN 15804. EPD of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programs or utilising different PCRs may not be comparable. Boral, as the EPD owner, has the sole ownership, liability and responsibility for the EPD.

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Program information and verification

EPD Version:	1.0
Reference year for data:	2018-01-01/2018-12-31

CEN standard EN 15804 served as the core PCR

PCR	PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-18 PCR 2012:01-SUB-PCR-G Concrete and concrete elements, 2020-09-18
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	☐ EPD process certification (Internal) ☒ EPD verification (External)
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ No ☒ Yes



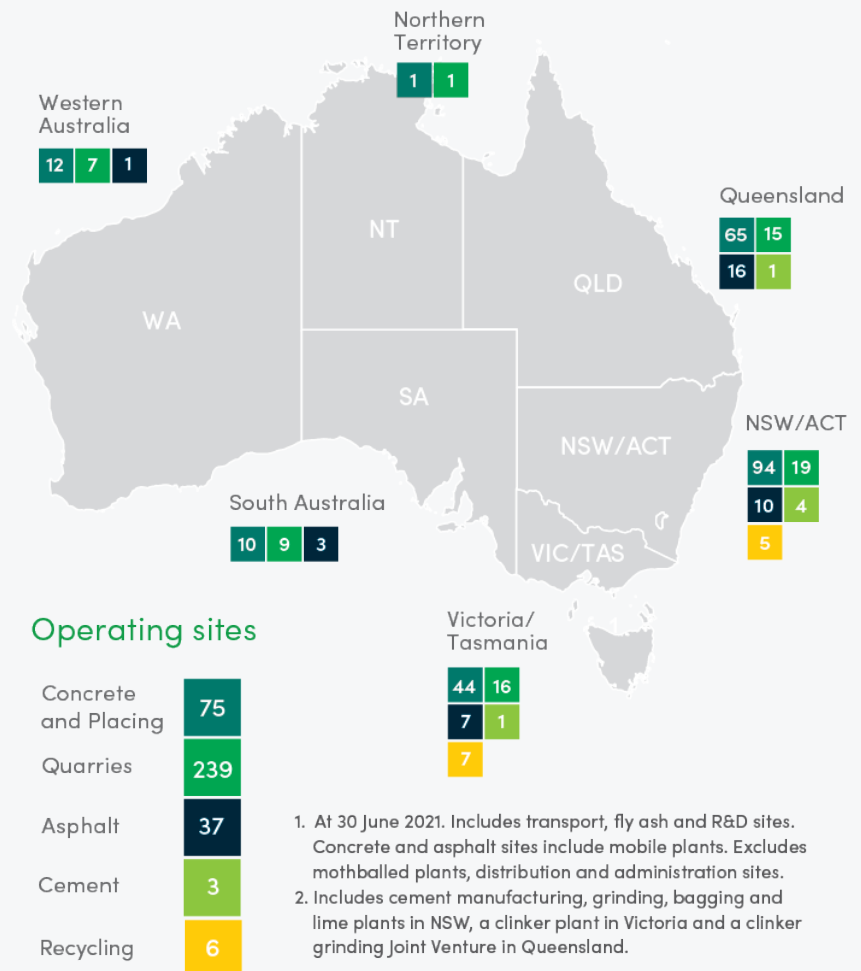
About Boral

Boral is the largest integrated construction materials company in Australia, with a leading position underpinned by strategically located quarry reserves and an extensive network of operating sites. We also manufacture and supply a range of building products.

Boral Concrete has over 230 pre-mix concrete plants around Australia producing a wide range of concrete mixes in metropolitan and country areas.

In South Australia, Boral Concrete supplies pre-mix concrete to all segments of the construction industry including infrastructure, social, commercial and residential construction.

This EPD covers the majority of the concrete products supplied from Boral plants in South Australia.



How we work

At Boral, we have a culture of 'working together' with a focus on Zero Harm Today. This ensures all of our employees, contractors, partners and communities in which we operate are free from harm, injury and illnesses.

Boral has a team of full-time Health, Safety, Environment and Quality specialists who operate across our integrated business, offering a single interface for safety communications and innovation across raw materials, logistics, operations and placement.

Innovation and technical capability

The Innovation Factory is Boral's in-house centre of excellence responsible for developing advanced cement and concrete solutions for our customers. Through consultation with our customers, the Innovation Factory is central to enabling transformation through innovative products at Boral.

Our focus on engagement and action is backed by intensive research and development through our dedicated and talented team who work in collaboration with many sections of the company to create a world of future generations will be proud of.

About Boral

Technical Services

As one of Australia's largest construction materials companies, Boral is committed to excellence, providing customers with quality products and reliable service. Our aim is to provide products backed up by specialised testing as well as extensive quality control testing and technical support.

To ensure we remain at the forefront, we constantly improve, develop and refine our products to maintain the high standards customers have come to expect.

Our production, technical and quality managers are committed to quality excellence in our manufacturing process. We have committed additional resources to research and we strive to develop whole-of-life solutions that offer a sustainable future. Our innovative products are designed in collaboration with our clients.

Not only are we the only Australian construction materials company to maintain a full-service construction materials laboratory in Australia, **Boral Materials Technical Services is also the largest facility of its kind in the country**, providing special and standard testing and product development services to Boral and our customers.

Boral maintains an ISO 9001-certified Quality System to ensure we conduct a regular regime of physical properties testing on all materials to certify they:

- Meet Australian Standards in the civil and structural construction industry;
- Comply with applicable legislation, regulations and industry standards;
- Meet project specifications; and
- Allow for continuous improvement.

Boral laboratory facilities have a quality management system that meets international standards and they are NATA-accredited for construction materials testing and chemical testing. These customer-focused services have earned Boral the reputation of a market leader in its approach.



Bridgeport Murray Bridge.

About Boral

Sustainability at Boral

We recognise that our commitment and progress in managing sustainability outcomes is vital to our business and meeting the expectations of our customers.

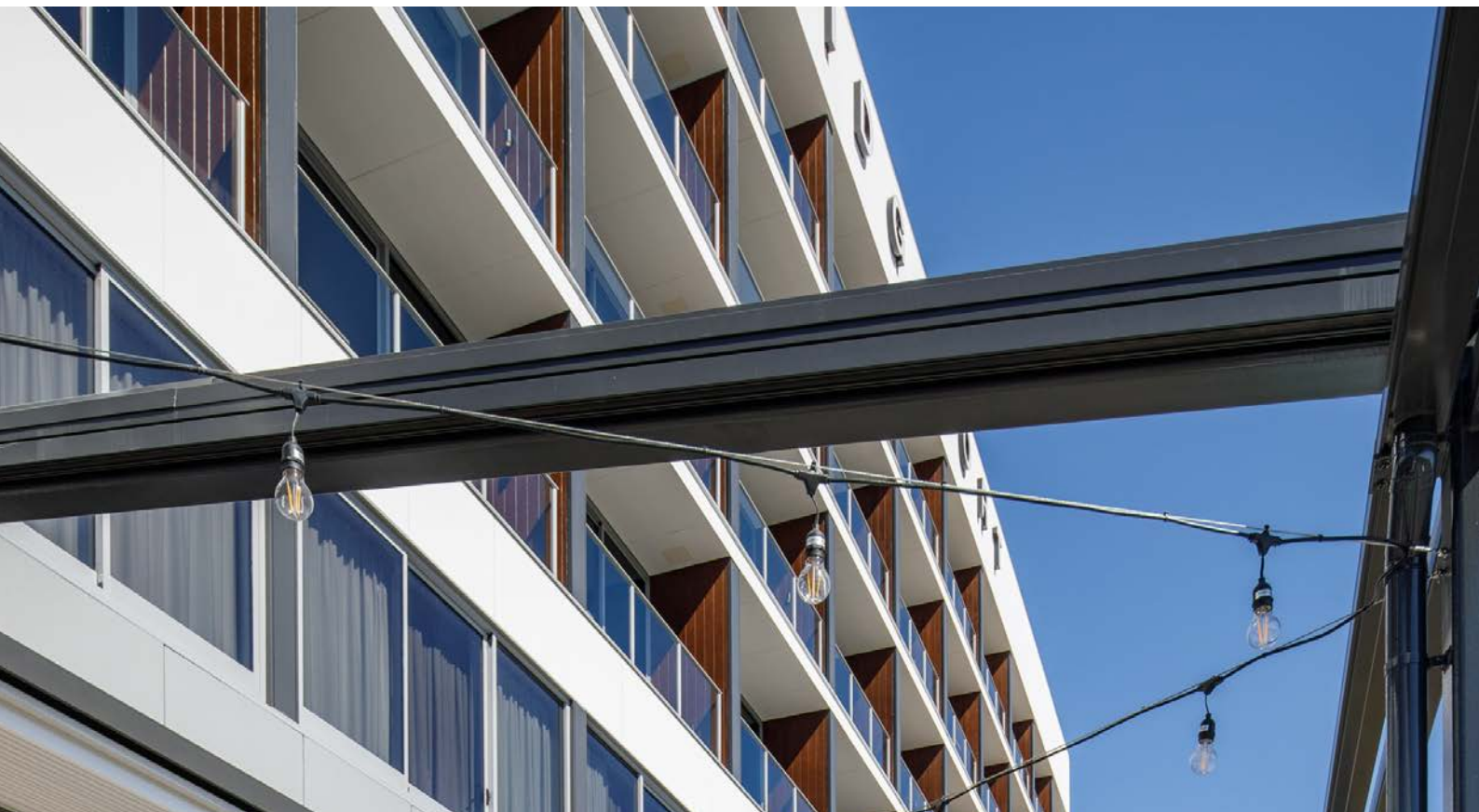
We strive to:

- Deliver innovative, superior performing and more sustainable products and solutions that respond to a changing world and better meet our customers' needs
- Drive safety performance towards world's best practice and invest in our people to enable them to deliver on our strategy
- Reduce our environmental footprint and build our resilience to climate impacts, and
- Be a socially responsible member of the communities in which we operate.

In recent years, we have substantially reshaped our business to respond and adapt to changing commercial, technological, and environmental factors. We have invested in growing our lower carbon concrete products.

We are increasing our investment in innovation to enable us to expand our products and solutions that have a lower carbon footprint and thereby positively contribute to an effective transition to a lower carbon economy.

Boral's ENVISIA® and Envirocrete®/Plus products underpin this improved sustainable concrete range. We monitor and report on our sustainability performance to drive progress and continuous improvement and are responding to increasing expectations of our customers on the disclosure of our sustainability risks and opportunities.



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About Boral

Our commitment

Our overarching goal is to deliver Zero Harm Today. This means we target zero injuries to our people and seek to eliminate adverse environmental impacts. Where elimination is not possible, we seek to minimise any harmful effects from our operations. At an absolute minimum, this means complying with environmental legislation, regulations, standards and codes of practice.

- Reducing greenhouse gas emissions from our processes, operations and facilities.
- Reducing waste in all forms including through the efficient use of energy, conservation of water, minimising and recycling waste materials and energy, prevention of pollution, and effective use of virgin and recovered resources and supplemental materials.
- Protecting biodiversity values at and around our facilities.
- Openly and constructively engaging with communities surrounding our operations.



Adelaide.

Geographical scope

SOUTH AUSTRALIA

The concrete plants considered for this Environmental Product Declaration comprise those in the state of South Australia, comprising of the Adelaide Metro and Adelaide East & Hills regions. Individual plants were assessed for life cycle assessment, and local surrounding similar raw material sources were included in the datasets.

These regions, and modelled plants, including geographically nearby plants are listed in the following location map.

- Boral Concrete Wingfield – Adelaide Metro
- Boral Concrete Littlehampton – Adelaide Hills East & Hills



-  **Red pins** = plants that are being modelled in SA EPD
-  **Green pins** = surrounding plants covered in SA EPD scope
-  **Orange pins** = out of scope for the SA EPD

Declared products

Products considered South Australian environmental product declaration

The products considered for the EPD fall into three broad categories: normal class products, lower carbon concrete products and special concrete products. A brief description of each category is given below, followed by a full list of the products.

1) Normal Class Concrete Products

Normal class concrete products are suitable for general applications and designed to meet the requirements of AS 1379 (Specification and supply of concrete). The normal class concrete products have been grouped according to the cement blend they contain as follows.

Normal Class concrete category	Cementitious type
Normal Class GP blend	General Purpose (GP) cement
Normal Class GP/FA	General Purpose (GP) cement and fly ash (FA)
Normal Class GP/GGBFS	General Purpose (GP) cement and ground granulated blast furnace slag (GGBFS)
Normal Class GP/GGBFS/FA	General Purpose (GP) ground granulated blast furnace slag (GGBFS) and fly ash (FA)

2) Lower Carbon Concrete Products

Lower carbon concrete products have been designed to have lower portland cement contents and low embodied carbon contents. The lower carbon concrete products have been further categorised according to their portland cement reduction and their performance, as per the sub categories below.

