ENVIRONMENTAL PRODUCT DECLARATION.

In accordance with ISO 14025:2006 and EN 15804+A2:2019/AC:2021

Programme: The International EPD® System, www.environdec.com

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AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

MARKHAM
adding life to concrete

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.epd-australasia.com

Company Introduction

MARKHAM is a leading sustainable solutions provider for new and existing concrete structures in New Zealand, Australia and the United Kingdom.

MARKHAM headquarters and manufacturing operations are based in Napier, where all admixture and spray-on products are produced.

MARKHAM products are then distributed across New Zealand or exported.

MARKHAM products are used for curing, sealing, waterproofing, and extending durability treatments for concrete structures.

These products are used in building construction and civil infrastructure projects globally.

Everything MARKHAM offers is about "adding life to concrete" and extending the concrete service life performance.

Note that MARKHAM has a data management system to capture procurement and production data - including raw materials, packaging materials (such as pails and totes) and product outputs.

Javi Otero (Manager – Health & Safety, QA and Sustainability) and Mark Smith (Director) managed the data collection and validation for MARKHAM.

Product covered by EPD

AQURON 1000

AQURON 1000 is a spray-applied colloidal silica hydrogel concrete sealer to increase durability for new and existing concrete.

AQURON 1000 complies to ASTM C309 - https://www.astm.org/c0309-19.html

Table 1: Industry classification

Product	Classification	Code	Category
Product name/type	UN CPC Ver.2.1	3427	Cyanides, cyanide oxides and complex cyanides; fulminates, cyanates and thiocyanates; silicates; borates; perborates
	ANZSIC 2006	1813	Basic Inorganic Chemical Manufacturing

Declared Unit

The declared unit for the EPD is one litre (1 L) of product, plus its packaging ready for delivery at the factory gate. The weight of the packaging is not included in the 1 L of product.

Table 2: Product information

Product	Density (kg/L)	Type
AQURON 1000	1.0	Spray Applied Colloidal Silica Hydrogel

Content Declaration

Due to the confidential nature of the composition, upper and lower limits are given per ingredient.

Table 3: Content declaration per 1 L of AQURON 1000

Product component	Density, kg/L of component	Concentration, ml/L of product	Post-consumer recycled material, weight % of product	Biogenic material, weight-% of product	Biogenic material, kg C/ declared unit
AQURON Super Concentrate 2006 – Clear Colloidal Nano Silica Liquid	1.10	45 – 96	0	0	0
Clear Silicate Liquid	1.40	64 – 300	0	0	0
AQURON Corrosion Inhibitor Concentrate Additive	1.10	0 – 23	0	0	0
Acrylic Sealer	1.20	0 – 5.3	0	0	0
Water	1.00	627 - 904	0	0	0
Total		1 000	0	0	0

Table 4: Composition of product packaging (per 1 L of AQURON 1000)

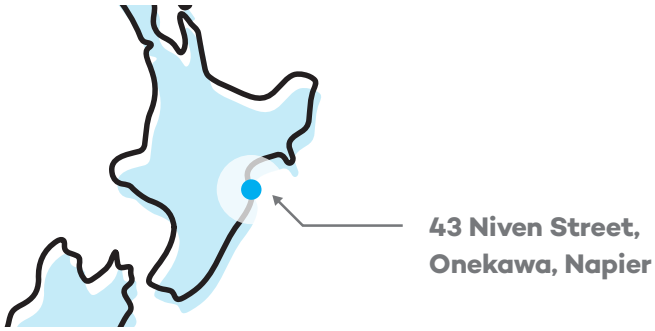
Packaging materials	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C/ declared unit
Pails (20L)	0.0665	5.54 – 6.65	0
Timber pallets	0.0240	2.00 – 2.40	0.101
Plastic wrap (LDPE)	0.000347	0.0289 – 0.0347	0
Plastic strapping (polypropylene)	0.000111	0.00925 – 0.0111	0
Labels (BOPP film)	0.00126	0.105 – 0.126	0
Total	0.0922	7.68 - 9.22	0.101

Dangerous substances from the candidate list of SVHC for Authorisation

None of the materials in this EPD are on the Candidate List of substances of very high concern (SVHC), by the European REACH Regulation at a concentration greater than 0.1% by mass.

