



Building something great

Pre-mix concrete EPD

Environmental Product Declaration

South Australia (SA) region



In accordance with ISO 14025:2006 and EN 15804:2012

An EPD should provide current information and may be updated if conditions change.

The stated validity is therefore subject to the continued registration and publication at epd-australasia.com

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Geographical Scope: SA region





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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 South 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. EPDs 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:	Description of the changes
Version 2	<p>The following edits were made as part of the first annual review.</p> <ul style="list-style-type: none"> • The address for Boral's head office has been updated. • The environmental profile and parameters were updated due to the publication of the cement manufacturers Environmental Product Declaration. • The map showing the number of operating sites has been updated. • Organisation acronyms have been changed (ISC etc). • The branding was updated. • Minor formatting changes • The products called Envisia 65MPa and Envisia 80MPa have been added to the Adelaide Metro Region and the Adelaide East and Hills region. • EPD registration number updated
Reference year for data:	2018-01-01/2018-12-31

CEN standard EN 15804 served as the core PCR	
PCR	<p>PCR 2019:14 Construction Products, version 1.11, 2021-02-05 (valid until 2024-12-20)</p> <p>c-PCR-003: Product Category Rules (PCR) for Concrete and Concrete Elements (EN 16757) 2019-12-20 (valid until 2024-12-20)</p>
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Claudia A. Peña. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	<input type="checkbox"/> EPD process certification (Internal) <input checked="" type="checkbox"/> EPD verification (External)
Procedure for follow-up of data during EPD validity involved third-party verifier	<input type="checkbox"/> No <input checked="" type="checkbox"/> 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.

Boral Concrete has over 200 pre-mix concrete plants around Australia producing a wide range of concrete mixes in metropolitan and country areas.

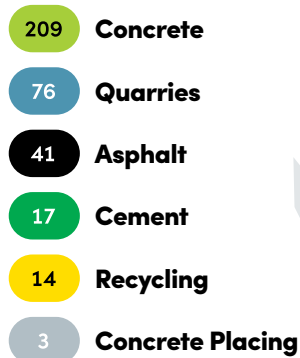
In the South Australia, Boral Concrete supplies pre-mix concrete to all segments of the construction industry including infrastructure, social, commercial and residential construction.

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

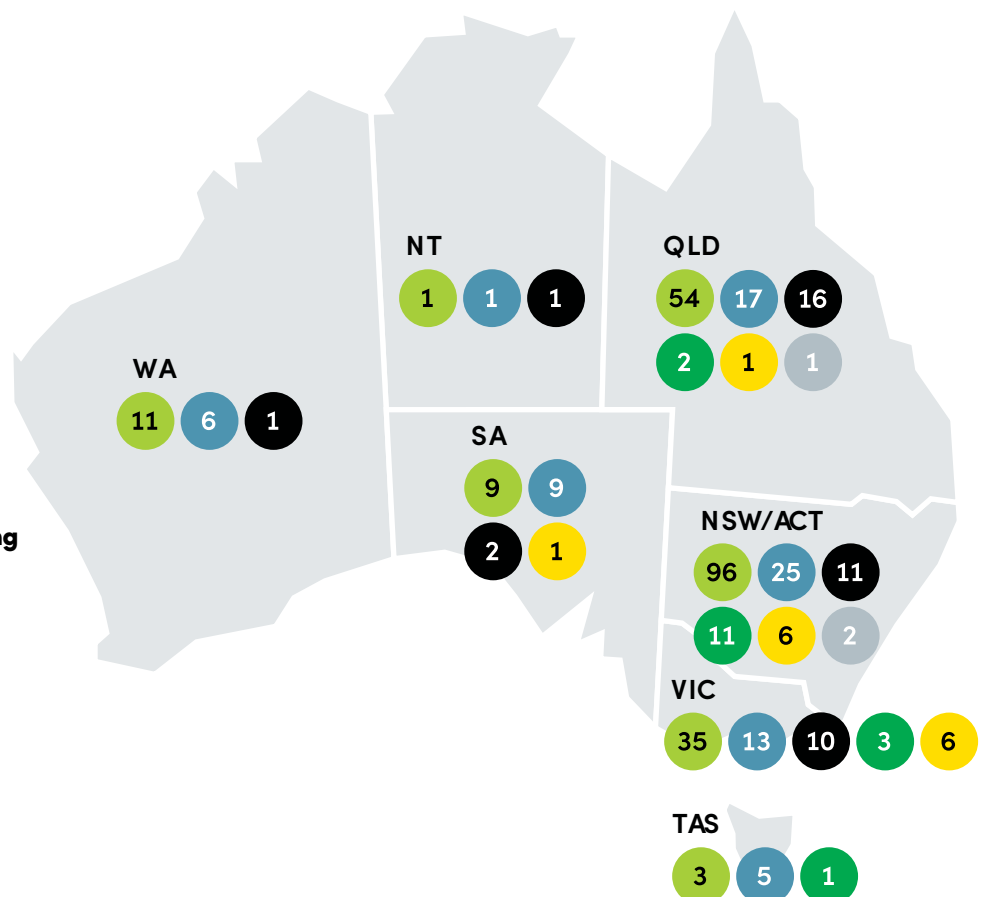
Construction materials Leading integrated network

360

Operating sites*



* Includes transport, fly ash and research and development sites.



About Boral

ZERO HARM
TODAY

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.

"Boral Materials Technical Services is also the largest facility of its kind in the country."

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
- 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.



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
- **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.

Our commitment

ZERO HARM
TODAY

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.

Geographical scope

South Australian (SA) Region

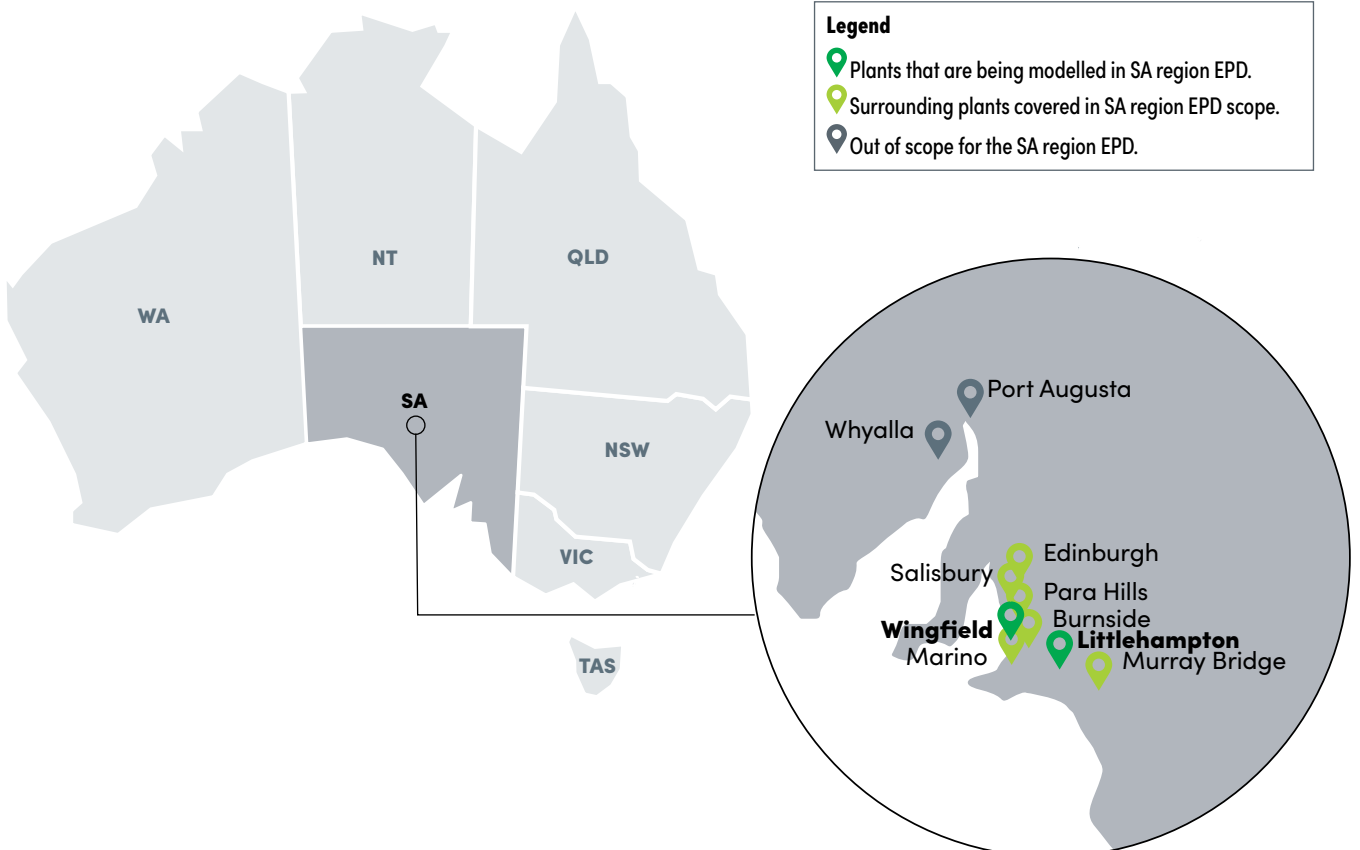


The concrete plants considered for this Environmental Product Declaration comprise those in the state of South Australia, comprising of the Adelaide Metropolitan and Adelaide East and Hills regions.