Lower Carbon Concrete Product	Portland cement reduction*	Typical properties
Envirocrete® 30%	≥30%	Complies with AS 1379
Envirocrete® 40%	≥40%	Complies with AS 1379
Envirocrete® Plus	≥45%	- Complies with AS 1379 - Improved early age strength and drying shrinkage compared to the Envirocrete® products
ENVISIA®	≥50%	- Complies with AS 1379 - Improved early age strength and drying shrinkage compared to the Envirocrete® and Envirocrete® Plus products

* The percentages indicate the typical portland cement reduction against default concrete mixes as defined in the Green Star and IS Rating tools by the Green Building Council of Australia (GBCA) and the Infrastructure Sustainability Council (ISC) respectively.

Declared products

Envirocrete® Concrete (30% and 40%)

Boral's Envirocrete® concrete is a lower carbon concrete product which complies with AS 1379. It contains supplementary cementitious materials to reduce the portland cement content. Envirocrete® has a minimum portland cement reduction of 40% compared to the GBCA and ISC reference case. Envirocrete® is ideal for general applications where high-performance concrete is not required.

Envirocrete® Plus Concrete

Boral's Envirocrete® Plus concrete is a lower carbon concrete product which complies with AS 1379. It contains supplementary cementitious materials to reduce the portland cement and the minimum reduction in portland cement compared to the GBCA and ISC reference case is 45%. Envirocrete® Plus also has enhanced engineering properties compared to the Envirocrete® range. The early age strength and drying shrinkage are superior to Envirocrete®.

ENVISIA® Concrete

Boral's ENVISIA® concrete is a lower carbon concrete product which complies with AS 1379 and has excellent engineering properties. It has a low portland cement content and a high supplementary cementitious content which results in reduced greenhouse gas emissions. ENVISIA® combines a proprietary cement technology (ZEP®) which gives it good early age strength, low shrinkage characteristics and excellent durability characteristics. An overview of the sustainability, durability, engineering and architectural properties are given over the page.



Declared products

Lower Carbon

- ENVISIA® has a low portland cement content and is suitable for projects seeking to maximise the number of green star points from concrete.
- ENVISIA® has a lower carbon content and is suitable for projects seeking compliance with the Green Building Council of Australia (GBCA) or the Infrastructure Sustainability Council (ISC).

Workability

- ENVISIA® can be placed, pumped and finished like conventional concrete

Superior Engineering properties

- ENVISIA® will achieve early-age strength equivalent to conventional concrete mixes with higher portland cement content (e.g post-tensioned and precast concrete.)
- ENVISIA® has 20 percent greater flexural strength compared to conventional concrete of the same grade.
- ENVISIA® achieves up to 50 percent reduction in shrinkage when compared to conventional sustainable concrete mixes. The low shrinkage of ENVISIA® will allow for more engineering options such as the design of larger slabs with fewer joints.

Superior Durability

- ENVISIA® provides improved durability, through greater protection to steel reinforcement against chloride induced corrosion.
- ENVISIA® has improved sulphate and acid resistance properties.
- ENVISIA® mitigates the potential expansion due to alkali aggregate reactivity.

Architectural Presence

- ENVISIA® can achieve a range of architectural benefits because of its off-form finish and lighter colour.
- ENVISIA®'s lighter colour will enhance the use of coloured oxides.



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Declared products

Special concrete products

Boral's special concrete products have been designed to meet specific project requirements in addition to the requirements of AS 1379. They include products that have been designed for infrastructure projects, multi-residential buildings, commercial buildings and civil works.

Products covered by this environmental product declaration

The products covered in the EPD are listed below. The environmental impacts of products not referenced in the EPD can be provided on request. Boral is developing an environmental impact calculator allowing us to provide environmental profiles for virtually any mix design from any of our concrete plants in Australia. We intend to have the calculator independently verified in line with the same standards this EPD is based on, so that the results are of similar standing.

Lower Carbon Concrete Products

- ENVISIA® 20 MPa
- ENVISIA® 25 MPa
- ENVISIA® 32 MPa
- ENVISIA® 40 MPa
- ENVISIA® 50 MPa
- ENVIROCRETE® PLUS 20 MPa
- ENVIROCRETE® PLUS 25 MPa
- ENVIROCRETE® PLUS 32 MPa
- ENVIROCRETE® PLUS 40 MPa
- ENVIROCRETE® PLUS 50 MPa
- ENVIROCRETE® 40% 20 MPa
- ENVIROCRETE® 40% 25 MPa
- ENVIROCRETE® 40% 32 MPa
- ENVIROCRETE® 40% 40 MPa
- ENVIROCRETE® 40% 50 MPa
- ENVIROCRETE® 30% 20 MPa
- ENVIROCRETE® 30% 25 MPa
- ENVIROCRETE® 30% 32 MPa
- ENVIROCRETE® 30% 40 MPa
- ENVIROCRETE® 30% 50 MPa

Normal Class Concrete Products

- NORMAL CLASS GP BLEND 20 MPa
- NORMAL CLASS GP BLEND 25 MPa
- NORMAL CLASS GP BLEND 32 MPa
- NORMAL CLASS GP BLEND 40 MPa
- NORMAL CLASS GP BLEND 50 MPa
- NORMAL CLASS GP/FA BLEND 20 MPa
- NORMAL CLASS GP/FA BLEND 25 MPa
- NORMAL CLASS GP/FA BLEND 32 MPa
- NORMAL CLASS GP/FA BLEND 40 MPa
- NORMAL CLASS GP/FA BLEND 50 MPa
- NORMAL CLASS GP/GGBFS BLEND 20 MPa
- NORMAL CLASS GP/GGBFS BLEND 25 MPa
- NORMAL CLASS GP/GGBFS BLEND 32 MPa
- NORMAL CLASS GP/GGBFS BLEND 40 MPa
- NORMAL CLASS GP/GGBFS BLEND 50 MPa
- NORMAL CLASS GP/GGBFS/FA BLEND 20 MPa
- NORMAL CLASS GP/GGBFS/FA BLEND 25 MPa
- NORMAL CLASS GP/GGBFS/FA BLEND 32 MPa
- NORMAL CLASS GP/GGBFS/FA BLEND 40 MPa
- NORMAL CLASS GP/GGBFS/FA BLEND 50 MPa

Concrete for Special Applications

- DIT 32 MPa SLIPFORM
- DIT 40 MPa PUMP B1 EXP
- DIT 50 MPa PUMP C1 EXP
- WATER AUTHORITY 40 MPa B2 EXP
- WATER AUTHORITY 50 MPa C1 EXP
- HIGH SLUMP 32 MPa
- HIGH SLUMP 40 MPa
- HIGH SLUMP 50 MPa
- HIGH WORKABILITY 65 MPa
- HIGH WORKABILITY 80 MPa
- TREMIE 40 MPa
- POST TENSIONED 40 MPa 25 MPa@3 DAYS
- SHOTCRETE 32 MPa
- SHOTCRETE 40 MPa
- KERB HAND 25 MPa
- KERB HAND 32 MPa
- KERB MACHINE 280KG
- KERB MACHINE 320KG
- PAVING 25 MPa
- PAVING 32 MPa
- 6:1 NO FINES
- FLOWABLE FILL 5 MPa PIPEFILL
- STABILISED SAND 3%
- STABILISED SAND 7%
- STABILISED SAND 10%

Pre-mix concrete production

Concrete production is the process of combining water, aggregates, cementitious binders and additives. These different 'ingredients' are mixed at a specialised facility known as a 'batching' plant.

A batching plant stores the ingredients in cement silos, aggregate bins and admixture tanks. The plants use calibrated weigh scales and flow meters to accurately weigh the ingredients which are then mixed in a mixer compliant with item C3 of AS 1379. Most concrete plants mix the concrete in a transit mixer (concrete truck) which then delivers the concrete to the project. However, some plants use a stationary mixer before discharging the mixed concrete into a concrete truck which then delivers the concrete to the project.

Depending on the proposed application of the final product, the concrete may contain other ingredients such as colour oxides and fibres and the production process may include heaters or chillers. Concrete production is time-sensitive, once the ingredients are mixed, workers must put the concrete in place before it loses workability.

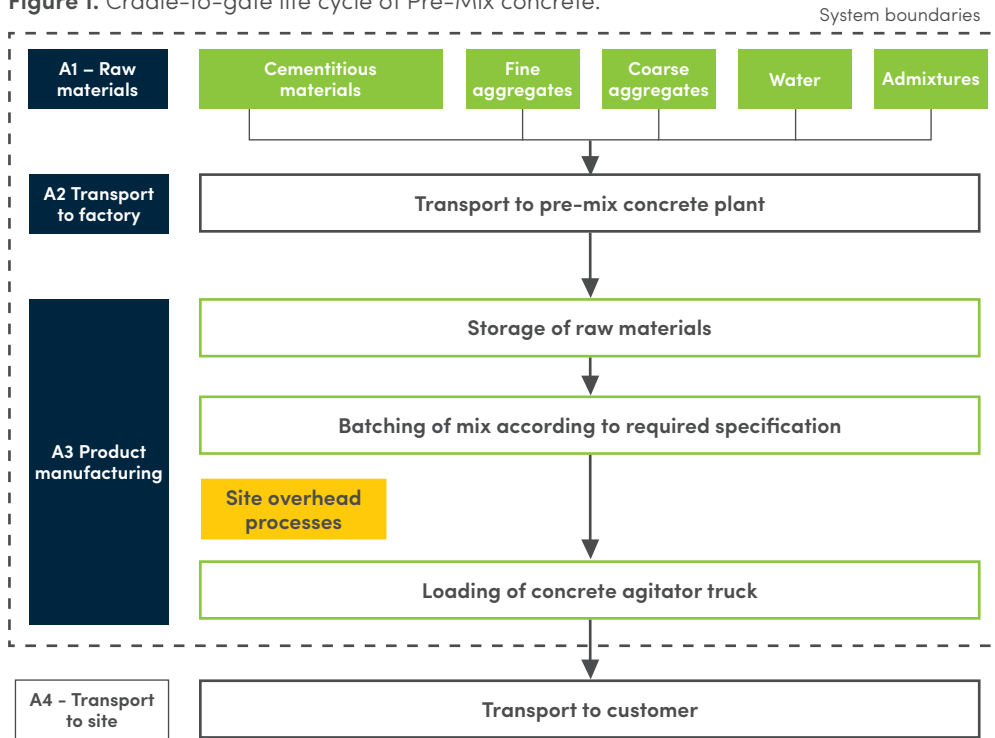


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Cradle-to-gate life cycle

This EPD covers the cradle-to-gate life cycle stages (A1-A3), as per diagram below. Downstream stages have not been included.

Figure 1. Cradle-to-gate life cycle of Pre-Mix concrete.



Raw Material Stage A1

All raw materials used in the production of Boral's normal class concrete, lower carbon concrete and special concrete products comply with the following standards as required by AS 3600 Concrete Structures (SA 2018) & AS 1379 Specification and Supply of Concrete (SA 2007/R2017):

- AS/NZS 3972: General purpose and blended cements (SA 2010)
- AS 3582.1 Supplementary cementitious materials
Part 1: Fly Ash (SA 2016)
- AS 3582.2 Supplementary cementitious materials
Part 2: Slag - Ground granulated blast furnace (SA 2016)
- AS 2758.1 Aggregates and rock for engineering purposes
Part 1: Concrete Aggregates (SA 2014)
- AS 1478.1 Chemical admixtures for concrete, mortar and grout (SA 2000)

Cradle-to-gate life cycle

Transportation Stage A2

Raw materials are typically transported to our sites via rigid trucks. Coarse aggregates, manufactured sands and natural sands are sourced from our network of quarries, as well as third-party quarries. General Purpose Cement (GP) and GGBFS are the two main cementitious materials used in the South Australia market. They are supplied by local suppliers in South Australia using local or imported ingredients and delivered to our sites in rigid trucks. ZEP® additive and silica fume are mostly imported. Admixtures are sourced from locally based suppliers and transported using rigid trucks.

Table 1: Scope of EPD

Product Stage			Construction Stage		Use Stage							End-of-life Stage				Benefits beyond system boundary
RAW MATERIAL SUPPLY	TRANSPORT	MANUFACTURING	TRANSPORT	CONSTRUCTION-INSTALLATION PROCESS	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	OPERATIONAL ENERGY USE	OPERATIONAL WATER USE	DECONSTRUCTION DEMOLITION	TRANSPORT	WASTE PROCESSING	DISPOSAL	REUSE, RECOVERY, RECYCLING POTENTIAL
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
			Scenario		Scenario							Scenario				
✓	✓	✓	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

✓ = module is included in this study MND = module is not declared*

* When a module is not accounted for, the stage is marked with "MND" (Module Not Declared). MND is used when we cannot define a typical scenario.