Manufacturing Process

Production of the AQURON products starts with the sourcing of the raw materials to MARKHAM's batching site. These raw materials are transported from Dallas (USA), Los Angeles (USA), Auckland (New Zealand), Wellington (New Zealand), and Hastings (New Zealand).



The batching system involves mixing the raw materials with a specified amount of water, as outlined in the product compositions. The last input in this system is electricity which was provided as primary data for the total annual consumption.

For AQURON 1000, MARKHAM uses pails (20 L) as the packaging material. Majority of the raw materials supplied are delivered in IBCs (Intermediate Bulk Containers) which MARKHAM washes and reuses to package their other products such as AQURON 300.

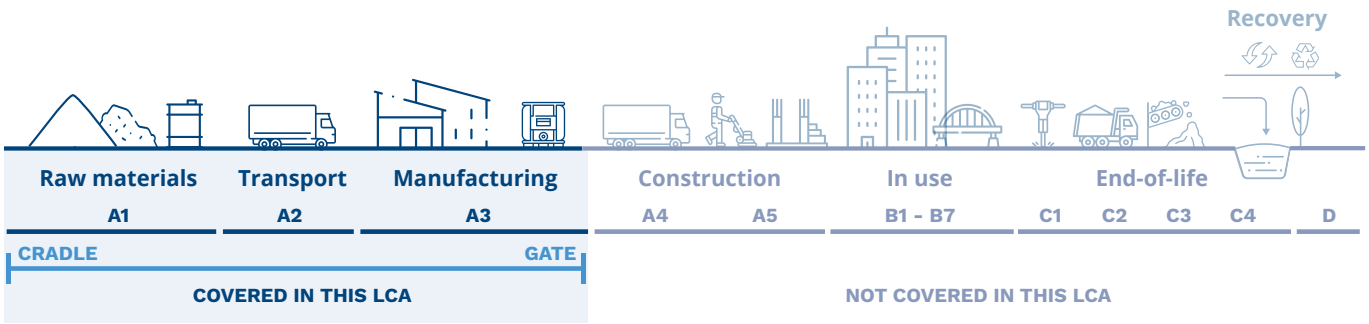


Figure 1: Life cycle stages covered in this EPD

System Boundaries

This EPD is of the type d - 'cradle to gate (Modules A1-A3)', given:

1. the product is physically integrated with other products during construction (i.e. concrete batching) so it cannot be physically separated from them at end-of-life;
2. the product is no longer identifiable at end-of-life as a result of a chemical transformation process; and
3. the product does not contain biogenic carbon.

Other life cycle stages (Modules A4-A5, B1-B7, C1-C4 and D) are dependent on particular scenarios and best modelled at the building level.

Table 5: Modules included in the scope of the EPD

	Product stage			Construction process stage		Use stage							End-of-life stage				Recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	US/NZ	GLO	NZ	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data	57%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: products	Not Applicable			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero).

The processes below are included in the product system to be studied.

Product stage (Modules A1-A3)

Module A1 (raw material supply) includes the production of raw materials used as ingredients in the products.

Module A2 (transportation) includes the transport of both the ingredients and packaging used for the products. These are all delivered to the manufacturing site in Napier with sources from Dallas (USA), Los Angeles (USA), Auckland (New Zealand), Wellington (New Zealand), and Hastings (New Zealand). International transport is by ship while all domestic transport is by truck.

Module A3 (manufacturing) includes both the production and packaging of the final products. Production processes involve weighing, batching, pumping, and mixing which all involve the use of electricity. Final products are then packaged in pails (20 L). Products packaged in pails will also require the use of timber pallets, plastic wrap, plastic strapping, and labels.