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 Metropolitan region
- **Boral Concrete Littlehampton**
–Adelaide Hills East and Adelaide Hills region



Declared products

Products considered for the South Australian (SA) region 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).

Normal class concrete category	Typical properties
NORMAL CLASS GP BLEND	General Purpose (GP) cement.
NORMAL CLASS GP / FA BLEND	General Purpose (GP) cement and fly ash (FA).
NORMAL CLASS GP / GGBFS BLEND	General Purpose (GP) cement and Ground Granulated Blast Furnace Slag (GGBFS).
NORMAL CLASS GP / GGBFS / FA BLEND	General Purpose (GP) cement and Ground Granulated Blast Furnace Slag (GGBFS) and fly ash.

2) Lower carbon concrete products

Lower carbon concrete products have been designed to have lower portland cement contents and lower 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%	<ul style="list-style-type: none"> Complies with AS 1379. Applicable for Green Star projects.
ENVIROCRETE® 40%	≥40%	<ul style="list-style-type: none"> Complies with AS 1379. Applicable for Green Star projects.
ENVIROCRETE® PLUS	≥45%	<ul style="list-style-type: none"> Complies with AS 1379. Applicable for Green Star projects. Improved early age strength and drying shrinkage compared to the ENVIROCRETE® products.
ENVISIA®	≥50%	<ul style="list-style-type: none"> Complies with AS 1379. Applicable for Green Star projects. 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 ISC 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® concrete is available with two levels of portland cement reduction. ENVIROCRETE® 30% has a minimum portland cement reduction of 30% when compared to the GBCA and ISC reference case and ENVIROCRETE® 40% has a minimum portland cement reduction of 40% when compared to the GBCA and ISC reference case. ENVIROCRETE® 30% and 40% are 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 contains supplementary cementitious materials to reduce the portland cement and the minimum portland cement reduction compared to the GBCA and ISC reference case is 50%. 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 below.

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 a rating 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.

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.

3) Concrete products for special applications

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.

Declared products

Products covered by this Environmental Product Declaration (EPD)

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.

1) Normal class concrete products

- NORMAL CLASS GP 20 MPa
- NORMAL CLASS GP 25 MPa
- NORMAL CLASS GP 32 MPa
- NORMAL CLASS GP 40 MPa
- NORMAL CLASS GP 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

2) Lower carbon concrete products

- ENVISIA® 20 MPa
- ENVISIA® 25 MPa
- ENVISIA® 32 MPa
- ENVISIA® 40 MPa
- ENVISIA® 50 MPa
- ENVISIA® 65 MPa
- ENVISIA® 80 MPa

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

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

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

3) Concrete products 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.

The batching plant stores the ingredients in cement silos, aggregate bins and admixture tanks and uses calibrated weigh scales and flow meters to accurately weigh the ingredients. The ingredients are then mixed in a transit mixer compliant with item C3 of AS 1379 to produce concrete which is delivered to the project.

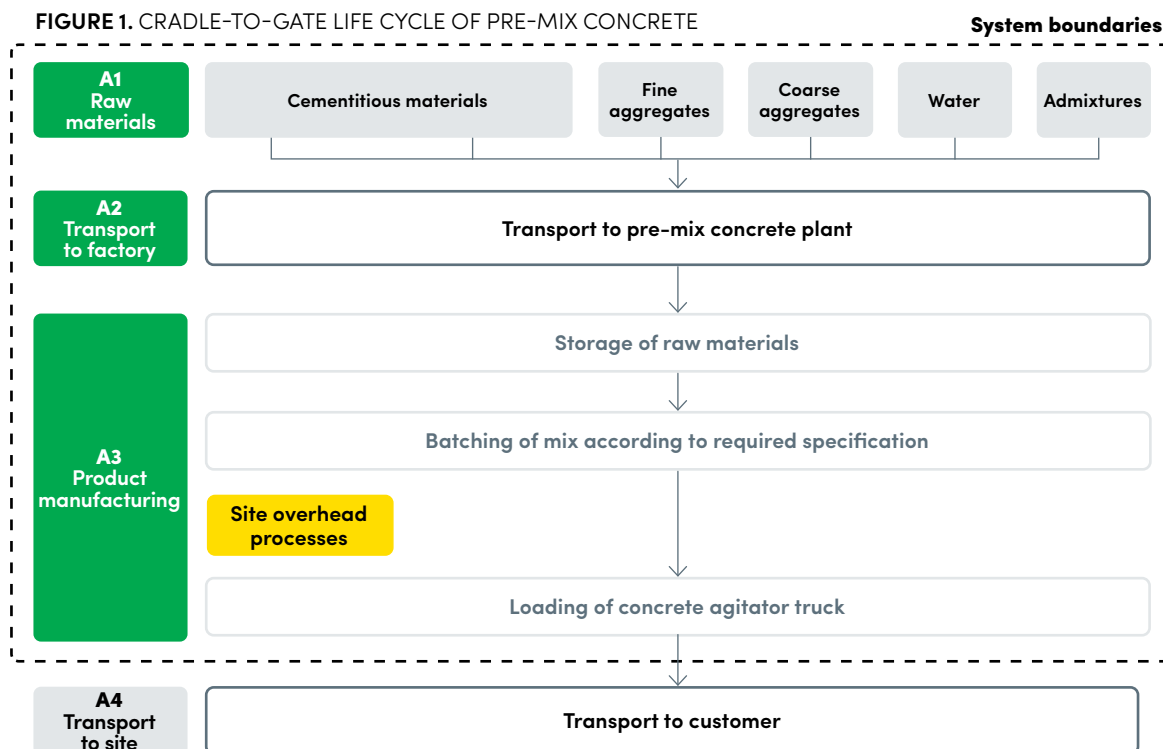
Depending on the proposed application of the final product, the concrete may contain other ingredients such as colour oxides and fibres and the production process may include heaters or chillers. Concrete production is time-sensitive, once the ingredients are mixed, workers must put the concrete in place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



Life cycle stages covered by the Life Cycle Assessment (LCA)

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) and AS 1379 Specification and Supply of Concrete (SA 2007/R2017):

- **AS 3972:** General purpose and blended cements
- **AS 3582.1** Supplementary cementitious materials Part 1: Fly Ash
- **AS 3582.2** Supplementary cementitious materials Part 2: Slag—Ground granulated blast furnace
- **AS 2758.1** Aggregates and rock for engineering purposes Part 1: Concrete Aggregates
- **AS 1478.1** Chemical admixtures for concrete, mortar and grout

Life cycle stages covered by the Life Cycle Assessment (LCA)

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 Ground Granulated Blast Furnace Slag (GGBFS) are the two main cementitious materials used in the South Australian market. They are supplied by local suppliers in the South Australian using imported ingredients and delivered to our sites in rigid trucks.

ZEP® additive is transported by articulated truck from Sydney; other admixtures are sourced from locally based suppliers and transported using rigid trucks.



BRIDGEPORT, MURRY BRIDGE, SA

Life cycle stages covered by the Life Cycle Assessment (LCA)

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.

Manufacturing stage (A3)

The 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.

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 GP cement are taken from AusLCI, although we have adjusted the GWP, ODP and parameter results based on the (EN 15804+A2 compliant) Adbri Cement Products EPD (S-P-05476 version 1.0). Data for admixtures have been sourced from EPDs published in December 2015 by EFCA (European Federation of Concrete Admixtures Associations) (EFCA 2015a-c). Background data (e.g. for energy and transport processes, 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