South Australia

Cradle-to-gate life cycle

Manufacturing Stage A3

The typical manufacturing process of Boral's normal class concrete, lower carbon concrete and special concrete products is by mixing concrete constituents comprising of cement and supplementary cementitious materials (SCM) (AS 3972/AS 3582.1,2), and fine/coarse aggregates (AS 2758.1), plus admixtures/additives (AS 1478.1) and water (AS 1379) directly in the truck referred to as the dry batch method, or in selected locations pre-mixing in a wet mix fashion, before delivery by agitator truck.

The entire process is covered under AS 1379 Specification and Supply of concrete and verified by third party under ISO9001. This manufacturing stage (A3) includes activities associated with sourcing and delivery of individual concrete constituents, up to the point of mixing at the batch plant, but not including delivery and placement of concrete at the project location. This is typically described as the Cradle (A1) to Gate (A3) life cycle.



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Life Cycle Assessment (LCA) Methodology

Background Data

Boral has supplied primary data from key quarries, cement production facilities and concrete production sites. Our concrete production site at Wingfield provided primary process data. Our mix designs and supply chains differ slightly between the regions, and therefore we included specific details for two sites (Wingfield and Littlehampton). The LCA shows that these sites are representative for key regions in SA.

Data for admixtures have been sourced from EPDs published in December 2015 by EFCA (European Federation of Concrete Admixtures Associations) (EFCA 2015a-e). Background data (e.g. for energy and transport processes, cement, blast furnace slag and fly ash) have predominantly been sourced from AusLCI and the AusLCI shadow database.

The quarry data, and concrete production data have been collected for calendar year 2018. The vast majority of the environmental profiles of our products are based on life cycle data that are less than five years old. Background data used is less than 10 years old.

Methodological choices have been applied in line with EN 15804 (CEN 2013); deviations have been recorded.

Representative plants in each region

Boral operates 9 concrete plants in South Australia. This EPD covers a sub-section of our concrete plants located in two key regions:

1. WINGFIELD for Adelaide Metro

2. LITTLEHAMPTON for Adelaide East & Hills

Our background LCA report shows that a single plant is representative for surrounding plants that have similar supply chains and mix designs.



 **Red pins** = plants that are being modelled in SA EPD

 **Green pins** = surrounding plants covered in SA EPD scope

Life Cycle Assessment (LCA) Methodology

Allocation

The key material production processes that require allocation are:

- **BFS:** blast furnace slag (BFS) is a by-product from steel-making. We have used the AusLCI data for BFS ("blast furnace slag allocation, at steel plant/AU U"), which contain impacts from pig iron production allocated to blast furnace slag.
- **Fly Ash:** fly ash is a by-product from coal-fired power plants. We have used the AusLCI data for fly ash, in which all environmental impacts of the power plant are allocated to the main product: electricity. Fly ash has only received the burdens of transport to our sites.
- **Silica fume:** Silica fume (micro-silica) is a by-product of silicon metal or ferrosilicon alloys production. Economic allocation was applied to attribute some of the impacts of ferrosilicon production to silica fume.
- **Pre-mix concrete:** Boral manufactures a range of pre-mix concrete products at its sites. At each manufacturing site, energy use for concrete production has been allocated to the products based on a volume basis (total m³ of pre-mix concrete products).
- **Cementitious binders:** Boral manufactures concrete using type GP cement inclusive of limestone mineral addition and slag cement and fly ash sourced from third-party suppliers. The cement production data is taken from the AusLCI data set.
- **Aggregates:** aggregates are produced through crushing of rock, which is graded in different sizes. The energy required for the crushing and screening does not differentiate between products. Therefore, aggregate production (including manufactured sand) has been allocated based on the mass of product.

The allocation assumptions were checked using sensitivity analyses, which showed that the allocation of fly ash can have an impact on the LCA results if impacts of electricity production are assigned to fly ash.

Cut-off Criteria

- The contribution of capital goods (production equipment and infrastructure) and personnel is outside the scope of the LCA, in line with the PCR (Envirodec 2020a).
- The amount of packaging used for admixtures is well below the materiality cut-off. Nonetheless, packaging materials and quantities are included in the admixture EPD data.

Key Assumptions

- Admixture data are based on generic EPDs that are valid for a range of different chemicals, including the admixtures used by Boral. No EPD has been published for Viscosity Modifying Admixtures (VMA); we have used an average of the five admixture EPDs published by EFCA as a proxy.
- Fly ash is considered a by-product of electricity generation that comes without prior environmental impacts. This allocation decision can have a significant effect on the environmental profile of products that use fly ash.
- Blast furnace slag receives some environmental impacts from pig iron production. This allocation decision has an effect on the environmental profile of products that use ground granulated blast furnace slag (GGBFS).
- Water consumption is not measured consistently across quarries. We have used AusLCI water consumption data per tonne of coarse and fine aggregates instead.

Product Composition

Content declaration

Table 2. SA product compositions

Constituent (% by weight)	Normal class GP blend	Normal class GP/FA	Normal class GP/GGBFS blend	Normal class GP/GGBFS FA blend	Envirocrete®
General Purpose cement	10-20%	7-15%	8-16%	7-13%	6-14%
Ground granulated blast furnace slag	-	-	2-4%	2-4%	3-8%
Fly ash	-	3-5%	-	2-3%	-
Silica fume	-	-	-	-	-
Coarse aggregate	40-41%	41-42%	40-42%	40-42%	40-42%
Manufactured sand	4-9%	4-9%	4-10%	4-10%	9-13%
Natural sand	28-32%	26-32%	28-32%	28-32%	23-29%
Admixtures	<0.2%	<0.2%	<0.2%	<0.2%	<0.2%
Water	7-8%	7-8%	7-8%	7-8%	7-8%

Table 2. Continued SA product compositions

Components (% m/m)	Envirocrete® Plus*	ENVISIA®*	DIT	Special
General Purpose cement	5-10%	4-8%	11-14%	3-18%
Ground granulated blast furnace slag	5-10%	6-13%	-	-
Fly ash	-	-	4-6%	0-11%
Silica fume	-	0-1%	-	0-1%
Coarse aggregate	40-42%	41-42%	42-46%	0-82%
Manufactured sand	7-11%	8-11%	0-5%	0-44%
Natural sand	23-29%	22-30%	25-33%	0-52%
Admixtures	<0.2%	<0.17%	<0.2%	<0.3%
Water	6-9%	6-9%	5-8%	5-10%

The products as supplied are non-hazardous. The products included in this EPD do not contain any substances of very high concern as defined by European REACH regulation in concentrations >0.1% (m/m). *May include Zep® technology

Declared Unit

The background LCA serves as the foundation for this EPD. An LCA analyses the environmental processes in the value chain of a product. It provides a comprehensive evaluation of all upstream (and sometimes downstream) material and energy inputs and outputs. The results are provided for a range of environmental impact categories, in line with EN 15804 (CEN 2013).

Pre-mix concrete is available in various strength grades and with characteristics that are specifically designed for each application. The declared unit that covers all of the products is: 1 cubic metre (m³) of pre-mix concrete (as ordered by client) with a given strength grade and identifying characteristics. This declared unit has been adapted from the sub-PCR (Envirodec 2020b).

All results are presented per declared unit and cover the A1-A3 life cycle stages (cradle-to-gate).

The product code for pre-mix concrete is UN CPC 375 (Articles of concrete, cement and plaster) and ANZSIC 20330 (Concrete – ready mixed – except dry mix).



Adelaide the City of Churches.

Environmental indicators

Table 3. Impact categories included in this assessment

Impact category	Acronym	Unit
Global Warming Potential	GWP	kg CO ₂ equivalents
Ozone Depletion Potential	ODP	kg CFC-11 equivalents
Acidification Potential of soil and water	AP	kg SO ₂ equivalents
Eutrophication Potential	EP	kg PO ₄ ³⁻ equivalents
Photochemical Ozone Creation Potential	POCP	kg C ₂ H ₄ equivalents
Abiotic Depletion Potential for Mineral Elements	ADPE	kg Sb equivalents
Abiotic Depletion Potential for Fossil Fuels	ADPF	MJ

Table 4: Parameters describing resource use, waste and output flows

Resource use	Acronym	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ _{NCV}
Use of renewable primary energy resources used as raw materials	PERM	MJ _{NCV}
Total use of renewable primary energy resources	PERT	MJ _{NCV}
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ _{NCV}
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ _{NCV}
Total use of non-renewable primary energy resources	PENRT	MJ _{NCV}
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ _{NCV}
Use of non-renewable secondary fuels	NRSF	MJ _{NCV}
Use of net fresh water	FW	m ³
Waste categories		
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Output flows		
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy	EE	MJ

Environmental profiles

LIMITATIONS

The results of this study and the EPD are valid for Boral products only. Products from other manufacturers will likely have different impacts due to differences in mix designs, supply chains and manufacturing processes. The main limitations of the LCA results are found in the parameter results, which are highly dependent on background data.

The environmental parameters are based on the life cycle inventory. There is some ambiguity around their presentation, and issues to note include:

- Hazardous waste disposal (HWD) is derived from background LCI data.
- Non-hazardous waste disposal (NHWD) is derived from background LCI data.
- Radioactive waste disposal (RWD) is derived from background LCI data. Radioactive waste is only coming through the EPD data for admixtures, unless the life cycle contains clinker manufactured overseas.

VARIATION (A1-A3) PER IMPACT CATEGORY

The results of the South Australian EPD clearly showed that the GHG emissions of the South Australian concrete products are not materially different between the manufacturing sites, with variations generally being less than $\pm 1\%$. The largest variation (4%) is found in stabilised sand 14:1, as this is the product with the smallest footprint. start2see has analysed the variation for the other mandatory indicators, and can confirm that the variation stays well within the $\pm 10\%$ range as required by the PCR (Envirodec 2020a) for most indicators.

We believe it is reasonable to use a single plant pre region as representative for the wider region.

A nighttime photograph of the Adelaide city skyline. In the foreground, a dark river reflects the city lights. A paved walkway runs along the riverbank, with a single person walking. Behind the walkway is a grassy area and a modern building with a large, curved, illuminated glass facade. To the left, a tall, multi-story building with a grid-like facade is brightly lit. Other city buildings are visible in the background under a clear night sky.

Adelaide Metro Region

**Environmental profiles
and parameters.**

Product table list - Adelaide Metro

In each region, we start with presenting a summary of the carbon footprint (GWP summary) of our concrete mixes.

Lower Carbon Concrete Products

Table No. 1 and 2

ENVISIA® 20 MPa
ENVISIA® 25 MPa
ENVISIA® 32 MPa
ENVISIA® 40 MPa
ENVISIA® 50 MPa

Table No. 3 and 4

ENVIROCRETE® PLUS 20 MPa
ENVIROCRETE® PLUS 25 MPa
ENVIROCRETE® PLUS 32 MPa
ENVIROCRETE® PLUS 40 MPa
ENVIROCRETE® PLUS 50 MPa

Table No. 5 and 6

ENVIROCRETE® 40% 20 MPa
ENVIROCRETE® 40% 25 MPa
ENVIROCRETE® 40% 32 MPa
ENVIROCRETE® 40% 40 MPa
ENVIROCRETE® 40 % 50 MPa

Table No. 7 and 8

ENVIROCRETE® 30% 20 MPa
ENVIROCRETE® 30% 25 MPa
ENVIROCRETE® 30% 32 MPa
ENVIROCRETE® 30% 40 MPa
ENVIROCRETE® 30% 50 MPa

Normal Class Concrete Products

Table No. 9 and 10

NORMAL CLASS GP BLEND 20 MPa
NORMAL CLASS GP BLEND 25 MPa
NORMAL CLASS GP BLEND 32 MPa
NORMAL CLASS GP BLEND 40 MPa
NORMAL CLASS GP BLEND 50 MPa

Table No. 11 and 12

NORMAL CLASS GP/FA BLEND 20 MPa
NORMAL CLASS GP/FA BLEND 25 MPa
NORMAL CLASS GP/FA BLEND 32 MPa
NORMAL CLASS GP/FA BLEND 40 MPa
NORMAL CLASS GP/FA BLEND 50 MPa

Table No. 13 and 14

NORMAL CLASS GP/GGBFS BLEND 20 MPa
NORMAL CLASS GP/GGBFS BLEND 25 MPa
NORMAL CLASS GP/GGBFS BLEND 32 MPa
NORMAL CLASS GP/GGBFS BLEND 40 MPa
NORMAL CLASS GP/GGBFS BLEND 50 MPa