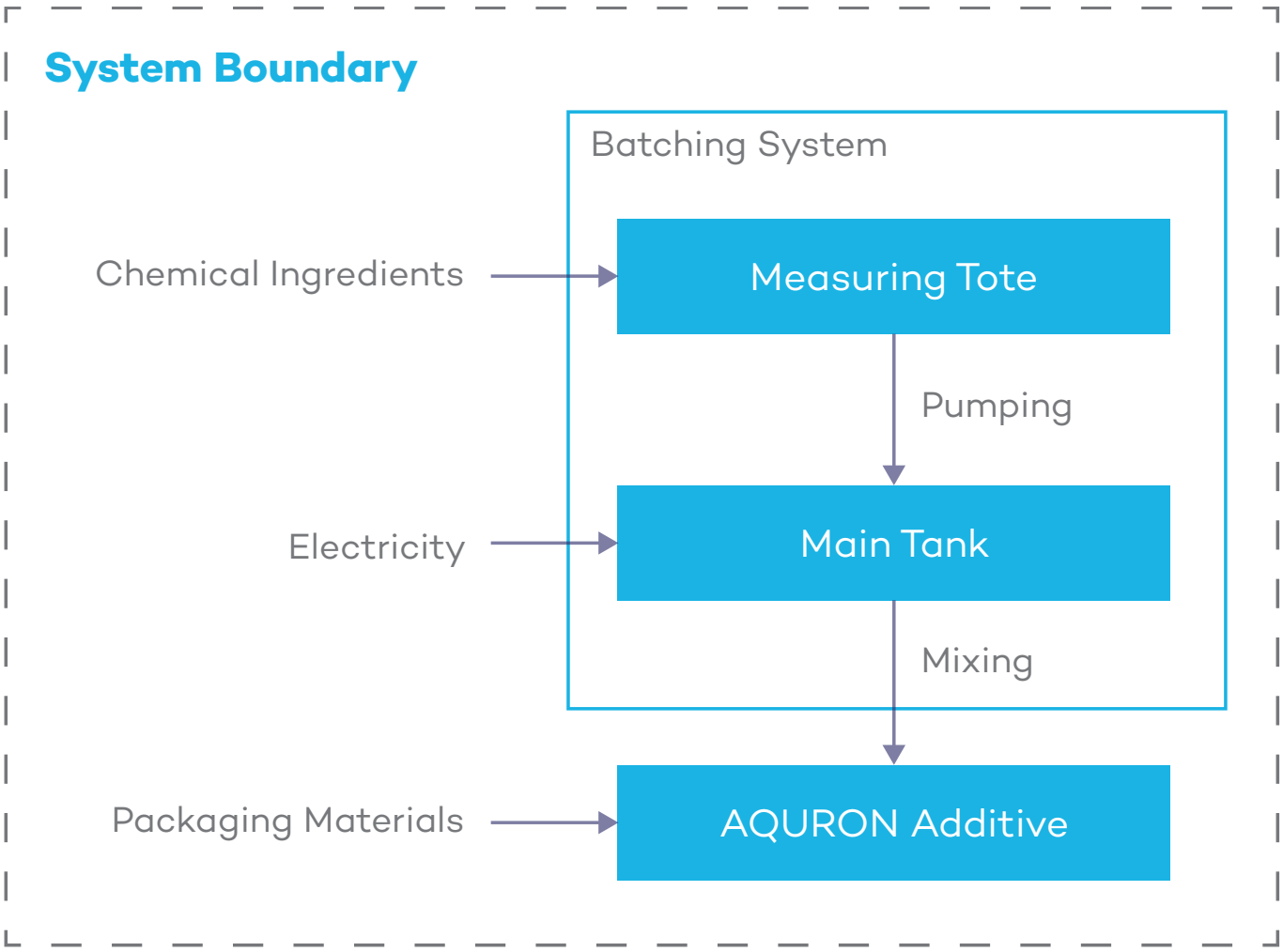


Figure 2: High level manufacturing processes (A1-A3)

Life cycle inventory (LCI) data and assumptions

Primary data for producing AQURON products were collected using customised data collection templates, for the period 1 January 2023 to 31 December 2023. All primary data falls within the mandatary 5-year period required under EN 15804 and the PCR. Background data was used for input materials sourced from raw material and packaging suppliers.