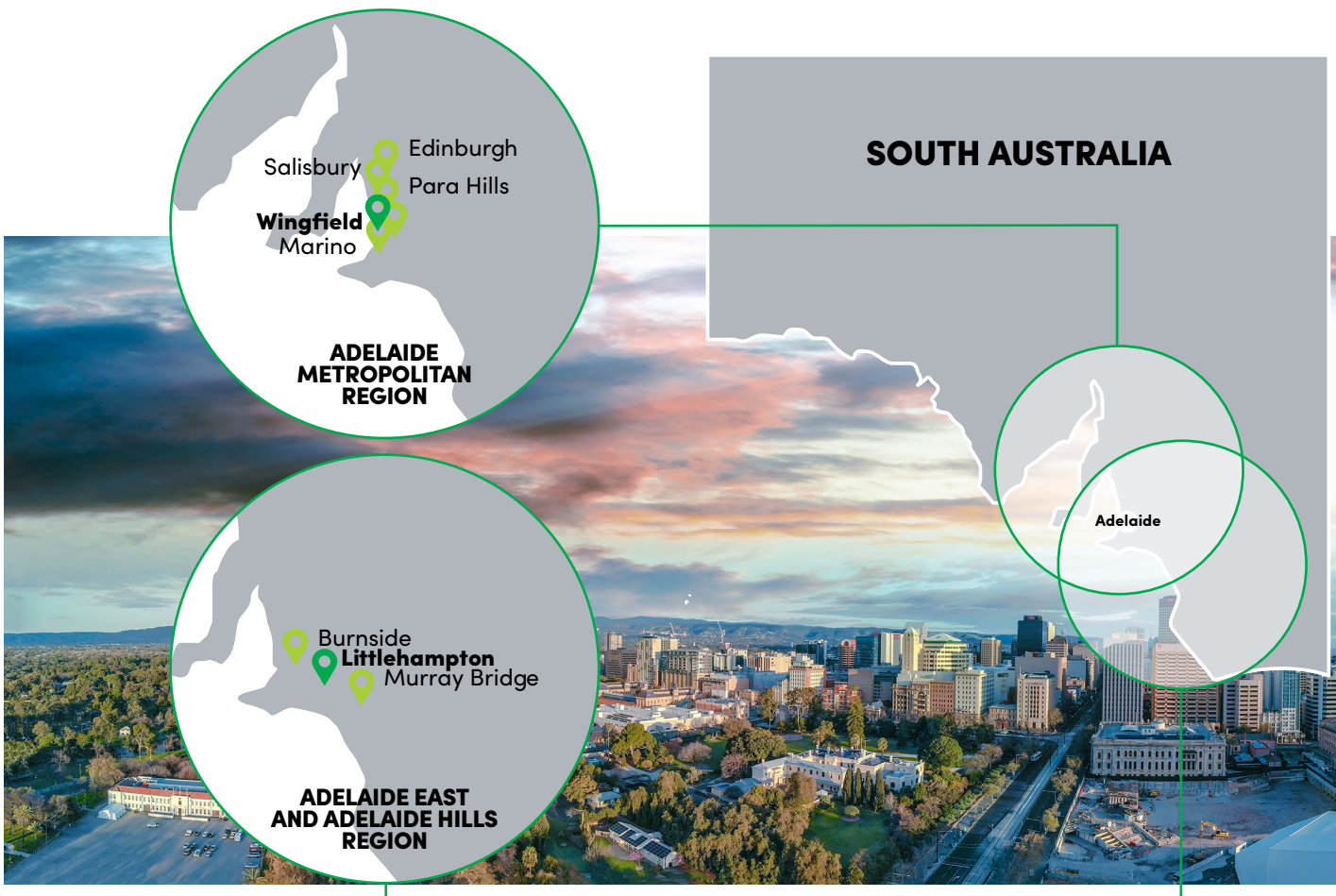
Boral operates nine concrete plants in South Australia.

This EPD covers a sub-section of our concrete plants located in two key regions:

- **Boral Concrete Wingfield** (Adelaide Metropolitan region)
- **Boral Concrete Littlehampton** (Adelaide East and Adelaide Hills)

Legend

- 📍 Plants that are being modelled in SA region EPD.
- 📍 Surrounding plants covered in SA region EPD scope.
- 📍 Out of scope for the SA region EPD.



Life Cycle Assessment (LCA) methodology

Allocation

The key material production processes that require allocation are:

Blast Furnace Slag (BFS)

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 using economic allocation.

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 (micro-silica)

Silica fume (micro-silica) is a by-product of silicon metal or ferrosilicon alloys production. We used economic allocation to assign impacts of silicon production to silicon and silica fume.

Pre-mix concrete

Boral manufactures a range of pre-mix concrete products at its sites. Energy use for concrete production has been allocated to the products based on a volume basis (total m³ of pre-mix concrete products).

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.

Life Cycle Assessment (LCA) methodology

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.

Water consumption

Is not measured consistently across quarries. We have used AusLCI water consumption data per tonne of coarse and fine aggregates instead.

Blast Furnace Slag

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).



Product composition

Content declaration (% by weight)

TABLE 2. SA PRODUCT COMPOSITIONS

Constituent (% by weight)	NORMAL CLASS GP BLEND	NORMAL CLASS GP / FA BLEND	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 3. SA PRODUCT COMPOSITIONS (CONTINUED)

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	<0.7%	<0.8%	<0.2%	<0.3%
Water	6-9%	6-9%	5-8%	5-10%

*May include Zep® technology.

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).

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 some downstream) material and energy inputs and outputs. The results are provided for a range of environmental impact categories, in line with EN 15804.

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: **One 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 premix concrete is UN CPC 375 (Articles of concrete, cement and plaster) and ANZSIC (Concrete-ready mixes—except dry mix).



Environmental indicators

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

TABLE 5. 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

Environmental profiles

The cradle-to-gate (module A1-A3) environmental profiles and environmental parameters of each product group are expressed per m³ of pre-mix concrete (volume as ordered by the client).

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 ±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 ±10% range as required by the PCR (Envirodec 2020a) for most indicators.

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

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.



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Environmental profiles and parameters

Product table list

Adelaide Metropolitan region

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

Normal class concrete products

Table no. 1 and 225

- 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. 3 and 426

- 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. 5 and 627

- 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. 7 and 828

- 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

Lower carbon concrete products

Table no. 9 and 1029

- ENVISIA® 20 MPa
- ENVISIA® 25 MPa
- ENVISIA® 32 MPa
- ENVISIA® 40 MPa
- ENVISIA® 50 MPa
- ENVISIA® 65 MPa
- ENVISIA® 80 MPa

Table no. 11 and 12 30

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

Table no. 13 and 14 31

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

Table no. 15 and 1632

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

Concrete for special applications

Table no. 17 and 1833

- 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 34

- 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 35

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

Table no. 23 and 24 36

- KERB HAND 25 MPa
- KERB HAND 32 MPa
- KERB MACHINE 280 kg
- KERB MACHINE 320 kg
- PAVING 25 MPa
- PAVING 32 MPa

Table no. 25 and 2637

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

Cradle-to-gate GWP-GHG summary (kg CO₂ eq/m³)

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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		
190	218	250	300	375		
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		
155	178	203	244	305		
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		
167	191	218	262	325		
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		
147	167	192	228	284		
ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
123	139	159	186	226	246	252
ENVIROCRETE® PLUS 20 MPa	ENVIROCRETE® PLUS 25 MPa	ENVIROCRETE® PLUS 32 MPa	ENVIROCRETE® PLUS 40 MPa	ENVIROCRETE® PLUS 50 MPa		
136	155	179	212	260		
ENVIROCRETE® 30% 20 MPa	ENVIROCRETE® 30% 25 MPa	ENVIROCRETE® 30% 32 MPa	ENVIROCRETE® 30% 40 MPa	ENVIROCRETE® 30% 50 MPa		
154	178	202	245	302		
ENVIROCRETE® 40% 20 MPa	ENVIROCRETE® 40% 25 MPa	ENVIROCRETE® 40% 32 MPa	ENVIROCRETE® 40% 40 MPa	ENVIROCRETE® 40% 50 MPa		
144	163	187	225	277		
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		
217	235	287	235	287		
HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa		
200	235	289	335	374		
TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa @3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa			
251	291	279	323			
KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa	
179	209	186	208	179	209	
NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%		
191	147	66	111	115		

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TABLE 1. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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	190	218	250	300	375
ODP	kg CFC11 eq	1.38E-05	1.58E-05	1.79E-05	2.14E-05	2.65E-05
AP	kg SO ₂ eq	1.07	1.23	1.41	1.70	2.13
EP	kg PO ₄ ³⁻ eq	0.147	0.168	0.192	0.229	0.285
POCP	kg C ₂ H ₄ eq	0.0618	0.0687	0.0765	0.0891	0.108
ADPE	kg Sb eq	3.10E-06	3.65E-06	4.15E-06	4.89E-06	6.52E-06
ADPF	MJ _{NCV}	1810	2070	2350	2790	3470

TABLE 2. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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}	7.64E+01	8.74E+01	9.97E+01	1.18E+02	1.47E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	7.64E+01	8.74E+01	9.97E+01	1.18E+02	1.47E+02
PENRE	MJ _{NCV}	2.33E+03	2.66E+03	3.04E+03	3.63E+03	4.53E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	2.33E+03	2.67E+03	3.05E+03	3.65E+03	4.55E+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	2.79E+00	2.80E+00	2.81E+00	2.85E+00	2.80E+00
HWD	kg	1.83E-03	2.15E-03	2.51E-03	3.06E-03	3.90E-03
NHWD	kg	5.56E+00	6.53E+00	7.61E+00	9.30E+00	1.18E+01
RWD	kg	1.80E-03	2.16E-03	2.46E-03	2.92E-03	4.05E-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

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TABLE 3. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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	155	178	203	244	305
ODP	kg CFC11 eq	1.17E-05	1.34E-05	1.51E-05	1.81E-05	2.23E-05
AP	kg SO ₂ eq	0.880	1.02	1.17	1.41	1.76
EP	kg PO ₄ ³⁻ eq	0.128	0.148	0.167	0.200	0.248
POCP	kg C ₂ H ₄ eq	0.0534	0.0592	0.0652	0.0756	0.0908
ADPE	kg Sb eq	2.94E-06	3.46E-06	3.94E-06	4.64E-06	6.20E-06
ADPF	MJ _{NCV}	1540	1750	1980	2350	2910