Table No. 15 and 16

NORMAL CLASS GP/GGBFS/FA BLEND 20 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 25 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 32 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 40 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 50 MPa

Concrete for Special Applications

Table No. 17 and 18

DIT 32 MPa SLIPFORM
DIT 40 MPa PUMP B1 EXP
DIT 50 MPa PUMP C1 EXP
WATER AUTHORITY 40 MPa B2 EXP
WATER AUTHORITY 50 MPa C1 EXP

Table No. 19 and 20

HIGH SLUMP 32 MPa
HIGH SLUMP 40 MPa
HIGH SLUMP 50 MPa
HIGH WORKABILITY 65 MPa
HIGH WORKABILITY 80 MPa

Table No. 21 and 22

TREMIE 40 MPa
POST TENSIONED 40 MPa 25 MPa@3 DAYS
SHOTCRETE 32 MPa
SHOTCRETE 40 MPa

Table No. 23 and 24

KERB HAND 25 MPa
KERB HAND 32 MPa
KERB MACHINE 280KG
KERB MACHINE 320KG
PAVING 25 MPa
PAVING 32 MPa

Table No. 25 and 26

NO FINES 6:1
FLOWABLE FILL 5 MPa PIPEFILL
STABILISED SAND 3%
STABILISED SAND 7%
STABILISED SAND 10%

Adelaide Metro Region

GWP SUMMARY (kg CO₂ eq/m³)

ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa	
154	175	202	240	294	
ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa	
177	203	236	281	347	
ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa	
194	220	255	309	382	
ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 25 MPa	ENVIROCRETE 30% 32 MPa	ENVIROCRETE 30% 40 MPa	ENVIROCRETE 30% 50 MPa	
211	246	281	343	425	
Normal GP blend 20 MPa	Normal GP blend 25 MPa	Normal GP blend 32 MPa	Normal GP blend 40 MPa	Normal GP blend 50 MPa	
272	315	362	437	550	
Normal GP/FA blend 20 MPa	Normal GP/FA blend 25 MPa	Normal GP/FA blend 32 MPa	Normal GP/FA blend 40 MPa	Normal GP/FA blend 50 MPa	
215	249	287	348	437	
Normal GP/ GGBFS blend 20 MPa	Normal GP/ GGBFS blend 25 MPa	Normal GP/ GGBFS blend 32 MPa	Normal GP/ GGBFS blend 40 MPa	Normal GP/ GGBFS blend 50 MPa	
233	267	307	373	464	
Normal GP/ GGBFS/FA blend 20 MPa	Normal GP/ GGBFS/FA blend 25 MPa	Normal GP/ GGBFS/FA blend 32 MPa	Normal GP/ GGBFS/FA blend 40 MPa	Normal GP/ GGBFS/FA blend 50 MPa	
200	230	265	317	398	
DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP	
308	333	410	333	410	
HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa	
282	333	412	481	531	
TREMIE 40 MPa	POST TENSIONED 40 MPa 25MPa@3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa		
356	419	404	469		
Kerb Hand 25 MPa	Kerb Hand 32 MPa	Kerb Machine 280kg	Kerb Machine 320kg	Paving 25MPa	Paving 32MPa
252	296	261	293	252	296
No Fines 6:1	FLOWABLE FILL 5 MPa PIPEFILL	Stabilised sand 3%	Stabilised sand 7%	Stabilised sand 10%	
281	190	84	153	156	

Adelaide Metro Region

Table 1. Environmental profiles (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Indicator	Unit	ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa
GWP	kg CO ₂ eq	154	175	202	240	294
ODP	kg CFC11 eq	5.10E-06	5.55E-06	6.08E-06	6.83E-06	7.85E-06
AP	kg SO ₂ eq	0.836	0.956	1.10	1.31	1.60
EP	kg PO ₄ ³⁻ eq	0.104	0.117	0.133	0.156	0.189
POCP	kg C ₂ H ₄ eq	0.0547	0.0605	0.0675	0.0772	0.0908
ADPE	kg Sb eq	2.96E-06	3.45E-06	4.06E-06	4.65E-06	5.55E-06
ADPF	MJ _{NCV}	1400	1580	1800	2070	2490

Table 2. Environmental parameters (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Parameter	Unit	ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa
PERE	MJ _{NCV}	3.11E+01	3.40E+01	3.76E+01	4.10E+01	4.69E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	2.89E-02	3.37E-02
PERT	MJ _{NCV}	3.11E+01	3.40E+01	3.76E+01	4.11E+01	4.69E+01
PENRE	MJ _{NCV}	1.44E+03	1.62E+03	1.85E+03	2.13E+03	2.55E+03
PENRM	MJ _{NCV}	9.56E+00	1.14E+01	1.37E+01	9.79E+00	1.21E+01
PENRT	MJ _{NCV}	1.45E+03	1.64E+03	1.86E+03	2.14E+03	2.57E+03
SM	kg	1.51E+02	1.77E+02	2.08E+02	2.50E+02	3.12E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	2.85E+00	2.90E+00	2.94E+00	2.99E+00	3.01E+00
HWD	kg	1.03E-05	1.22E-05	1.47E-05	1.45E-05	1.77E-05
NHWD	kg	1.44E-01	1.67E-01	1.96E-01	4.97E-01	5.86E-01
RWD	kg	1.79E-03	2.12E-03	2.55E-03	2.07E-03	2.53E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 3. Environmental profiles (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Indicator	Unit	ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa
GWP	kg CO ₂ eq	177	203	236	281	347
ODP	kg CFC11 eq	5.19E-06	5.64E-06	6.25E-06	7.05E-06	8.17E-06
AP	kg SO ₂ eq	0.879	1.01	1.18	1.41	1.73
EP	kg PO ₄ ³⁻ eq	0.112	0.127	0.147	0.173	0.211
POCP	kg C ₂ H ₄ eq	0.0565	0.0626	0.0705	0.0812	0.0964
ADPE	kg Sb eq	3.00E-06	3.52E-06	4.00E-06	4.71E-06	6.28E-06
ADPF	MJ _{NCV}	1490	1680	1930	2270	2770

Table 4. Environmental parameters (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Parameter	Unit	ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa
PERE	MJ _{NCV}	3.18E+01	3.48E+01	3.81E+01	4.32E+01	5.11E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.18E+01	3.48E+01	3.81E+01	4.32E+01	5.11E+01
PENRE	MJ _{NCV}	1.53E+03	1.73E+03	1.98E+03	2.33E+03	2.83E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.54E+03	1.74E+03	1.99E+03	2.34E+03	2.85E+03
SM	kg	1.20E+02	1.40E+02	1.66E+02	2.03E+02	2.55E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.03E+00	3.07E+00	3.13E+00	3.20E+00	3.29E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.38E-01	1.62E-01	1.85E-01	2.21E-01	2.86E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 5. Environmental profiles (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Indicator	Unit	ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa
GWP	kg CO ₂ eq	194	220	255	309	382
ODP	kg CFC11 eq	5.17E-06	5.59E-06	6.14E-06	7.00E-06	8.11E-06
AP	kg SO ₂ eq	0.897	1.02	1.18	1.43	1.77
EP	kg PO ₄ ³⁻ eq	0.118	0.133	0.152	0.182	0.223
POCP	kg C ₂ H ₄ eq	0.0569	0.0627	0.0701	0.0817	0.0971
ADPE	kg Sb eq	2.97E-06	3.48E-06	3.94E-06	4.65E-06	6.22E-06
ADPF	MJ _{NCV}	1530	1710	1950	2330	2840

Table 6. Environmental parameters (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Parameter	Unit	ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa
PERE	MJ _{NCV}	3.05E+01	3.33E+01	3.60E+01	4.10E+01	4.84E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.05E+01	3.33E+01	3.60E+01	4.10E+01	4.84E+01
PENRE	MJ _{NCV}	1.57E+03	1.76E+03	2.00E+03	2.38E+03	2.90E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.58E+03	1.77E+03	2.01E+03	2.40E+03	2.92E+03
SM	kg	9.36E+01	1.14E+02	1.30E+02	1.61E+02	2.03E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.04E+00	3.08E+00	3.13E+00	3.23E+00	3.32E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.22E-01	1.43E-01	1.61E-01	1.94E-01	2.51E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 7. Environmental profiles (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Indicator	Unit	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 25 MPa	ENVIROCRETE 30% 32 MPa	ENVIROCRETE 30% 40 MPa	ENVIROCRETE 30% 50 MPa
GWP	kg CO ₂ eq	211	246	281	343	425
ODP	kg CFC11 eq	5.23E-06	5.70E-06	6.25E-06	7.13E-06	8.27E-06
AP	kg SO ₂ eq	0.937	1.08	1.24	1.51	1.87
EP	kg PO ₄ ³⁻ eq	0.125	0.143	0.163	0.196	0.240
POCP	kg C ₂ H ₄ eq	0.0583	0.0649	0.0723	0.0845	0.101
ADPE	kg Sb eq	3.01E-06	3.53E-06	4.00E-06	4.72E-06	6.31E-06
ADPF	MJ _{NCV}	1600	1820	2060	2470	3020

Table 8. Environmental parameters (A1–A3), lower carbon concrete, Adelaide Metro (SA), per m³

Parameter	Unit	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 25 MPa	ENVIROCRETE 30% 32 MPa	ENVIROCRETE 30% 40 MPa	ENVIROCRETE 30% 50 MPa
PERE	MJ _{NCV}	3.10E+01	3.40E+01	3.68E+01	4.21E+01	4.97E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.10E+01	3.40E+01	3.68E+01	4.21E+01	4.97E+01
PENRE	MJ _{NCV}	1.64E+03	1.87E+03	2.11E+03	2.53E+03	3.08E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.65E+03	1.88E+03	2.12E+03	2.54E+03	3.10E+03
SM	kg	7.28E+01	8.32E+01	9.88E+01	1.20E+02	1.51E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.10E+00	3.15E+00	3.21E+00	3.33E+00	3.45E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.20E-01	1.40E-01	1.59E-01	1.90E-01	2.47E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 9. Environmental profiles (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Indicator	Unit	Normal Class GP blend 20 MPa	Normal Class GP blend 25 MPa	Normal Class GP blend 32 MPa	Normal Class GP blend 40 MPa	Normal Class GP blend 50 MPa
GWP	kg CO ₂ eq	272	315	362	437	550
ODP	kg CFC11 eq	5.49E-06	5.98E-06	6.54E-06	7.46E-06	8.80E-06
AP	kg SO ₂ eq	1.08	1.24	1.43	1.72	2.16
EP	kg PO ₄ ³⁻ eq	0.149	0.170	0.195	0.233	0.290
POCP	kg C ₂ H ₄ eq	0.0636	0.0708	0.0789	0.0920	0.111
ADPE	kg Sb eq	3.10E-06	3.65E-06	4.15E-06	4.90E-06	6.53E-06
ADPF	MJ _{NCV}	1850	2110	2400	2850	3540

Table 10. Environmental parameters (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Parameter	Unit	Normal Class GP blend 20 MPa	Normal Class GP blend 25 MPa	Normal Class GP blend 32 MPa	Normal Class GP blend 40 MPa	Normal Class GP blend 50 MPa
PERE	MJ _{NCV}	3.20E+01	3.53E+01	3.89E+01	4.42E+01	5.24E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.20E+01	3.53E+01	3.89E+01	4.42E+01	5.24E+01
PENRE	MJ _{NCV}	1.89E+03	2.15E+03	2.45E+03	2.91E+03	3.60E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.90E+03	2.17E+03	2.46E+03	2.92E+03	3.63E+03
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.22E+00	3.31E+00	3.40E+00	3.57E+00	3.72E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.14E-01	1.33E-01	1.50E-01	1.78E-01	2.33E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 11. Environmental profiles (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Indicator	Unit	Normal Class GP/FA blend 20 MPa	Normal Class GP/FA blend 25 MPa	Normal Class GP/FA blend 32 MPa	Normal Class GP/FA blend 40 MPa	Normal Class GP/FA blend 50 MPa
GWP	kg CO ₂ eq	215	249	287	348	437
ODP	kg CFC11 eq	5.55E-06	6.14E-06	6.62E-06	7.55E-06	8.93E-06
AP	kg SO ₂ eq	0.888	1.03	1.18	1.42	1.78
EP	kg PO ₄ ³⁻ eq	0.130	0.149	0.169	0.202	0.251
POCP	kg C ₂ H ₄ eq	0.0547	0.0607	0.0670	0.0778	0.0937
ADPE	kg Sb eq	2.95E-06	3.46E-06	3.94E-06	4.65E-06	6.21E-06
ADPF	MJ _{NCV}	1560	1780	2010	2400	2970