TABLE 4. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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}	6.08E+01	6.92E+01	7.89E+01	9.38E+01	1.16E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.08E+01	6.92E+01	7.89E+01	9.38E+01	1.16E+02
PENRE	MJ _{NCV}	1.93E+03	2.21E+03	2.51E+03	3.00E+03	3.73E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.94E+03	2.22E+03	2.52E+03	3.01E+03	3.75E+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	2.67E+00	2.68E+00	2.69E+00	2.70E+00	2.63E+00
HWD	kg	1.36E-03	1.60E-03	1.87E-03	2.31E-03	2.95E-03
NHWD	kg	4.13E+00	4.86E+00	5.70E+00	7.03E+00	8.98E+00
RWD	kg	1.80E-03	2.16E-03	2.46E-03	2.92E-03	4.04E-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

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TABLE 5. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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	167	191	218	262	325
ODP	kg CFC11 eq	1.21E-05	1.36E-05	1.54E-05	1.85E-05	2.26E-05
AP	kg SO ₂ eq	0.980	1.12	1.29	1.56	1.94
EP	kg PO ₄ ³⁻ eq	0.132	0.150	0.171	0.205	0.252
POCP	kg C ₂ H ₄ eq	0.0590	0.0654	0.0728	0.0844	0.102
ADPE	kg Sb eq	3.03E-06	3.56E-06	4.04E-06	4.76E-06	6.35E-06
ADPF	MJ _{NCV}	1660	1880	2130	2540	3130

TABLE 6. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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}	6.68E+01	7.56E+01	8.55E+01	1.02E+02	1.25E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.68E+01	7.56E+01	8.55E+01	1.02E+02	1.25E+02
PENRE	MJ _{NCV}	2.08E+03	2.37E+03	2.69E+03	3.23E+03	3.98E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	2.09E+03	2.38E+03	2.70E+03	3.24E+03	4.01E+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	2.77E+00	2.78E+00	2.80E+00	2.81E+00	2.75E+00
HWD	kg	1.47E-03	1.71E-03	1.99E-03	2.47E-03	3.11E-03
NHWD	kg	4.50E+00	5.23E+00	6.08E+00	7.53E+00	9.48E+00
RWD	kg	1.80E-03	2.16E-03	2.46E-03	2.92E-03	4.04E-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

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TABLE 7. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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 CO₂ eq	147	167	192	228	284
ODP	kg CFC11 eq	1.08E-05	1.22E-05	1.39E-05	1.63E-05	2.02E-05
AP	kg SO ₂ eq	0.871	1.00	1.15	1.38	1.72
EP	kg PO ₄ ³⁻ eq	0.121	0.138	0.157	0.186	0.231
POCP	kg C ₂ H ₄ eq	0.0542	0.0598	0.0665	0.0764	0.0918
ADPE	kg Sb eq	2.94E-06	3.45E-06	3.92E-06	4.61E-06	6.16E-06
ADPF	MJ _{NCV}	1500	1700	1930	2270	2800

TABLE 8. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE METROPOLITAN (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}	5.77E+01	6.52E+01	7.38E+01	8.68E+01	1.07E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.77E+01	6.52E+01	7.38E+01	8.68E+01	1.07E+02
PENRE	MJ _{NCV}	1.85E+03	2.10E+03	2.39E+03	2.83E+03	3.52E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.86E+03	2.11E+03	2.41E+03	2.85E+03	3.54E+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	2.72E+00	2.73E+00	2.74E+00	2.73E+00	2.66E+00
HWD	kg	1.20E-03	1.40E-03	1.64E-03	2.00E-03	2.56E-03
NHWD	kg	3.67E+00	4.28E+00	5.00E+00	6.10E+00	7.81E+00
RWD	kg	1.80E-03	2.16E-03	2.46E-03	2.92E-03	4.04E-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

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TABLE 9. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (SA), PER M³

Indicator	Unit	ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
GWP	kg CO ₂ eq	123	139	159	186	226	246	252
ODP	kg CFC11 eq	8.29E-06	9.24E-06	1.04E-05	1.23E-05	1.47E-05	1.60E-05	1.64E-05
AP	kg SO ₂ eq	0.833	0.951	1.10	1.30	1.59	1.74	1.76
EP	kg PO ₄ ³⁻ eq	0.103	0.116	0.132	0.155	0.187	0.203	0.206
POCP	kg C ₂ H ₄ eq	0.0540	0.0597	0.0666	0.0760	0.0893	0.0959	0.104
ADPE	kg Sb eq	2.96E-06	3.45E-06	4.06E-06	4.65E-06	5.54E-06	6.44E-06	6.77E-06
ADPF	MJ _{NCV}	1390	1560	1780	2050	2460	2670	2820

TABLE 10. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (SA), PER M³

Parameter	Unit	ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
PERE	MJ _{NCV}	4.81E+01	5.37E+01	6.07E+01	7.00E+01	8.35E+01	9.07E+01	1.16E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	2.89E-02	3.37E-02	4.33E-02	4.33E-02
PERT	MJ _{NCV}	4.81E+01	5.37E+01	6.07E+01	7.00E+01	8.36E+01	9.07E+01	1.16E+02
PENRE	MJ _{NCV}	1.61E+03	1.82E+03	2.07E+03	2.41E+03	2.91E+03	3.17E+03	3.26E+03
PENRM	MJ _{NCV}	9.56E+00	1.14E+01	1.37E+01	9.79E+00	1.21E+01	1.37E+01	1.39E+01
PENRT	MJ _{NCV}	1.62E+03	1.83E+03	2.09E+03	2.42E+03	2.92E+03	3.18E+03	3.28E+03
SM	kg	1.51E+02	1.77E+02	2.08E+02	2.50E+02	3.12E+02	3.43E+02	3.48E+02
RSF	MJ _{NCV}	0.00E+00	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	0.00E+00
FW	m ³	2.69E+00	2.71E+00	2.72E+00	2.71E+00	2.66E+00	2.61E+00	1.61E+01
HWD	kg	7.07E-04	8.19E-04	9.64E-04	1.20E-03	1.52E-03	1.68E-03	1.52E-03
NHWD	kg	2.23E+00	2.58E+00	3.04E+00	4.05E+00	5.09E+00	5.69E+00	5.21E+00
RWD	kg	1.79E-03	2.13E-03	2.55E-03	2.07E-03	2.54E-03	2.93E-03	2.96E-03
CRU	kg	0.00E+00	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	9.60E+01
MER	kg	0.00E+00	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	0.00E+00

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TABLE 11. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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 CO₂ eq	136	155	179	212	260
ODP	kg CFC11 eq	9.35E-06	1.05E-05	1.20E-05	1.41E-05	1.70E-05
AP	kg SO ₂ eq	0.874	1.00	1.17	1.40	1.72
EP	kg PO ₄ ³⁻ eq	0.111	0.126	0.145	0.171	0.209
POCP	kg C ₂ H ₄ eq	0.0556	0.0615	0.0692	0.0797	0.0946
ADPE	kg Sb eq	3.00E-06	3.52E-06	3.99E-06	4.70E-06	6.28E-06
ADPF	MJ _{NCV}	1470	1660	1910	2240	2730

TABLE 12. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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}	5.40E+01	6.08E+01	6.89E+01	8.08E+01	9.84E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.40E+01	6.08E+01	6.89E+01	8.08E+01	9.84E+01
PENRE	MJ _{NCV}	1.75E+03	1.98E+03	2.28E+03	2.69E+03	3.29E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.76E+03	1.99E+03	2.29E+03	2.71E+03	3.31E+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	2.81E+00	2.82E+00	2.82E+00	2.84E+00	2.83E+00
HWD	kg	9.21E-04	1.08E-03	1.28E-03	1.56E-03	1.96E-03
NHWD	kg	2.86E+00	3.36E+00	3.98E+00	4.84E+00	6.09E+00
RWD	kg	1.80E-03	2.15E-03	2.45E-03	2.91E-03	4.04E-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

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TABLE 13. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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 CO₂ eq	154	178	202	245	302
ODP	kg CFC11 eq	1.10E-05	1.26E-05	1.42E-05	1.71E-05	2.08E-05
AP	kg SO ₂ eq	0.930	1.07	1.23	1.50	1.85
EP	kg PO ₄ ³⁻ eq	0.124	0.142	0.161	0.194	0.237
POCP	kg C ₂ H ₄ eq	0.0571	0.0634	0.0706	0.0824	0.098
ADPE	kg Sb eq	3.01E-06	3.53E-06	3.99E-06	4.72E-06	6.30E-06
ADPF	MJ _{NCV}	1570	1790	2030	2430	2970

TABLE 14. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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}	6.19E+01	7.06E+01	7.93E+01	9.51E+01	1.16E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.19E+01	7.06E+01	7.93E+01	9.51E+01	1.16E+02
PENRE	MJ _{NCV}	1.94E+03	2.22E+03	2.52E+03	3.04E+03	3.73E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.95E+03	2.24E+03	2.54E+03	3.06E+03	3.75E+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	2.80E+00	2.80E+00	2.80E+00	2.82E+00	2.80E+00
HWD	kg	1.28E-03	1.52E-03	1.76E-03	2.19E-03	2.75E-03
NHWD	kg	3.91E+00	4.64E+00	5.37E+00	6.71E+00	8.42E+00
RWD	kg	1.80E-03	2.16E-03	2.46E-03	2.92E-03	4.04E-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

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TABLE 15. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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 CO₂ eq	144	163	187	225	277
ODP	kg CFC11 eq	1.02E-05	1.14E-05	1.30E-05	1.55E-05	1.88E-05
AP	kg SO ₂ eq	0.891	1.02	1.17	1.42	1.75
EP	kg PO ₄ ³⁻ eq	0.117	0.132	0.151	0.180	0.220
POCP	kg C ₂ H ₄ eq	0.0558	0.0615	0.0686	0.0799	0.0948
ADPE	kg Sb eq	2.97E-06	3.48E-06	3.94E-06	4.65E-06	6.21E-06
ADPF	MJ _{NCV}	1510	1690	1920	2290	2800

TABLE 16. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE METROPOLITAN (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}	5.75E+01	6.41E+01	7.27E+01	8.64E+01	1.05E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.75E+01	6.41E+01	7.27E+01	8.64E+01	1.05E+02
PENRE	MJ _{NCV}	1.83E+03	2.06E+03	2.36E+03	2.83E+03	3.46E+03
PENRM	MJ _{NCV}	9.29E+00	1.12E+01	1.31E+01	1.56E+01	2.16E+01
PENRT	MJ _{NCV}	1.84E+03	2.07E+03	2.37E+03	2.84E+03	3.48E+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	2.78E+00	2.78E+00	2.77E+00	2.79E+00	2.77E+00
HWD	kg	1.12E-03	1.28E-03	1.52E-03	1.88E-03	2.36E-03
NHWD	kg	3.44E+00	3.93E+00	4.66E+00	5.76E+00	7.24E+00
RWD	kg	1.80E-03	2.15E-03	2.45E-03	2.92E-03	4.04E-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

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TABLE 17. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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	217	235	287	235	287
ODP	kg CFC11 eq	1.62E-05	1.78E-05	2.14E-05	1.78E-05	2.14E-05
AP	kg SO ₂ eq	1.26	1.37	1.68	1.37	1.68
EP	kg PO ₄ ³⁻ eq	0.178	0.197	0.238	0.197	0.238
POCP	kg C ₂ H ₄ eq	0.0694	0.0741	0.0867	0.0741	0.0867
ADPE	kg Sb eq	7.59E-06	4.62E-06	5.48E-06	4.62E-06	5.48E-06
ADPF	MJ _{NCV}	2100	2280	2740	2280	2740

TABLE 18. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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}	8.30E+01	8.87E+01	1.08E+02	8.87E+01	1.08E+02
PERM	MJ _{NCV}	0.00E+00	2.89E-02	3.37E-02	2.89E-02	3.37E-02
PERT	MJ _{NCV}	8.30E+01	8.87E+01	1.08E+02	8.87E+01	1.08E+02
PENRE	MJ _{NCV}	2.68E+03	2.90E+03	3.51E+03	2.90E+03	3.51E+03
PENRM	MJ _{NCV}	9.29E+00	9.79E+00	1.18E+01	9.79E+00	1.18E+01
PENRT	MJ _{NCV}	2.69E+03	2.91E+03	3.52E+03	2.91E+03	3.52E+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	2.41E+00	2.59E+00	2.57E+00	2.61E+00	2.57E+00
HWD	kg	2.03E-03	2.19E-03	2.75E-03	2.19E-03	2.75E-03
NHWD	kg	7.40E+00	6.94E+00	8.68E+00	6.94E+00	8.68E+00
RWD	kg	2.87E-03	2.08E-03	2.49E-03	2.08E-03	2.49E-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

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TABLE 19. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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 CO₂ eq	200	235	289	335	374
ODP	kg CFC11 eq	1.51E-05	1.76E-05	2.15E-05	2.45E-05	2.72E-05
AP	kg SO ₂ eq	1.16	1.36	1.69	1.95	2.14
EP	kg PO ₄ ³⁻ eq	0.167	0.195	0.241	0.273	0.297
POCP	kg C ₂ H ₄ eq	0.0649	0.0735	0.0875	0.099	0.115
ADPE	kg Sb eq	4.80E-06	5.75E-06	7.98E-06	1.12E-05	1.19E-05
ADPF	MJ _{NCV}	1950	2270	2780	3190	3610

TABLE 20. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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}	7.77E+01	9.02E+01	1.10E+02	1.30E+02	1.68E+02
PERM	MJ _{NCV}	3.85E-02	4.71E-02	6.54E-02	1.09E-01	1.12E-01
PERT	MJ _{NCV}	7.77E+01	9.02E+01	1.10E+02	1.30E+02	1.68E+02
PENRE	MJ _{NCV}	2.48E+03	2.89E+03	3.55E+03	4.10E+03	4.57E+03
PENRM	MJ _{NCV}	9.08E+00	1.09E+01	1.62E+01	2.07E+01	2.16E+01
PENRT	MJ _{NCV}	2.48E+03	2.90E+03	3.57E+03	4.12E+03	4.60E+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	2.69E+00	2.64E+00	2.58E+00	2.59E+00	1.61E+01
HWD	kg	1.84E-03	2.19E-03	2.76E-03	3.28E-03	3.52E-03
NHWD	kg	5.96E+00	7.14E+00	9.03E+00	1.11E+01	1.18E+01
RWD	kg	2.02E-03	2.44E-03	3.59E-03	4.78E-03	4.98E-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

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TABLE 21. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (SA), PER M³

Indicator	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa@ 3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
GWP	kg CO₂ eq	251	291	279	323
ODP	kg CFC11 eq	1.83E-05	2.11E-05	2.02E-05	2.33E-05
AP	kg SO ₂ eq	1.47	1.67	1.62	1.87
EP	kg PO ₄ ³⁻ eq	0.208	0.231	0.224	0.258
POCP	kg C ₂ H ₄ eq	0.0747	0.0869	0.0799	0.0909
ADPE	kg Sb eq	2.26E-05	5.37E-06	4.26E-06	4.88E-06
ADPF	MJ _{NCV}	2450	2750	2620	3010

TABLE 22. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (SA), PER M³

Parameter	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa@ 3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
PERE	MJ _{NCV}	1.05E+02	1.12E+02	1.09E+02	1.25E+02
PERM	MJ _{NCV}	2.07E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	1.05E+02	1.12E+02	1.09E+02	1.25E+02
PENRE	MJ _{NCV}	3.11E+03	3.54E+03	3.39E+03	3.91E+03
PENRM	MJ _{NCV}	1.54E+01	1.81E+01	1.26E+01	1.46E+01
PENRT	MJ _{NCV}	3.12E+03	3.56E+03	3.40E+03	3.93E+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	2.70E+00	2.64E+00	2.70E+00	2.70E+00
HWD	kg	2.39E-03	2.87E-03	2.78E-03	3.26E-03
NHWD	kg	1.17E+01	8.72E+00	8.45E+00	9.90E+00
RWD	kg	6.43E-03	3.39E-03	2.48E-03	2.86E-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 Metropolitan region

TABLE 23. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (SA), PER M³

Indicator	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa
GWP	kg CO₂ eq	179	209	186	208	179	209
ODP	kg CFC11 eq	1.37E-05	1.57E-05	1.41E-05	1.57E-05	1.37E-05	1.57E-05
AP	kg SO ₂ eq	1.03	1.21	1.07	1.20	1.03	1.21
EP	kg PO ₄ ³⁻ eq	0.149	0.172	0.154	0.171	0.149	0.172
POCP	kg C ₂ H ₄ eq	0.0604	0.0676	0.0637	0.0687	0.0604	0.0676
ADPE	kg Sb eq	2.08E-06	2.35E-06	7.48E-06	8.45E-06	2.08E-06	2.35E-06
ADPF	MJ _{NCV}	1750	2010	1830	2020	1750	2010

TABLE 24. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (SA), PER M³

Parameter	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa
PERE	MJ _{NCV}	6.75E+01	7.81E+01	7.01E+01	7.82E+01	6.75E+01	7.81E+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}	6.75E+01	7.81E+01	7.01E+01	7.82E+01	6.75E+01	7.81E+01
PENRE	MJ _{NCV}	2.22E+03	2.56E+03	2.31E+03	2.57E+03	2.22E+03	2.56E+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}	2.22E+03	2.57E+03	2.32E+03	2.57E+03	2.22E+03	2.57E+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	2.56E+00	2.57E+00	2.65E+00	2.61E+00	2.61E+00	2.62E+00
HWD	kg	1.63E-03	1.95E-03	1.67E-03	1.91E-03	1.63E-03	1.95E-03
NHWD	kg	4.95E+00	5.90E+00	6.59E+00	7.53E+00	4.95E+00	5.90E+00
RWD	kg	1.04E-03	1.17E-03	2.25E-03	2.50E-03	1.04E-03	1.17E-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

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TABLE 25. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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 CO₂ eq	191	147	65.8	111	115
ODP	kg CFC11 eq	1.37E-05	1.21E-05	5.33E-06	8.47E-06	8.99E-06
AP	kg SO ₂ eq	1.09	0.880	0.350	0.616	0.652
EP	kg PO ₄ ³⁻ eq	0.146	0.146	0.0552	0.0892	0.0983
POCP	kg C ₂ H ₄ eq	0.0558	0.0548	0.0321	0.0429	0.0439
ADPE	kg Sb eq	2.23E-06	8.26E-06	8.95E-07	1.36E-06	1.56E-06
ADPF	MJ _{NCV}	1770	1600	720	1120	1180