Table 12. Environmental parameters (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Parameter	Unit	Normal Class GP/FA blend 20 MPa	Normal Class GP/FA blend 25 MPa	Normal Class GP/FA blend 32 MPa	Normal Class GP/FA blend 40 MPa	Normal Class GP/FA blend 50 MPa
PERE	MJ _{NCV}	2.80E+01	3.06E+01	3.35E+01	3.79E+01	4.44E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.80E+01	3.06E+01	3.35E+01	3.79E+01	4.44E+01
PENRE	MJ _{NCV}	1.61E+03	1.83E+03	2.06E+03	2.45E+03	3.03E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.62E+03	1.84E+03	2.08E+03	2.47E+03	3.05E+03
SM	kg	6.24E+01	7.80E+01	8.32E+01	9.88E+01	1.25E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	2.99E+00	3.06E+00	3.13E+00	3.25E+00	3.32E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.01E-01	1.18E-01	1.33E-01	1.58E-01	2.08E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 13. Environmental profiles (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Indicator	Unit	Normal Class GP/GGBFS blend 20 MPa	Normal Class GP/GGBFS blend 25 MPa	Normal Class GP/GGBFS blend 32 MPa	Normal Class GP/GGBFS blend 40 MPa	Normal Class GP/GGBFS blend 50 MPa
GWP	kg CO ₂ eq	233	267	307	373	464
ODP	kg CFC11 eq	5.36E-06	5.82E-06	6.38E-06	7.23E-06	8.50E-06
AP	kg SO ₂ eq	0.988	1.13	1.30	1.57	1.96
EP	kg PO ₄ ³⁻ eq	0.134	0.152	0.173	0.207	0.256
POCP	kg C ₂ H ₄ eq	0.0605	0.0671	0.0747	0.0868	0.105
ADPE	kg Sb eq	3.03E-06	3.56E-06	4.04E-06	4.77E-06	6.35E-06
ADPF	MJ _{NCV}	1690	1920	2170	2590	3190

Table 14. Environmental parameters (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Parameter	Unit	Normal Class GP/GGBFS blend 20 MPa	Normal Class GP/GGBFS blend 25 MPa	Normal Class GP/GGBFS blend 32 MPa	Normal Class GP/GGBFS blend 40 MPa	Normal Class GP/GGBFS blend 50 MPa
PERE	MJ _{NCV}	3.11E+01	3.41E+01	3.72E+01	4.23E+01	4.98E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.11E+01	3.41E+01	3.72E+01	4.23E+01	4.98E+01
PENRE	MJ _{NCV}	1.73E+03	1.96E+03	2.22E+03	2.64E+03	3.25E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.74E+03	1.97E+03	2.23E+03	2.66E+03	3.27E+03
SM	kg	4.68E+01	5.72E+01	6.76E+01	7.80E+01	1.04E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.12E+00	3.19E+00	3.27E+00	3.39E+00	3.48E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.18E-01	1.38E-01	1.56E-01	1.85E-01	2.43E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 15. Environmental profiles (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Indicator	Unit	NORMAL GP/ GGBFS/FA blend 20 MPa	NORMAL GP/ GGBFS/FA blend 25 MPa	NORMAL GP/ GGBFS/FA blend 32 MPa	NORMAL GP/ GGBFS/FA blend 40 MPa	NORMAL GP/ GGBFS/FA blend 50 MPa
GWP	kg CO ₂ eq	200	230	265	317	398
ODP	kg CFC11 eq	5.40E-06	5.86E-06	6.43E-06	7.27E-06	8.58E-06
AP	kg SO ₂ eq	0.878	1.01	1.16	1.39	1.74
EP	kg PO ₄ ³⁻ eq	0.123	0.139	0.159	0.188	0.233
POCP	kg C ₂ H ₄ eq	0.0553	0.0611	0.0681	0.0783	0.0942
ADPE	kg Sb eq	2.94E-06	3.45E-06	3.92E-06	4.61E-06	6.17E-06
ADPF	MJ _{NCV}	1520	1720	1960	2310	2850

Table 16. Environmental parameters (A1–A3), normal class concrete, Adelaide Metro (SA), per m³

Parameter	Unit	NORMAL GP/ GGBFS/FA blend 20 MPa	NORMAL GP/ GGBFS/FA blend 25 MPa	NORMAL GP/ GGBFS/FA blend 32 MPa	NORMAL GP/ GGBFS/FA blend 40 MPa	NORMAL GP/ GGBFS/FA blend 50 MPa
PERE	MJ _{NCV}	2.88E+01	3.15E+01	3.42E+01	3.85E+01	4.52E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.88E+01	3.15E+01	3.42E+01	3.85E+01	4.52E+01
PENRE	MJ _{NCV}	1.57E+03	1.77E+03	2.01E+03	2.36E+03	2.92E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.58E+03	1.78E+03	2.02E+03	2.38E+03	2.94E+03
SM	kg	8.32E+01	9.88E+01	1.14E+02	1.40E+02	1.77E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.00E+00	3.05E+00	3.12E+00	3.20E+00	3.26E+00
HWD	kg	1.04E-05	1.24E-05	1.41E-05	1.67E-05	2.31E-05
NHWD	kg	1.11E-01	1.29E-01	1.46E-01	1.74E-01	2.28E-01
RWD	kg	1.79E-03	2.15E-03	2.45E-03	2.91E-03	4.03E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 17. Environmental profiles (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Indicator	Unit	DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP
GWP	kg CO ₂ eq	308	333	410	333	410
ODP	kg CFC11 eq	6.96E-06	7.81E-06	8.93E-06	7.81E-06	8.93E-06
AP	kg SO ₂ eq	1.27	1.39	1.69	1.39	1.69
EP	kg PO ₄ ³⁻ eq	0.180	0.200	0.241	0.200	0.241
POCP	kg C ₂ H ₄ eq	0.0714	0.0762	0.0893	0.0762	0.0893
ADPE	kg Sb eq	7.59E-06	4.62E-06	5.48E-06	4.62E-06	5.48E-06
ADPF	MJ _{NCV}	2140	2320	2790	2320	2790

Table 18. Environmental parameters (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Parameter	Unit	DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP
PERE	MJ _{NCV}	3.38E+01	3.56E+01	4.09E+01	3.56E+01	4.09E+01
PERM	MJ _{NCV}	0.00E+00	2.89E-02	3.37E-02	2.89E-02	3.37E-02
PERT	MJ _{NCV}	3.38E+01	3.56E+01	4.10E+01	3.56E+01	4.10E+01
PENRE	MJ _{NCV}	2.20E+03	2.38E+03	2.86E+03	2.38E+03	2.86E+03
PENRM	MJ _{NCV}	9.29E+00	9.79E+00	1.18E+01	9.79E+00	1.18E+01
PENRT	MJ _{NCV}	2.21E+03	2.39E+03	2.87E+03	2.39E+03	2.87E+03
SM	kg	8.84E+01	1.30E+02	1.51E+02	1.30E+02	1.51E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	2.89E+00	3.11E+00	3.22E+00	3.13E+00	3.22E+00
HWD	kg	1.52E-05	1.45E-05	1.74E-05	1.45E-05	1.74E-05
NHWD	kg	1.36E+00	4.26E-01	5.02E-01	4.26E-01	5.02E-01
RWD	kg	2.87E-03	2.07E-03	2.48E-03	2.07E-03	2.48E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 19. Environmental profiles (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Indicator	Unit	HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa
GWP	kg CO ₂ eq	282	333	412	481	531
ODP	kg CFC11 eq	6.78E-06	7.63E-06	9.02E-06	9.66E-06	1.12E-05
AP	kg SO ₂ eq	1.17	1.38	1.70	1.97	2.16
EP	kg PO ₄ ³⁻ eq	0.169	0.198	0.243	0.277	0.301
POCP	kg C ₂ H ₄ eq	0.0666	0.0756	0.0901	0.102	0.122
ADPE	kg Sb eq	4.81E-06	5.75E-06	7.98E-06	1.12E-05	1.18E-05
ADPF	MJ _{NCV}	1990	2310	2830	3250	3680

Table 20. Environmental parameters (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Parameter	Unit	HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa
PERE	MJ _{NCV}	3.33E+01	3.71E+01	4.34E+01	5.07E+01	8.25E+01
PERM	MJ _{NCV}	3.85E-02	4.71E-02	6.54E-02	1.09E-01	1.12E-01
PERT	MJ _{NCV}	3.34E+01	3.71E+01	4.35E+01	5.08E+01	8.26E+01
PENRE	MJ _{NCV}	2.04E+03	2.37E+03	2.90E+03	3.33E+03	3.75E+03
PENRM	MJ _{NCV}	9.08E+00	1.09E+01	1.62E+01	2.07E+01	2.16E+01
PENRT	MJ _{NCV}	2.05E+03	2.38E+03	2.92E+03	3.35E+03	3.77E+03
SM	kg	9.88E+01	1.20E+02	1.56E+02	1.46E+02	1.25E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.13E+00	3.16E+00	3.23E+00	3.36E+00	1.65E+01
HWD	kg	1.51E-05	1.83E-05	2.66E-05	3.74E-05	3.88E-05
NHWD	kg	5.13E-01	6.23E-01	8.58E-01	1.35E+00	1.39E+00
RWD	kg	2.02E-03	2.43E-03	3.57E-03	4.77E-03	4.97E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 21. Environmental profiles (A1-A3), concrete for special applications, Adelaide Metro (SA), per m³

Indicator	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa@ 3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
GWP	kg CO ₂ eq	356	419	404	469
ODP	kg CFC11 eq	7.57E-06	8.07E-06	7.55E-06	8.47E-06
AP	kg SO ₂ eq	1.48	1.68	1.63	1.89
EP	kg PO ₄ ³⁻ eq	0.210	0.234	0.227	0.262
POCP	kg C ₂ H ₄ eq	0.0770	0.0897	0.0826	0.0940
ADPE	kg Sb eq	2.26E-05	5.38E-06	4.26E-06	4.88E-06
ADPF	MJ _{NCV}	2490	2810	2670	3080

Table 22. Environmental parameters (A1-A3), concrete for special applications, Adelaide Metro (SA), per m³

Parameter	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa@ 3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
PERE	MJ _{NCV}	4.82E+01	4.25E+01	4.17E+01	4.63E+01
PERM	MJ _{NCV}	2.07E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	4.84E+01	4.25E+01	4.17E+01	4.63E+01
PENRE	MJ _{NCV}	2.55E+03	2.87E+03	2.73E+03	3.14E+03
PENRM	MJ _{NCV}	1.54E+01	1.81E+01	1.26E+01	1.46E+01
PENRT	MJ _{NCV}	2.57E+03	2.88E+03	2.74E+03	3.16E+03
SM	kg	1.40E+02	7.28E+01	9.36E+01	1.04E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.26E+00	3.32E+00	3.36E+00	3.47E+00
HWD	kg	5.33E-05	1.94E-05	1.43E-05	1.65E-05
NHWD	kg	4.66E+00	1.87E-01	1.60E-01	1.84E-01
RWD	kg	6.42E-03	3.38E-03	2.47E-03	2.85E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 23. Environmental profiles (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Indicator	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280KG	KERB MACHINE 320kg	PAVING 25 MPa	PAVING 32 MPa
GWP	kg CO ₂ eq	252	296	261	293	252	296
ODP	kg CFC11 eq	6.24E-06	6.87E-06	6.52E-06	6.97E-06	6.24E-06	6.87E-06
AP	kg SO ₂ eq	1.04	1.22	1.08	1.21	1.04	1.22
EP	kg PO ₄ ³⁻ eq	0.150	0.174	0.155	0.173	0.150	0.174
POCP	kg C ₂ H ₄ eq	0.0620	0.0694	0.0653	0.0706	0.0620	0.0694
ADPE	kg Sb eq	2.08E-06	2.36E-06	7.48E-06	8.45E-06	2.08E-06	2.36E-06
ADPF	MJ _{NCV}	1780	2050	1860	2060	1780	2050

Table 24. Environmental parameters (A1–A3), concrete for special applications, Adelaide Metro (SA), per m³