TABLE 26. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE METROPOLITAN (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}	7.92E+01	5.24E+01	3.04E+01	4.79E+01	4.75E+01
PERM	MJ _{NCV}	0.00E+00	8.66E-02	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	7.92E+01	5.25E+01	3.04E+01	4.79E+01	4.75E+01
PENRE	MJ _{NCV}	2.31E+03	1.91E+03	8.59E+02	1.40E+03	1.45E+03
PENRM	MJ _{NCV}	5.74E+00	1.47E+01	9.84E-01	2.24E+00	3.17E+00
PENRT	MJ _{NCV}	2.32E+03	1.92E+03	8.60E+02	1.40E+03	1.46E+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	1.62E+00	2.97E+00	3.34E+00	3.28E+00	3.26E+00
HWD	kg	1.98E-03	9.79E-04	4.13E-04	9.37E-04	9.14E-04
NHWD	kg	6.01E+00	3.88E+00	1.27E+00	2.85E+00	2.79E+00
RWD	kg	1.08E-03	3.70E-03	3.01E-04	5.38E-04	7.11E-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



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Environmental profiles and parameters

Product table list

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

Normal class concrete products

Table no. 1 and 2 41

- 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. 3 and 4 42

- 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. 5 and 6 43

- 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. 7 and 8 44

- 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

Lower carbon concrete products

Table no. 9 and 10 45

- ENVISIA® 20 MPa
- ENVISIA® 25 MPa
- ENVISIA® 32 MPa
- ENVISIA® 40 MPa
- ENVISIA® 50 MPa
- ENVISIA® 65 MPa
- ENVISIA® 80 MPa

Table no. 11 and 12 46

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

Table no. 13 and 14 47

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

Table no. 15 and 16 48

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

Concrete for special applications

Table no. 17 and 18 49

- DIT 32 MPa 20 mm SLIPFORM
- DIT 40 MPa 20 mm PUMP B1 EXP
- DIT 50 MPa 20 mm PUMP C1 EXP
- WATER AUTHORITY 40 MPa B2 EXP
- WATER AUTHORITY 50 MPa C1 EXP

Table no. 19 and 20 50

- 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 51

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

Table no. 23 and 24 52

- KERB HAND 25 MPa
- KERB HAND 32 MPa
- KERB MACHINE 280 kg
- KERB MACHINE 320 kg
- PAVING 25 MPa
- PAVING 32 MPa

Table no. 25 and 26 53

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

Cradle-to-gate GWP-GHG summary (kg CO₂ eq/m³)

Adelaide East and Adelaide Hills region

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		
203	225	257	308	377		
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		
169	184	211	249	307		
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		
178	197	224	267	328		
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		
157	173	195	232	291		
ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
128	140	159	186	227	253	258
ENVIROCRETE® PLUS 20 MPa	ENVIROCRETE® PLUS 25 MPa	ENVIROCRETE® PLUS 32 MPa	ENVIROCRETE® PLUS 40 MPa	ENVIROCRETE® PLUS 50 MPa		
143	153	175	207	254		
ENVIROCRETE® 30% 20 MPa	ENVIROCRETE® 30% 25 MPa	ENVIROCRETE® 30% 32 MPa	ENVIROCRETE® 30% 40 MPa	ENVIROCRETE® 30% 50 MPa		
164	201	208	248	302		
ENVIROCRETE® 40% 20 MPa	ENVIROCRETE® 40% 25 MPa	ENVIROCRETE® 40% 32 MPa	ENVIROCRETE® 40% 40 MPa	ENVIROCRETE® 40% 50 MPa		
152	168	191	228	277		
DTI 32 MPa SLIPFORM	DTI 40 MPa PUMP B1 EXP	DTI 50 MPa PUMP C1 EXP	WATER AUTHORITY 40 MPa B2 EXP	WATER AUTHORITY 50 MPa C1 EXP		
225	241	293	241	293		
HIGH SLUMP 32 MPa	HIGH SLUMP 40 MPa	HIGH SLUMP 50 MPa	HIGH WORKABILITY 65 MPa	HIGH WORKABILITY 80 MPa		
204	244	295	340	379		
TREMIE 40 MPa	POST TENSIONED 40 MPa 25 MPa @3 DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa			
259	295	286	330			
KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa	
185	215	184	207	185	215	
NO FINES 6:1	FLOWABLE FILL 5 MPa PIPEFILL	STABILISED SAND 3%	STABILISED SAND 7%	STABILISED SAND 10%		
196	146	62.1	108	112		

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TABLE 1. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	203	225	257	308	377
ODP	kg CFC11 eq	1.47E-05	1.62E-05	1.84E-05	2.19E-05	2.67E-05
AP	kg SO ₂ eq	1.14	1.26	1.45	1.74	2.14
EP	kg PO ₄ ³⁻ eq	0.158	0.174	0.198	0.236	0.288
POCP	kg C ₂ H ₄ eq	0.0650	0.0706	0.0788	0.0919	0.110
ADPE	kg Sb eq	3.49E-06	3.81E-06	4.37E-06	5.19E-06	6.71E-06
ADPF	MJ _{NCV}	1940	2130	2420	2870	3490

TABLE 2. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	7.71E+01	8.52E+01	9.75E+01	1.17E+02	1.43E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	7.71E+01	8.52E+01	9.75E+01	1.17E+02	1.43E+02
PENRE	MJ _{NCV}	2.48E+03	2.74E+03	3.12E+03	3.72E+03	4.55E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	2.49E+03	2.75E+03	3.13E+03	3.74E+03	4.57E+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	3.27E+00	3.28E+00	3.31E+00	3.34E+00	3.36E+00
HWD	kg	1.95E-03	2.19E-03	2.55E-03	3.10E-03	3.86E-03
NHWD	kg	5.94E+00	6.67E+00	7.75E+00	9.44E+00	1.17E+01
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.10E-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

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TABLE 3. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	169	184	211	249	307
ODP	kg CFC11 eq	1.26E-05	1.37E-05	1.56E-05	1.84E-05	2.25E-05
AP	kg SO ₂ eq	0.956	1.05	1.20	1.43	1.77
EP	kg PO ₄ ³⁻ eq	0.140	0.153	0.174	0.205	0.251
POCP	kg C ₂ H ₄ eq	0.0568	0.0609	0.0676	0.0780	0.0930
ADPE	kg Sb eq	3.34E-06	3.63E-06	4.16E-06	4.92E-06	6.39E-06
ADPF	MJ _{NCV}	1660	1810	2050	2410	2940

TABLE 4. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	6.15E+01	6.71E+01	7.67E+01	9.06E+01	1.12E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.15E+01	6.71E+01	7.67E+01	9.06E+01	1.12E+02
PENRE	MJ _{NCV}	2.09E+03	2.27E+03	2.59E+03	3.06E+03	3.75E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	2.10E+03	2.29E+03	2.60E+03	3.08E+03	3.77E+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	3.19E+00	3.19E+00	3.19E+00	3.21E+00	3.19E+00
HWD	kg	1.48E-03	1.63E-03	1.91E-03	2.31E-03	2.91E-03
NHWD	kg	4.51E+00	4.99E+00	5.84E+00	7.05E+00	8.87E+00
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.09E-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

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TABLE 5. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	178	197	224	267	328
ODP	kg CFC11 eq	1.26E-05	1.39E-05	1.58E-05	1.87E-05	2.28E-05
AP	kg SO ₂ eq	1.04	1.16	1.32	1.58	1.95
EP	kg PO ₄ ³⁻ eq	0.141	0.155	0.176	0.209	0.256
POCP	kg C ₂ H ₄ eq	0.0613	0.0665	0.0742	0.0861	0.103
ADPE	kg Sb eq	3.41E-06	3.72E-06	4.24E-06	5.04E-06	6.54E-06
ADPF	MJ _{NCV}	1760	1930	2190	2590	3160

TABLE 6. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	6.61E+01	7.32E+01	8.32E+01	9.91E+01	1.22E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.61E+01	7.32E+01	8.32E+01	9.91E+01	1.22E+02
PENRE	MJ _{NCV}	2.20E+03	2.43E+03	2.76E+03	3.28E+03	4.02E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	2.21E+03	2.44E+03	2.77E+03	3.29E+03	4.04E+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	3.20E+00	3.21E+00	3.24E+00	3.27E+00	3.28E+00
HWD	kg	1.55E-03	1.75E-03	2.03E-03	2.47E-03	3.11E-03
NHWD	kg	4.76E+00	5.37E+00	6.22E+00	7.55E+00	9.50E+00
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.09E-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

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TABLE 7. ENVIRONMENTAL PROFILES (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	157	173	195	232	291
ODP	kg CFC11 eq	1.14E-05	1.25E-05	1.40E-05	1.66E-05	2.06E-05
AP	kg SO ₂ eq	0.933	1.03	1.17	1.40	1.75
EP	kg PO ₄ ³⁻ eq	0.130	0.143	0.161	0.191	0.237
POCP	kg C ₂ H ₄ eq	0.0565	0.0609	0.0672	0.0778	0.0941
ADPE	kg Sb eq	3.32E-06	3.61E-06	4.11E-06	4.88E-06	6.37E-06
ADPF	MJ _{NCV}	1600	1750	1960	2310	2870