Parameter	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280KG	KERB MACHINE 320kg	PAVING 25 MPa	PAVING 32 MPa
PERE	MJ _{NCV}	2.79E+01	3.08E+01	2.95E+01	3.19E+01	2.80E+01	3.09E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.79E+01	3.08E+01	2.95E+01	3.19E+01	2.80E+01	3.09E+01
PENRE	MJ _{NCV}	1.83E+03	2.10E+03	1.92E+03	2.12E+03	1.83E+03	2.10E+03
PENRM	MJ _{NCV}	5.25E+00	6.23E+00	5.35E+00	6.12E+00	5.25E+00	6.23E+00
PENRT	MJ _{NCV}	1.84E+03	2.11E+03	1.92E+03	2.12E+03	1.84E+03	2.11E+03
SM	kg	7.28E+01	8.32E+01	7.28E+01	8.32E+01	7.28E+01	8.32E+01
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	2.95E+00	3.03E+00	3.05E+00	3.06E+00	2.99E+00	3.08E+00
HWD	kg	6.02E-06	6.68E-06	1.12E-05	1.23E-05	6.02E-06	6.68E-06
NHWD	kg	8.80E-02	9.89E-02	1.61E+00	1.84E+00	8.81E-02	9.91E-02
RWD	kg	1.04E-03	1.16E-03	2.24E-03	2.50E-03	1.04E-03	1.16E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide Metro Region

Table 25. Environmental profiles (A1-A3), concrete for special applications, Adelaide Metro (SA), per m³

Indicator	Unit	NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%
GWP	kg CO ₂ eq	281	190	84	153	156
ODP	kg CFC11 eq	4.63E-06	7.79E-06	3.44E-06	4.20E-06	4.83E-06
AP	kg SO ₂ eq	1.10	0.886	0.352	0.621	0.657
EP	kg PO ₄ ³⁻ eq	0.148	0.147	0.0556	0.0902	0.0993
POCP	kg C ₂ H ₄ eq	0.0577	0.0557	0.0325	0.0438	0.0448
ADPE	kg Sb eq	2.23E-06	8.26E-06	8.96E-07	1.36E-06	1.56E-06
ADPF	MJ _{NCV}	1810	1620	730	1140	1200

Table 26. Environmental parameters (A1-A3), concrete for special applications, Adelaide Metro (SA), per m³

Parameter	Unit	NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%
PERE	MJ _{NCV}	3.10E+01	2.92E+01	2.04E+01	2.52E+01	2.53E+01
PERM	MJ _{NCV}	0.00E+00	8.66E-02	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	3.10E+01	2.93E+01	2.04E+01	2.52E+01	2.53E+01
PENRE	MJ _{NCV}	1.84E+03	1.68E+03	7.61E+02	1.18E+03	1.24E+03
PENRM	MJ _{NCV}	5.74E+00	1.47E+01	9.84E-01	2.24E+00	3.17E+00
PENRT	MJ _{NCV}	1.85E+03	1.70E+03	7.62E+02	1.18E+03	1.24E+03
SM	kg	0.00E+00	2.50E+02	0.00E+00	0.00E+00	5.20E+01
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	2.09E+00	3.19E+00	3.43E+00	3.50E+00	3.48E+00
HWD	kg	6.15E-06	2.94E-05	1.83E-06	3.18E-06	4.18E-06
NHWD	kg	9.02E-02	1.04E+00	3.52E-02	5.59E-02	6.07E-02
RWD	kg	1.07E-03	3.70E-03	3.00E-04	5.34E-04	7.08E-04
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



Adelaide East & Hills Region

**Environmental profiles
and parameters.**

Product table list - Adelaide East & Hills

In each region, we start with presenting a summary of the carbon footprint (GWP summary) of our concrete mixes.

Lower Carbon Concrete Products

Table No. 1 and 2

ENVISIA® 20 MPa
ENVISIA® 25 MPa
ENVISIA® 32 MPa
ENVISIA® 40 MPa
ENVISIA® 50 MPa

Table No. 3 and 4

ENVIROCRETE® PLUS 20 MPa
ENVIROCRETE® PLUS 25 MPa
ENVIROCRETE® PLUS 32 MPa
ENVIROCRETE® PLUS 40 MPa
ENVIROCRETE® PLUS 50 MPa

Table No. 5 and 6

ENVIROCRETE® 40% 20 MPa
ENVIROCRETE® 40% 25 MPa
ENVIROCRETE® 40% 32 MPa
ENVIROCRETE® 40% 40 MPa
ENVIROCRETE® 40 % 50 MPa

Table No. 7 and 8

ENVIROCRETE® 30% 20 MPa
ENVIROCRETE® 30% 25 MPa
ENVIROCRETE® 30% 32 MPa
ENVIROCRETE® 30% 40 MPa
ENVIROCRETE® 30% 50 MPa

Normal Class Concrete Products

Table No. 9 and 10

NORMAL CLASS GP BLEND 20 MPa
NORMAL CLASS GP BLEND 25 MPa
NORMAL CLASS GP BLEND 32 MPa
NORMAL CLASS GP BLEND 40 MPa
NORMAL CLASS GP BLEND 50 MPa

Table No. 11 and 12

NORMAL CLASS GP/FA BLEND 20 MPa
NORMAL CLASS GP/FA BLEND 25 MPa
NORMAL CLASS GP/FA BLEND 32 MPa
NORMAL CLASS GP/FA BLEND 40 MPa
NORMAL CLASS GP/FA BLEND 50 MPa

Table No. 13 and 14

NORMAL CLASS GP/GGBFS BLEND 20 MPa
NORMAL CLASS GP/GGBFS BLEND 25 MPa
NORMAL CLASS GP/GGBFS BLEND 32 MPa
NORMAL CLASS GP/GGBFS BLEND 40 MPa
NORMAL CLASS GP/GGBFS BLEND 50 MPa

Table No. 15 and 16

NORMAL CLASS GP/GGBFS/FA BLEND 20 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 25 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 32 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 40 MPa
NORMAL CLASS GP/GGBFS/FA BLEND 50 MPa

Concrete for Special Applications

Table No. 17 and 18

DIT 32 MPa SLIPFORM
DIT 40 MPa PUMP B1 EXP
DIT 50 MPa PUMP C1 EXP
WATER AUTHORITY 40 MPa B2 EXP
WATER AUTHORITY 50 MPa C1 EXP

Table No. 19 and 20

HIGH SLUMP 32 MPa
HIGH SLUMP 40 MPa
HIGH SLUMP 50 MPa
HIGH WORKABILITY 65 MPa
HIGH WORKABILITY 80 MPa

Table No. 21 and 22

TREMIE 40 MPa 10MM CFA
POST TENSIONED 40 MPa 25 MPa@3 DAYS
SHOTCRETE 32 MPa
SHOTCRETE 40 MPa

Table No. 23 and 24

KERB HAND 25 MPa
KERB HAND 32 MPa
KERB MACHINE 280KG
KERB MACHINE 320KG
PAVING 25MPa
PAVING 32MPa

Table No. 25 and 26

6:1 NO FINES
FLOWABLE FILL 5 MPa PIPEFILL
STABILISED SAND 3%
STABILISED SAND 7%
STABILISED SAND 10%

Adelaide East & Hills Region

GWP SUMMARY (kg CO₂ eq/m³)

ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa	
161	176	202	238	292	
ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa	
185	198	229	273	337	
ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa	
203	227	258	312	380	
ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 25 MPa	ENVIROCRETE 30% 32 MPa	ENVIROCRETE 30% 40 MPa	ENVIROCRETE 30% 50 MPa	
225	268	288	346	423	
Normal GP blend 20 MPa	Normal GP blend 25 MPa	Normal GP blend 32 MPa	Normal GP blend 40 MPa	Normal GP blend 50 MPa	
291	323	371	447	550	
Normal GP/FA blend 20 MPa	Normal GP/FA blend 25 MPa	Normal GP/FA blend 32 MPa	Normal GP/FA blend 40 MPa	Normal GP/FA blend 50 MPa	
234	257	296	353	437	
Normal GP/ GGBFS blend 20 MPa	Normal GP/ GGBFS blend 25 MPa	Normal GP/ GGBFS blend 32 MPa	Normal GP/ GGBFS blend 40 MPa	Normal GP/ GGBFS blend 50 MPa	
247	275	315	377	467	
Normal GP/ GGBFS/FA blend 20 MPa	Normal GP/ GGBFS/FA blend 25 MPa	Normal GP/ GGBFS/FA blend 32 MPa	Normal GP/ GGBFS/FA blend 40 MPa	Normal GP/ GGBFS/FA blend 50 MPa	
214	237	268	321	407	
DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP	
317	339	416	339	416	
HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa	
286	343	418	486	536	
TREMIE 40 MPa CFA	POST TENSIONED 40 MPa 25MPa@3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa		
364	423	411	476		
Kerb Hand 25 MPa	Kerb Hand 32 MPa	Kerb Machine 280kg	Kerb Machine 320kg	Paving 25MPa	Paving 32MPa
260	304	259	292	260	304
No Fines 6:1	FLOWABLE FILL 5 MPa PIPEFILL	Stabilised sand 3%	Stabilised sand 7%	Stabilised sand 10%	
285	188	81	150	153	

Adelaide East & Hills Region

Table 1. Environmental profiles (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa
GWP	kg CO ₂ eq	161	176	202	238	292
ODP	kg CFC11 eq	5.14E-06	5.48E-06	5.99E-06	6.76E-06	7.81E-06
AP	kg SO ₂ eq	0.865	0.951	1.09	1.29	1.58
EP	kg PO ₄ ³⁻ eq	0.108	0.118	0.133	0.156	0.189
POCP	kg C ₂ H ₄ eq	0.0552	0.0594	0.0661	0.0759	0.0898
ADPE	kg Sb eq	3.26E-06	3.56E-06	4.12E-06	4.79E-06	6.18E-06
ADPF	MJ _{NCV}	1450	1580	1780	2080	2510

Table 2. Environmental parameters (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	ENVISIA 20 MPa	ENVISIA 25 MPa	ENVISIA 32 MPa	ENVISIA 40 MPa	ENVISIA 50 MPa
PERE	MJ _{NCV}	2.78E+01	2.99E+01	3.32E+01	3.76E+01	4.43E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.78E+01	2.99E+01	3.32E+01	3.76E+01	4.43E+01
PENRE	MJ _{NCV}	1.49E+03	1.62E+03	1.83E+03	2.13E+03	2.57E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.59E+01	2.13E+01
PENRT	MJ _{NCV}	1.50E+03	1.63E+03	1.84E+03	2.15E+03	2.59E+03
SM	kg	1.51E+02	1.72E+02	1.98E+02	2.44E+02	3.02E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.29E+00	3.32E+00	3.35E+00	3.40E+00	3.46E+00
HWD	kg	1.11E-05	1.22E-05	1.44E-05	1.71E-05	2.29E-05
NHWD	kg	1.64E-01	1.81E-01	2.06E-01	2.40E-01	2.95E-01
RWD	kg	1.93E-03	2.12E-03	2.51E-03	2.97E-03	3.98E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 3. Environmental profiles (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa
GWP	kg CO ₂ eq	185	198	229	273	337
ODP	kg CFC11 eq	5.32E-06	5.60E-06	6.16E-06	6.98E-06	8.16E-06
AP	kg SO ₂ eq	0.927	1.00	1.15	1.37	1.70
EP	kg PO ₄ ³⁻ eq	0.118	0.127	0.144	0.170	0.208
POCP	kg C ₂ H ₄ eq	0.0579	0.0616	0.0688	0.0796	0.0952
ADPE	kg Sb eq	3.36E-06	3.65E-06	4.17E-06	4.95E-06	6.44E-06
ADPF	MJ _{NCV}	1560	1670	1900	2230	2730

Table 4. Environmental parameters (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	ENVIROCRETE PLUS 20 MPa	ENVIROCRETE PLUS 25 MPa	ENVIROCRETE PLUS 32 MPa	ENVIROCRETE PLUS 40 MPa	ENVIROCRETE PLUS 50 MPa
PERE	MJ _{NCV}	2.86E+01	3.04E+01	3.37E+01	3.88E+01	4.67E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.86E+01	3.04E+01	3.37E+01	3.88E+01	4.67E+01
PENRE	MJ _{NCV}	1.60E+03	1.71E+03	1.94E+03	2.29E+03	2.79E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.61E+03	1.72E+03	1.96E+03	2.30E+03	2.81E+03
SM	kg	1.30E+02	1.46E+02	1.66E+02	2.03E+02	2.55E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.42E+00	3.44E+00	3.52E+00	3.60E+00	3.71E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.65E-01	1.79E-01	2.01E-01	2.38E-01	3.00E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 5. Environmental profiles (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa
GWP	kg CO ₂ eq	203	227	258	312	380
ODP	kg CFC11 eq	5.31E-06	5.67E-06	6.23E-06	7.09E-06	8.20E-06
AP	kg SO ₂ eq	0.946	1.05	1.20	1.44	1.76
EP	kg PO ₄ ³⁻ eq	0.124	0.137	0.155	0.185	0.223
POCP	kg C ₂ H ₄ eq	0.0584	0.0634	0.0706	0.0821	0.0971
ADPE	kg Sb eq	3.34E-06	3.63E-06	4.14E-06	4.92E-06	6.39E-06
ADPF	MJ _{NCV}	1600	1760	1980	2350	2840