TABLE 8. ENVIRONMENTAL PARAMETERS (A1-A3), NORMAL CLASS CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	5.71E+01	6.28E+01	7.03E+01	8.35E+01	1.05E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.71E+01	6.28E+01	7.03E+01	8.35E+01	1.05E+02
PENRE	MJ _{NCV}	1.97E+03	2.16E+03	2.43E+03	2.88E+03	3.59E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.98E+03	2.17E+03	2.44E+03	2.89E+03	3.62E+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	3.16E+00	3.16E+00	3.18E+00	3.19E+00	3.19E+00
HWD	kg	1.28E-03	1.44E-03	1.64E-03	2.00E-03	2.60E-03
NHWD	kg	3.93E+00	4.41E+00	5.02E+00	6.12E+00	7.95E+00
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.09E-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

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TABLE 9. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Indicator	Unit	ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
GWP	kg CO₂ eq	128	140	159	186	227	253	258
ODP	kg CFC11 eq	8.51E-06	9.17E-06	1.04E-05	1.20E-05	1.45E-05	1.61E-05	1.66E-05
AP	kg SO ₂ eq	0.861	0.947	1.09	1.28	1.57	1.76	1.78
EP	kg PO ₄ ³⁻ eq	0.107	0.117	0.132	0.155	0.187	0.208	0.210
POCP	kg C ₂ H ₄ eq	0.0544	0.0587	0.0652	0.0748	0.0884	0.0973	0.106
ADPE	kg Sb eq	3.26E-06	3.55E-06	4.12E-06	4.79E-06	6.18E-06	6.88E-06	1.20E-05
ADPF	MJ _{NCV}	1440	1560	1770	2050	2480	2750	2900

TABLE 10. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Parameter	Unit	ENVISIA® 20 MPa	ENVISIA® 25 MPa	ENVISIA® 32 MPa	ENVISIA® 40 MPa	ENVISIA® 50 MPa	ENVISIA® 65 MPa	ENVISIA® 80 MPa
PERE	MJ _{NCV}	4.57E+01	4.96E+01	5.66E+01	6.56E+01	8.00E+01	8.89E+01	1.18E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-01
PERT	MJ _{NCV}	4.57E+01	4.96E+01	5.66E+01	6.56E+01	8.00E+01	8.89E+01	1.18E+02
PENRE	MJ _{NCV}	1.67E+03	1.81E+03	2.06E+03	2.40E+03	2.92E+03	3.25E+03	3.34E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.59E+01	2.13E+01	2.39E+01	2.03E+01
PENRT	MJ _{NCV}	1.68E+03	1.82E+03	2.07E+03	2.42E+03	2.94E+03	3.27E+03	3.36E+03
SM	kg	1.51E+02	1.72E+02	1.98E+02	2.44E+02	3.02E+02	3.43E+02	3.48E+02
RSF	MJ _{NCV}	0.00E+00	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	0.00E+00
FW	m ³	3.11E+00	3.12E+00	3.12E+00	3.12E+00	3.11E+00	3.08E+00	1.66E+01
HWD	kg	7.47E-04	8.19E-04	9.72E-04	1.16E-03	1.49E-03	1.69E-03	1.54E-03
NHWD	kg	2.37E+00	2.60E+00	3.07E+00	3.68E+00	4.68E+00	5.30E+00	6.06E+00
RWD	kg	1.93E-03	2.13E-03	2.51E-03	2.97E-03	3.98E-03	4.48E-03	4.81E-03
CRU	kg	0.00E+00	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	9.60E+01
MER	kg	0.00E+00	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	0.00E+00

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TABLE 11. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	143	153	175	207	254
ODP	kg CFC11 eq	9.63E-06	1.02E-05	1.17E-05	1.37E-05	1.66E-05
AP	kg SO ₂ eq	0.921	1.00	1.14	1.37	1.69
EP	kg PO ₄ ³⁻ eq	0.117	0.126	0.143	0.169	0.206
POCP	kg C ₂ H ₄ eq	0.0570	0.0606	0.0676	0.0782	0.0934
ADPE	kg Sb eq	3.36E-06	3.65E-06	4.16E-06	4.94E-06	6.43E-06
ADPF	MJ _{NCV}	1540	1650	1870	2200	2690

TABLE 12. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	5.15E+01	5.51E+01	6.30E+01	7.45E+01	9.17E+01
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.15E+01	5.51E+01	6.30E+01	7.45E+01	9.17E+01
PENRE	MJ _{NCV}	1.83E+03	1.95E+03	2.23E+03	2.63E+03	3.23E+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	1.97E+03	2.24E+03	2.65E+03	3.25E+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	3.19E+00	3.20E+00	3.23E+00	3.26E+00	3.28E+00
HWD	kg	9.53E-04	1.03E-03	1.22E-03	1.48E-03	1.87E-03
NHWD	kg	2.98E+00	3.21E+00	3.80E+00	4.62E+00	5.82E+00
RWD	kg	1.98E-03	2.17E-03	2.51E-03	3.04E-03	4.09E-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

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TABLE 13. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE HILLS (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 CO₂ eq	164	201	208	248	302
ODP	kg CFC11 eq	1.16E-05	1.37E-05	1.45E-05	1.72E-05	2.07E-05
AP	kg SO ₂ eq	0.990	1.31	1.26	1.51	1.85
EP	kg PO ₄ ³⁻ eq	0.132	0.165	0.166	0.197	0.238
POCP	kg C ₂ H ₄ eq	0.0591	0.0756	0.0716	0.0831	0.098
ADPE	kg Sb eq	3.38E-06	3.77E-06	4.20E-06	4.99E-06	6.47E-06
ADPF	MJ _{NCV}	1670	2100	2080	2460	2970

TABLE 14. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE HILLS (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}	6.07E+01	7.09E+01	7.67E+01	9.14E+01	1.11E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	6.07E+01	7.09E+01	7.67E+01	9.14E+01	1.11E+02
PENRE	MJ _{NCV}	2.06E+03	2.54E+03	2.59E+03	3.07E+03	3.73E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	2.07E+03	2.55E+03	2.60E+03	3.09E+03	3.75E+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	3.19E+00	3.23E+00	3.20E+00	3.20E+00	3.20E+00
HWD	kg	1.36E-03	1.52E-03	1.80E-03	2.19E-03	2.71E-03
NHWD	kg	4.17E+00	4.69E+00	5.51E+00	6.73E+00	8.32E+00
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.09E-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

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TABLE 15. ENVIRONMENTAL PROFILES (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	152	168	191	228	277
ODP	kg CFC11 eq	1.06E-05	1.17E-05	1.31E-05	1.56E-05	1.87E-05
AP	kg SO ₂ eq	0.941	1.05	1.19	1.43	1.75
EP	kg PO ₄ ³⁻ eq	0.124	0.136	0.154	0.183	0.221
POCP	kg C ₂ H ₄ eq	0.0575	0.0623	0.0693	0.0805	0.0952
ADPE	kg Sb eq	3.33E-06	3.63E-06	4.14E-06	4.92E-06	6.39E-06
ADPF	MJ _{NCV}	1580	1740	1960	2320	2800

TABLE 16. ENVIRONMENTAL PARAMETERS (A1-A3), LOWER CARBON CONCRETE, ADELAIDE EAST AND ADELAIDE 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}	5.53E+01	6.12E+01	6.91E+01	8.27E+01	1.00E+02
PERM	MJ _{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	5.53E+01	6.12E+01	6.91E+01	8.27E+01	1.00E+02
PENRE	MJ _{NCV}	1.92E+03	2.12E+03	2.39E+03	2.85E+03	3.45E+03
PENRM	MJ _{NCV}	1.03E+01	1.14E+01	1.34E+01	1.62E+01	2.19E+01
PENRT	MJ _{NCV}	1.93E+03	2.13E+03	2.41E+03	2.87E+03	3.48E+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	3.19E+00	3.19E+00	3.20E+00	3.22E+00	3.21E+00
HWD	kg	1.16E-03	1.32E-03	1.52E-03	1.88E-03	2.32E-03
NHWD	kg	3.58E+00	4.07E+00	4.68E+00	5.78E+00	7.14E+00
RWD	kg	1.98E-03	2.18E-03	2.52E-03	3.04E-03	4.09E-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

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TABLE 17. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE 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	225	241	293	241	293
ODP	kg CFC11 eq	1.68E-05	1.80E-05	2.18E-05	1.80E-05	2.18E-05
AP	kg SO ₂ eq	1.30	1.40	1.71	1.40	1.71
EP	kg PO ₄ ³⁻ eq	0.186	0.202	0.244	0.202	0.244
POCP	kg C ₂ H ₄ eq	0.0722	0.0764	0.0900	0.0764	0.0900
ADPE	kg Sb eq	7.59E-06	7.26E-06	8.58E-06	7.26E-06	8.58E-06
ADPF	MJ _{NCV}	2180	2340	2820	2340	2820