Table 6. Environmental parameters (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	ENVIROCRETE 40% 20 MPa	ENVIROCRETE 40% 25 MPa	ENVIROCRETE 40% 32 MPa	ENVIROCRETE 40% 40 MPa	ENVIROCRETE 40% 50 MPa
PERE	MJ _{NCV}	2.73E+01	2.94E+01	3.24E+01	3.74E+01	4.45E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.73E+01	2.94E+01	3.24E+01	3.74E+01	4.45E+01
PENRE	MJ _{NCV}	1.64E+03	1.81E+03	2.04E+03	2.41E+03	2.91E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.66E+03	1.82E+03	2.05E+03	2.43E+03	2.93E+03
SM	kg	1.04E+02	1.14E+02	1.35E+02	1.61E+02	2.03E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.46E+00	3.50E+00	3.56E+00	3.66E+00	3.76E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.47E-01	1.60E-01	1.80E-01	2.13E-01	2.67E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 7. Environmental profiles (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa
GWP	kg CO ₂ eq	225	268	288	346	423
ODP	kg CFC11 eq	5.41E-06	6.80E-06	6.36E-06	7.24E-06	8.40E-06
AP	kg SO ₂ eq	0.997	1.32	1.27	1.52	1.86
EP	kg PO ₄ ³⁻ eq	0.133	0.166	0.168	0.199	0.241
POCP	kg C ₂ H ₄ eq	0.0604	0.0771	0.0733	0.0852	0.101
ADPE	kg Sb eq	3.38E-06	3.78E-06	4.20E-06	4.99E-06	6.47E-06
ADPF	MJ _{NCV}	1690	2130	2110	2500	3020

Table 8. Environmental parameters (A1–A3), lower carbon concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa	ENVIROCRETE 30% 20 MPa
PERE	MJ _{NCV}	2.79E+01	3.42E+01	3.33E+01	3.83E+01	4.57E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.79E+01	3.42E+01	3.33E+01	3.83E+01	4.57E+01
PENRE	MJ _{NCV}	1.73E+03	2.18E+03	2.16E+03	2.55E+03	3.09E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.75E+03	2.20E+03	2.18E+03	2.57E+03	3.11E+03
SM	kg	7.80E+01	1.92E+02	9.88E+01	1.20E+02	1.51E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.51E+00	3.59E+00	3.62E+00	3.72E+00	3.84E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.45E-01	1.90E-01	1.77E-01	2.09E-01	2.62E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 9. Environmental profiles (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	Normal Class GP blend 20 MPa	Normal Class GP blend 25 MPa	Normal Class GP blend 32 MPa	Normal Class GP blend 40 MPa	Normal Class GP blend 50 MPa
GWP	kg CO ₂ eq	291	323	371	447	550
ODP	kg CFC11 eq	5.78E-06	6.20E-06	6.81E-06	7.79E-06	9.11E-06
AP	kg SO ₂ eq	1.15	1.28	1.47	1.76	2.16
EP	kg PO ₄ ³⁻ eq	0.160	0.176	0.201	0.240	0.292
POCP	kg C ₂ H ₄ eq	0.0669	0.0727	0.0812	0.0949	0.113
ADPE	kg Sb eq	3.50E-06	3.81E-06	4.37E-06	5.19E-06	6.71E-06
ADPF	MJ _{NCV}	1970	2170	2470	2930	3570

Table 10. Environmental parameters (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	Normal Class GP blend 20 MPa	Normal Class GP blend 25 MPa	Normal Class GP blend 32 MPa	Normal Class GP blend 40 MPa	Normal Class GP blend 50 MPa
PERE	MJ _{NCV}	2.98E+01	3.21E+01	3.57E+01	4.13E+01	4.94E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.98E+01	3.21E+01	3.57E+01	4.13E+01	4.94E+01
PENRE	MJ _{NCV}	2.02E+03	2.22E+03	2.52E+03	2.99E+03	3.63E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	2.03E+03	2.23E+03	2.53E+03	3.00E+03	3.66E+03
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.73E+00	3.80E+00	3.91E+00	4.07E+00	4.27E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.38E-01	1.50E-01	1.68E-01	1.98E-01	2.48E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 11. Environmental profiles (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	Normal Class GP/FA blend 20 MPa	Normal Class GP/FA blend 25 MPa	Normal Class GP/FA blend 32 MPa	Normal Class GP/FA blend 40 MPa	Normal Class GP/FA blend 50 MPa
GWP	kg CO ₂ eq	234	257	296	353	437
ODP	kg CFC11 eq	5.88E-06	6.30E-06	6.90E-06	7.91E-06	9.26E-06
AP	kg SO ₂ eq	0.964	1.06	1.21	1.45	1.78
EP	kg PO ₄ ³⁻ eq	0.141	0.154	0.176	0.208	0.254
POCP	kg C ₂ H ₄ eq	0.0583	0.0625	0.0695	0.0802	0.0958
ADPE	kg Sb eq	3.34E-06	3.64E-06	4.16E-06	4.93E-06	6.40E-06
ADPF	MJ _{NCV}	1690	1840	2080	2450	2990

Table 12. Environmental parameters (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	Normal Class GP/FA blend 20 MPa	Normal Class GP/FA blend 25 MPa	Normal Class GP/FA blend 32 MPa	Normal Class GP/FA blend 40 MPa	Normal Class GP/FA blend 50 MPa
PERE	MJ _{NCV}	2.58E+01	2.75E+01	3.04E+01	3.47E+01	4.14E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.58E+01	2.75E+01	3.04E+01	3.47E+01	4.14E+01
PENRE	MJ _{NCV}	1.74E+03	1.89E+03	2.14E+03	2.51E+03	3.06E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.75E+03	1.90E+03	2.15E+03	2.53E+03	3.09E+03
SM	kg	6.24E+01	7.28E+01	8.32E+01	1.04E+02	1.25E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.54E+00	3.57E+00	3.64E+00	3.75E+00	3.88E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.25E-01	1.35E-01	1.51E-01	1.77E-01	2.23E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 13. Environmental profiles (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	Normal Class GP/GGBFS blend 20 MPa	Normal Class GP/GGBFS blend 25 MPa	Normal Class GP/GGBFS blend 32 MPa	Normal Class GP/GGBFS blend 40 MPa	Normal Class GP/GGBFS blend 50 MPa
GWP	kg CO ₂ eq	247	275	315	377	467
ODP	kg CFC11 eq	5.56E-06	5.95E-06	6.54E-06	7.44E-06	8.71E-06
AP	kg SO ₂ eq	1.05	1.17	1.33	1.60	1.97
EP	kg PO ₄ ³⁻ eq	0.143	0.157	0.178	0.212	0.259
POCP	kg C ₂ H ₄ eq	0.0628	0.0682	0.0762	0.0885	0.106
ADPE	kg Sb eq	3.41E-06	3.72E-06	4.25E-06	5.04E-06	6.54E-06
ADPF	MJ _{NCV}	1790	1970	2230	2640	3220

Table 14. Environmental parameters (A1–A3), normal class concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	Normal Class GP/GGBFS blend 20 MPa	Normal Class GP/GGBFS blend 25 MPa	Normal Class GP/GGBFS blend 32 MPa	Normal Class GP/GGBFS blend 40 MPa	Normal Class GP/GGBFS blend 50 MPa
PERE	MJ _{NCV}	2.85E+01	3.07E+01	3.40E+01	3.92E+01	4.69E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.85E+01	3.07E+01	3.40E+01	3.92E+01	4.69E+01
PENRE	MJ _{NCV}	1.83E+03	2.01E+03	2.28E+03	2.69E+03	3.28E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.84E+03	2.02E+03	2.29E+03	2.71E+03	3.30E+03
SM	kg	5.20E+01	5.72E+01	6.76E+01	8.32E+01	9.88E+01
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.57E+00	3.63E+00	3.72E+00	3.85E+00	4.01E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.42E-01	1.55E-01	1.74E-01	2.06E-01	2.57E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 15. Environmental profiles (A1-A3), normal class concrete, Adelaide East & Hills (SA), per m³

Indicator	Unit	Normal Class GP/GGBFS/FA blend 20 MPa	Normal Class GP/GGBFS/FA blend 25 MPa	Normal Class GP/GGBFS/FA blend 32 MPa	Normal Class GP/GGBFS/FA blend 40 MPa	Normal Class GP/GGBFS/FA blend 50 MPa
GWP	kg CO ₂ eq	214	237	268	321	407
ODP	kg CFC11 eq	5.61E-06	6.00E-06	6.60E-06	7.52E-06	8.86E-06
AP	kg SO ₂ eq	0.940	1.04	1.18	1.41	1.77
EP	kg PO ₄ ³⁻ eq	0.131	0.145	0.163	0.193	0.239
POCP	kg C ₂ H ₄ eq	0.0577	0.0623	0.0688	0.0797	0.0966
ADPE	kg Sb eq	3.32E-06	3.61E-06	4.12E-06	4.89E-06	6.37E-06
ADPF	MJ _{NCV}	1620	1780	1990	2350	2920

Table 16. Environmental parameters (A1-A3), normal class concrete, Adelaide East & Hills (SA), per m³

Parameter	Unit	Normal Class GP/GGBFS/FA blend 20 MPa	Normal Class GP/GGBFS/FA blend 25 MPa	Normal Class GP/GGBFS/FA blend 32 MPa	Normal Class GP/GGBFS/FA blend 40 MPa	Normal Class GP/GGBFS/FA blend 50 MPa
PERE	MJ _{NCV}	2.62E+01	2.81E+01	3.07E+01	3.53E+01	4.26E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.62E+01	2.81E+01	3.07E+01	3.53E+01	4.26E+01
PENRE	MJ _{NCV}	1.67E+03	1.82E+03	2.04E+03	2.41E+03	2.98E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.68E+03	1.84E+03	2.06E+03	2.42E+03	3.00E+03
SM	kg	8.84E+01	9.88E+01	1.20E+02	1.46E+02	1.72E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.46E+00	3.50E+00	3.56E+00	3.66E+00	3.80E+00
HWD	kg	1.14E-05	1.25E-05	1.44E-05	1.74E-05	2.34E-05
NHWD	kg	1.35E-01	1.46E-01	1.64E-01	1.93E-01	2.43E-01
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.03E-03	4.08E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 17. Environmental profiles (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Indicator	Unit	DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP
GWP	kg CO ₂ eq	317	339	416	339	416
ODP	kg CFC11 eq	7.34E-06	8.08E-06	9.31E-06	8.08E-06	9.31E-06
AP	kg SO ₂ eq	1.31	1.41	1.72	1.41	1.72
EP	kg PO ₄ ³⁻ eq	0.188	0.205	0.247	0.205	0.247
POCP	kg C ₂ H ₄ eq	0.0742	0.0785	0.0927	0.0785	0.0927
ADPE	kg Sb eq	7.59E-06	7.27E-06	8.59E-06	7.27E-06	8.59E-06
ADPF	MJ _{NCV}	2220	2380	2870	2380	2870

Table 18. Environmental parameters (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Parameter	Unit	DIT 32 MPa SLIPFORM	DIT 40 MPa PUMP B1 EXP	DIT 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP
PERE	MJ _{NCV}	3.17E+01	3.48E+01	4.08E+01	3.49E+01	4.08E+01
PERM	MJ _{NCV}	0.00E+00	7.21E-02	8.46E-02	7.21E-02	8.46E-02
PERT	MJ _{NCV}	3.17E+01	3.49E+01	4.08E+01	3.49E+01	4.08E+01
PENRE	MJ _{NCV}	2.28E+03	2.45E+03	2.95E+03	2.45E+03	2.95E+03
PENRM	MJ _{NCV}	8.14E+00	1.19E+01	1.43E+01	1.19E+01	1.43E+01
PENRT	MJ _{NCV}	2.29E+03	2.46E+03	2.96E+03	2.46E+03	2.96E+03
SM	kg	9.36E+01	1.30E+02	1.51E+02	1.30E+02	1.51E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.54E+00	3.65E+00	3.78E+00	3.67E+00	3.78E+00
HWD	kg	1.39E-05	2.29E-05	2.72E-05	2.29E-05	2.72E-05
NHWD	kg	1.40E+00	9.05E-01	1.06E+00	9.05E-01	1.06E+00
RWD	kg	2.65E-03	2.83E-03	3.38E-03	2.83E-03	3.38E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 19. Environmental profiles (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Indicator	Unit	HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa
GWP	kg CO ₂ eq	286	343	418	486	536
ODP	kg CFC11 eq	6.92E-06	8.02E-06	9.37E-06	1.01E-05	1.17E-05
AP	kg SO ₂ eq	1.19	1.42	1.73	1.99	2.19
EP	kg PO ₄ ³⁻ eq	0.173	0.206	0.249	0.282	0.306
POCP	kg C ₂ H ₄ eq	0.0678	0.0789	0.0930	0.105	0.125
ADPE	kg Sb eq	6.61E-06	8.03E-06	1.02E-05	1.14E-05	1.21E-05
ADPF	MJ _{NCV}	2030	2410	2900	3310	3740

Table 20. Environmental parameters (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Parameter	Unit	HIGH SLUMP 32 MPa	HIGHSLUMP 40 MPa	HIGHSLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa
PERE	MJ _{NCV}	3.12E+01	3.59E+01	4.24E+01	4.78E+01	8.05E+01
PERM	MJ _{NCV}	6.78E-02	8.37E-02	1.03E-01	1.15E-01	1.20E-01
PERT	MJ _{NCV}	3.13E+01	3.60E+01	4.25E+01	4.79E+01	8.06E+01
PENRE	MJ _{NCV}	2.09E+03	2.47E+03	2.97E+03	3.38E+03	3.81E+03
PENRM	MJ _{NCV}	1.04E+01	1.28E+01	1.74E+01	1.94E+01	2.03E+01
PENRT	MJ _{NCV}	2.10E+03	2.48E+03	2.99E+03	3.40E+03	3.83E+03
SM	kg	9.88E+01	1.25E+02	1.56E+02	1.46E+02	1.25E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.57E+00	3.64E+00	3.75E+00	3.88E+00	1.71E+01
HWD	kg	2.06E-05	2.54E-05	3.32E-05	3.70E-05	3.87E-05
NHWD	kg	8.42E-01	1.03E+00	1.28E+00	1.43E+00	1.49E+00
RWD	kg	2.51E-03	3.08E-03	4.11E-03	4.58E-03	4.80E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 21. Environmental profiles (A1-A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Indicator	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25@3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
GWP	kg CO ₂ eq	364	423	411	476
ODP	kg CFC11 eq	8.42E-06	8.37E-06	8.38E-06	9.32E-06
AP	kg SO ₂ eq	1.52	1.70	1.67	1.93
EP	kg PO ₄ ³⁻ eq	0.218	0.238	0.235	0.269
POCP	kg C ₂ H ₄ eq	0.0839	0.0918	0.0893	0.101
ADPE	kg Sb eq	2.27E-05	5.25E-06	4.07E-06	4.66E-06
ADPF	MJ _{NCV}	2590	2850	2760	3170

Table 22. Environmental parameters (A1-A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Parameter	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25@3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
PERE	MJ _{NCV}	4.48E+01	3.94E+01	3.71E+01	4.17E+01
PERM	MJ _{NCV}	2.07E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	4.50E+01	3.94E+01	3.71E+01	4.17E+01
PENRE	MJ _{NCV}	2.66E+03	2.91E+03	2.83E+03	3.24E+03
PENRM	MJ _{NCV}	1.54E+01	1.69E+01	1.15E+01	1.34E+01
PENRT	MJ _{NCV}	2.68E+03	2.93E+03	2.84E+03	3.25E+03
SM	kg	1.40E+02	7.28E+01	9.36E+01	1.04E+02
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.57E+00	3.84E+00	3.58E+00	3.67E+00
HWD	kg	5.33E-05	1.82E-05	1.30E-05	1.50E-05
NHWD	kg	4.68E+00	1.95E-01	1.68E-01	1.91E-01
RWD	kg	6.42E-03	3.16E-03	2.25E-03	2.60E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 23. Environmental profiles (A1-A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Indicator	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280KG	KERB MACHINE 320KG	PAVING 25 MPa	PAVING 32 MPa
GWP	kg CO ₂ eq	260	304	259	292	260	304
ODP	kg CFC11 eq	6.41E-06	7.11E-06	6.06E-06	6.61E-06	6.41E-06	7.11E-06
AP	kg SO ₂ eq	1.08	1.25	1.07	1.21	1.08	1.25
EP	kg PO ₄ ³⁻ eq	0.156	0.180	0.155	0.173	0.156	0.180
POCP	kg C ₂ H ₄ eq	0.0634	0.0715	0.0608	0.0669	0.0634	0.0715
ADPE	kg Sb eq	2.06E-06	2.31E-06	5.86E-06	7.56E-06	2.06E-06	2.31E-06
ADPF	MJ _{NCV}	1830	2110	1820	2030	1830	2110

Table 24. Environmental parameters (A1-A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Parameter	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280KG	KERB MACHINE 320KG	PAVING 25 MPa	PAVING 32 MPa
PERE	MJ _{NCV}	2.55E+01	2.84E+01	2.76E+01	3.01E+01	2.56E+01	2.84E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.55E+01	2.84E+01	2.76E+01	3.01E+01	2.56E+01	2.84E+01
PENRE	MJ _{NCV}	1.89E+03	2.17E+03	1.87E+03	2.09E+03	1.89E+03	2.17E+03
PENRM	MJ _{NCV}	4.59E+00	5.41E+00	4.59E+00	5.25E+00	4.59E+00	5.41E+00
PENRT	MJ _{NCV}	1.89E+03	2.17E+03	1.87E+03	2.09E+03	1.89E+03	2.17E+03
SM	kg	7.28E+01	8.32E+01	7.28E+01	8.32E+01	7.28E+01	8.32E+01
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.49E+00	3.58E+00	3.61E+00	3.63E+00	3.53E+00	3.63E+00
HWD	kg	5.25E-06	5.80E-06	8.62E-06	1.04E-05	5.25E-06	5.80E-06
NHWD	kg	9.85E-02	1.09E-01	1.12E+00	1.56E+00	9.87E-02	1.09E-01
RWD	kg	9.05E-04	1.01E-03	1.69E-03	2.11E-03	9.05E-04	1.01E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Adelaide East & Hills Region

Table 25. Environmental profiles (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Indicator	Unit	NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%
GWP	kg CO ₂ eq	285	188	81	150	153
ODP	kg CFC11 eq	5.14E-06	7.62E-06	2.97E-06	3.81E-06	4.50E-06
AP	kg SO ₂ eq	1.13	0.879	0.332	0.605	0.643
EP	kg PO ₄ ³⁻ eq	0.154	0.145	0.0517	0.0869	0.0965
POCP	kg C ₂ H ₄ eq	0.0612	0.0544	0.0285	0.0405	0.0421
ADPE	kg Sb eq	1.14E-06	8.88E-06	7.74E-07	1.19E-06	1.37E-06
ADPF	MJ _{NCV}	1850	1600	670	1090	1150

Table 26. Environmental parameters (A1–A3), concrete for special applications, Adelaide East & Hills (SA), per m³

Parameter	Unit	NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%
PERE	MJ _{NCV}	2.62E+01	2.64E+01	1.36E+01	1.83E+01	1.84E+01
PERM	MJ _{NCV}	0.00E+00	1.01E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	2.62E+01	2.65E+01	1.36E+01	1.83E+01	1.84E+01
PENRE	MJ _{NCV}	1.89E+03	1.66E+03	7.00E+02	1.12E+03	1.19E+03
PENRM	MJ _{NCV}	0.00E+00	1.46E+01	8.74E-01	1.91E+00	2.73E+00
PENRT	MJ _{NCV}	1.89E+03	1.68E+03	7.01E+02	1.12E+03	1.19E+03
SM	kg	0.00E+00	2.50E+02	0.00E+00	0.00E+00	5.20E+01
RSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	3.04E+00	2.89E+00	2.85E+00	2.92E+00	2.90E+00
HWD	kg	0.00E+00	3.14E-05	1.59E-06	2.70E-06	3.58E-06
NHWD	kg	8.05E-02	1.19E+00	4.30E-02	6.26E-02	6.69E-02
RWD	kg	0.00E+00	3.80E-03	2.60E-04	4.54E-04	6.07E-04
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other environmental information

Water management

Water is a valuable resource and good quality fresh water is essential to our concrete, construction material and plasterboard operations. We use water in manufacturing, and for dust suppression, cleaning and sanitation. Our quarry and asphalt operations are able to use recycled, brackish and/or process water.

At our larger sites, including quarries, we also capture rainfall or stream flow that is largely used for dust control purposes. We are developing systems that will enable us to collect data on captured rainfall and are developing plans that will underpin an overall improvement in water efficiency.

When developing or purchasing new facilities, our due diligence assessment includes scenario analysis of the quantity and quality of water, assessment of the risks of potential water discharges, and, where relevant, river catchment assessments to ensure sufficient water availability and supply.

Waste and recycling

Throughout Boral's operations, some materials are commonly re-used back into our production processes. Returned concrete is used to make concrete blocks at some plants. This beneficially uses materials that would otherwise require disposal. A large proportion of Boral's recycled and lower carbon products revenue, totalling nine per cent of Boral Limited revenue, is derived from external waste products.

This includes our fly ash and recycling businesses. Opportunities for the re-use of production by-products or waste material continues to grow and are actively being pursued.

Biodiversity management

Protecting the diversity of plant and animal species at and around our operational sites is a core component of our land management efforts. Some examples of the many initiatives to protect biodiversity at our own sites include:

- Maintaining koala fodder plantations at Narangba and Petrie quarries in Queensland.
- Collaborating with the Royal Botanic Garden Sydney NSW in research on the endangered Illawarra Socketwood population at our Dunmore Quarry in New South Wales.
- Partnering with Sleepy Burrows Wombat Sanctuary to capture and relocate wombats found at our Peppertree Quarry in New South Wales.
- Boral in WA has completed a number of community projects at Orange Grove Primary School including a Heritage Garden space, installation of garden pathways and cockatoo nesting boxes.
- Conservation work to provide habitat for the threatened legless lizard and spiny rice-flower at Deer Park Quarry in Victoria.
- Construction of a bird island habitat as part of our rehabilitation of wetlands at our Dunmore Quarry in New South Wales.
- Through our community partnership with Conservation Volunteers Australia, we support
- conservation and education initiatives in our local communities, including native vegetation initiatives in local reserves and schools.

Our approach to climate related risks

Our approach

Boral recognises that climate related physical risks and a global transition to a lower-carbon future are expected to impact our operations, customers and suppliers. We support the Paris Agreement and mechanisms to achieve its objective of limiting future average global temperature rises to well below 2°C, as well as Australia's 2030 target of a 26–28% reduction in carbon emissions below 2005 levels.

Looking at how Boral's carbon emissions are tracking relative to 2005 levels, in Australia we have reduced emissions by around 40% since FY2005. We achieved about half of this decrease largely by realigning our portfolio away from emissions-intensive businesses. The remainder of the decrease is due to reducing clinker manufacturing in Australia in favour of importing it from more efficient and larger scale operations in Asia. Including Boral North America, our Scope 1 and 2 emissions decreased by 43% since FY2005. We continue to progressively adopt the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). In FY2019, we enhanced our climate-related governance and risk management, completed scenario analysis of Boral Cement's business and continued to strengthen our resilience to a 2°C scenario. We also broadened our reporting of physical climate-related risks and Scope 3 emissions.

We completed a Group-wide review of our climate-related risks and opportunities using the TCFD framework. This review informed a two-year roadmap to undertake further scenario analysis of key climate related business risks. We transparently and constructively engaged with Climate Action 100+ investor representatives and other stakeholders during the year, sharing our progress in aligning our efforts with the TCFD recommendations and building greater resilience to climate-related impacts.



Our approach to climate related risks

Energy and climate policy

Boral has not identified any major positions on energy and climate policy held by our industry associations that are materially inconsistent with Boral's position.

We support:

- A national approach to climate and energy policy to ensure that least-cost carbon emissions abatement is targeted while ensuring reliable and competitive energy can be delivered.
- Climate and energy policies that do not unduly erode the competitiveness of domestic-based businesses.

Through our community partnership with Conservation Volunteers Australia, we support conservation and education initiatives in our local communities, including native vegetation initiatives in local reserves and schools.

In Australia, we are a member of the Cement Industry Federation (CIF). The CIF policy is to support the Federal Government's national target to reduce emissions by 26–28 per cent by 2030, and the CIF has been working with the World Business Council for Sustainable Development and its current roadmap to reduce emissions.

Boral acknowledges the Paris Agreement and supports mechanisms to achieve its objectives, including a national approach to climate and energy policy. Boral's major industry associations are:

- Green Building Council of Australia (GBCA)
- Infrastructure Sustainability Council (ISC)
- Concrete Institute of Australia (CIA)
- Australian Pozzolan Association (APoZA)
- Business Council of Australia
- Cement Industry Federation
- Cement, Concrete & Aggregates Australia
- Australian Mines and Metals Association's Australian Resources and Energy Group
- American Coal Ash Association.

For more information visit boral.com/industry_associations

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www.boral.com.au/concrete

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