TABLE 18. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE 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}	8.18E+01	8.79E+01	1.07E+02	8.79E+01	1.07E+02
PERM	MJ _{NCV}	0.00E+00	7.21E-02	8.46E-02	7.21E-02	8.46E-02
PERT	MJ _{NCV}	8.18E+01	8.80E+01	1.07E+02	8.80E+01	1.07E+02
PENRE	MJ _{NCV}	2.77E+03	2.96E+03	3.59E+03	2.96E+03	3.59E+03
PENRM	MJ _{NCV}	8.14E+00	1.19E+01	1.43E+01	1.19E+01	1.43E+01
PENRT	MJ _{NCV}	2.78E+03	2.98E+03	3.61E+03	2.98E+03	3.61E+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	3.05E+00	3.13E+00	3.13E+00	3.15E+00	3.13E+00
HWD	kg	2.07E-03	2.20E-03	2.76E-03	2.20E-03	2.76E-03
NHWD	kg	7.56E+00	7.42E+00	9.24E+00	7.42E+00	9.24E+00
RWD	kg	2.66E-03	2.84E-03	3.39E-03	2.84E-03	3.39E-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 and Adelaide Hills region

TABLE 19. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	204	244	295	340	379
ODP	kg CFC11 eq	1.52E-05	1.82E-05	2.19E-05	2.49E-05	2.76E-05
AP	kg SO ₂ eq	1.18	1.41	1.71	1.97	2.17
EP	kg PO ₄ ³⁻ eq	0.171	0.204	0.246	0.278	0.303
POCP	kg C ₂ H ₄ eq	0.0660	0.0768	0.0904	0.102	0.119
ADPE	kg Sb eq	6.61E-06	8.02E-06	1.02E-05	1.14E-05	1.22E-05
ADPF	MJ _{NCV}	1990	2360	2840	3240	3670

TABLE 20. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE HILLS (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}	7.56E+01	8.99E+01	1.09E+02	1.27E+02	1.66E+02
PERM	MJ _{NCV}	6.78E-02	8.37E-02	1.03E-01	1.15E-01	1.20E-01
PERT	MJ _{NCV}	7.57E+01	9.00E+01	1.09E+02	1.27E+02	1.66E+02
PENRE	MJ _{NCV}	2.52E+03	3.00E+03	3.62E+03	4.16E+03	4.64E+03
PENRM	MJ _{NCV}	1.04E+01	1.28E+01	1.74E+01	1.94E+01	2.03E+01
PENRT	MJ _{NCV}	2.53E+03	3.01E+03	3.64E+03	4.18E+03	4.66E+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	3.13E+00	3.12E+00	3.10E+00	3.11E+00	1.67E+01
HWD	kg	1.84E-03	2.24E-03	2.76E-03	3.28E-03	3.52E-03
NHWD	kg	6.29E+00	7.67E+00	9.45E+00	1.11E+01	1.19E+01
RWD	kg	2.51E-03	3.09E-03	4.12E-03	4.60E-03	4.82E-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 and Adelaide Hills region

TABLE 21. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Indicator	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25@3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
GWP	kg CO₂ eq	259	295	286	330
ODP	kg CFC11 eq	1.91E-05	2.14E-05	2.10E-05	2.42E-05
AP	kg SO ₂ eq	1.51	1.69	1.66	1.91
EP	kg PO ₄ ³⁻ eq	0.216	0.235	0.232	0.266
POCP	kg C ₂ H ₄ eq	0.0817	0.0891	0.0866	0.098
ADPE	kg Sb eq	2.27E-05	5.24E-06	4.07E-06	4.65E-06
ADPF	MJ _{NCV}	2550	2790	2710	3100

TABLE 22. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Parameter	Unit	TREMIE 40 MPa	POST TENSIONED 40 MPa 25@3DAYS	SHOTCRETE 32 MPa	SHOTCRETE 40 MPa
PERE	MJ _{NCV}	1.02E+02	1.09E+02	1.05E+02	1.21E+02
PERM	MJ _{NCV}	2.07E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	1.02E+02	1.09E+02	1.05E+02	1.21E+02
PENRE	MJ _{NCV}	3.22E+03	3.59E+03	3.49E+03	4.01E+03
PENRM	MJ _{NCV}	1.54E+01	1.69E+01	1.15E+01	1.34E+01
PENRT	MJ _{NCV}	3.23E+03	3.60E+03	3.50E+03	4.03E+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	3.02E+00	3.16E+00	2.92E+00	2.91E+00
HWD	kg	2.39E-03	2.87E-03	2.78E-03	3.26E-03
NHWD	kg	1.17E+01	8.73E+00	8.46E+00	9.91E+00
RWD	kg	6.43E-03	3.17E-03	2.26E-03	2.61E-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 and Adelaide Hills region

TABLE 23. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Indicator	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa
GWP	kg CO₂ eq	185	215	184	207	185	215
ODP	kg CFC11 eq	1.40E-05	1.62E-05	1.37E-05	1.53E-05	1.40E-05	1.62E-05
AP	kg SO ₂ eq	1.07	1.24	1.06	1.20	1.07	1.24
EP	kg PO ₄ ³⁻ eq	0.154	0.178	0.153	0.171	0.154	0.178
POCP	kg C ₂ H ₄ eq	0.0618	0.0696	0.0592	0.0651	0.0618	0.0696
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}	1800	2070	1790	1990	1800	2070

TABLE 24. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE HILLS (SA), PER M³

Parameter	Unit	KERB HAND 25 MPa	KERB HAND 32 MPa	KERB MACHINE 280 kg	KERB MACHINE 320 kg	PAVING 25 MPa	PAVING 32 MPa
PERE	MJ _{NCV}	6.60E+01	7.66E+01	6.81E+01	7.65E+01	6.61E+01	7.67E+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}	6.60E+01	7.66E+01	6.81E+01	7.65E+01	6.61E+01	7.67E+01
PENRE	MJ _{NCV}	2.28E+03	2.64E+03	2.27E+03	2.54E+03	2.28E+03	2.64E+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}	2.29E+03	2.64E+03	2.27E+03	2.54E+03	2.29E+03	2.64E+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	3.09E+00	3.11E+00	3.22E+00	3.18E+00	3.14E+00	3.16E+00
HWD	kg	1.67E-03	1.98E-03	1.67E-03	1.91E-03	1.67E-03	1.98E-03
NHWD	kg	5.07E+00	6.03E+00	6.10E+00	7.25E+00	5.08E+00	6.03E+00
RWD	kg	9.12E-04	1.02E-03	1.70E-03	2.11E-03	9.12E-04	1.02E-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 and Adelaide Hills region

TABLE 25. ENVIRONMENTAL PROFILES (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE 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 CO₂ eq	196	146	62.1	108	112
ODP	kg CFC11 eq	1.42E-05	1.20E-05	4.85E-06	8.08E-06	8.67E-06
AP	kg SO ₂ eq	1.12	0.874	0.330	0.600	0.638
EP	kg PO ₄ ³⁻ eq	0.152	0.144	0.0513	0.0859	0.0955
POCP	kg C ₂ H ₄ eq	0.0593	0.0535	0.0281	0.0396	0.0412
ADPE	kg Sb eq	1.14E-06	8.88E-06	7.74E-07	1.19E-06	1.37E-06
ADPF	MJ _{NCV}	1810	1580	670	1070	1140

TABLE 26. ENVIRONMENTAL PARAMETERS (A1-A3), CONCRETE FOR SPECIAL APPLICATIONS, ADELAIDE EAST AND ADELAIDE 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}	7.44E+01	4.95E+01	2.37E+01	4.11E+01	4.06E+01
PERM	MJ _{NCV}	0.00E+00	1.01E-01	0.00E+00	0.00E+00	0.00E+00
PERT	MJ _{NCV}	7.44E+01	4.96E+01	2.37E+01	4.11E+01	4.06E+01
PENRE	MJ _{NCV}	2.36E+03	1.89E+03	7.98E+02	1.35E+03	1.41E+03
PENRM	MJ _{NCV}	0.00E+00	1.46E+01	8.74E-01	1.91E+00	2.73E+00
PENRT	MJ _{NCV}	2.36E+03	1.90E+03	7.99E+02	1.35E+03	1.41E+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	2.57E+00	2.66E+00	2.75E+00	2.70E+00	2.68E+00
HWD	kg	1.98E-03	9.81E-04	4.13E-04	9.37E-04	9.14E-04
NHWD	kg	6.00E+00	4.04E+00	1.28E+00	2.86E+00	2.79E+00
RWD	kg	7.93E-06	3.81E-03	2.62E-04	4.57E-04	6.10E-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 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:

- Conservation work to provide habitat for the threatened **legless lizard** and **spiny rice-flower** at Deer Park Quarry in Victoria.
- 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.
- 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.

The industry associations representing the Concrete and Cement industries are:

- Cement, Concrete and Aggregates Australia (CCAA).
- Green Building Council of Australia (GBCA)
- Infrastructure Sustainability Council (ISC)
- Concrete Institute of Australia (CIA)
- Australian Pozzolan Association (APoZA)
- Business Council of Australia (BCA)
- Cement Industry Federation (CIF)

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