Upstream data

The study uses primary data from the batching plant in Napier. Predominantly, raw materials are sourced from Dallas (USA), Los Angeles (USA), Auckland (New Zealand), Wellington (New Zealand), and Hastings (New Zealand), and all are sent to Napier for production. Supporting background data specific to USA and New Zealand or Australia was used whenever possible. All electricity and water data were regionalised for New Zealand.

LCA software and database

The study was conducted in Microsoft Excel, using the life cycle inventory data from ecoinvent, Allocation, cut-off, EN15804, ecoinvent database version 3.10 (Wernet, 2016) and Levasil CB30 EPD (Nouryon, 2022) for raw materials, electricity, packaging and transportation. Ecoinvent datasets were downloaded from the ecoinvent website as an Excel file; this file presents environmental impact results for a comprehensive list of background datasets. Note that these datasets have not been used in conjunction with an LCA software. The reference year for the data ranges from 2016-2023 and is within the 10-year limit allowable for generic data under EN 15804 and PCR.

Electricity

The composition of the residual electricity grid mix of New Zealand is modelled using published data for the period 1 April 2021 – 31 March 2022 (BraveTrace, 2023). The New Zealand residual electricity mix is made up of hydro (56.6%), geothermal (19.7%) natural gas (12.5%), wind (6.55%), coal (4.25%), biomass (0.266%) and biogas (0.160%).

Onsite consumption (3.00%), and the medium voltage (1kV-60kV) grid's transmission and distribution losses (3.17%) are calculated based on data from the Ministry of Business, Innovation & Employment (MBIE, 2023).

The emission factor for the New Zealand residual grid mix for the GWP-GHG indicator is 0.156 kg CO_2-eq./kWh (medium voltage, based on EF3.1).

Allocation

Multi-output Allocations: Multi-output allocation generally follows the requirements of ISO 14044, section 4.3.4.2. The electricity input was provided as primary data for the total annual consumption. This was then allocated to each product based on their respective production amounts, resulting in an equal distribution of electricity consumption per L of product.

Allocation of background data: Allocation of background data (energy and materials) is documented online at https://ecoquery.ecoinvent.org/3.10/EN15804/search.

Cut off criteria

No cut-off criteria are defined for this study. For the processes within the system boundary, all available energy and material flow data have been included in the study.

Transport

Average transportation distances and modes of transport were supplied by MARKHAM for the raw materials, operating materials, and auxiliary materials to the production facility.

Table 6: Transport parameters

Product component/material	Transport mode	Dataset	Distance (km)
AQURON Super Concentrate 2006 – Clear Colloidal Nano Silica Liquid	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	2 400 (US) + 400 (NZ)
AQURON Super Concentrate 2006 – Clear Colloidal Nano Silica Liquid	Ocean-Going Ship	Transport, freight, sea, container ship	10 500
Clear Silicate Liquid	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	300
Pails, 20L (virgin)	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	400
Timber Pallets	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	25
Plastic Strapping	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	25
Plastic Wrap	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	25
Labels	Truck	Transport, freight, lorry 16-32 metric ton, EURO6	350

Capital goods and infrastructure

In this study capital goods and infrastructure have been included in the background datasets as provided by ecoinvent (Wernet, 2016). It is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from these datasets.

Other Assumptions

Data for electricity was provided for the overall manufacturing site during the study period. The total consumption was split into electricity for process related (batching) and overheads as 10% and 90%, respectively.

Assessment Indicators

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804 reference package based on EF 3.1 is used.

- Table 7 contains the core environmental impact indicators in accordance with EN 15804:2012+A2:2019, describing the potential environmental impacts of the product.
- Table 8 shows the life cycle inventory indicators for resource use.
- Table 9 displays the life cycle inventory indicators for waste and other outputs.
- Table 10 provides additional environmental impact indicators in accordance with EN 15804:2012+A2:2019.
- Table 11 displays biogenic carbon content indicators.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The use of primary energy is separated into energy used as raw material and energy used as energy carrier as per option C in Annex 3 in the PCR (EPD International, 2024).

Energy indicators (MJ) are always given as net calorific value.

Table 7: EN15804+A2 Core Environmental Impact Indicators

Impact category	Abbreviation	Unit
Climate change – total	GWP-total	kg CO_2-eq.
Climate change – fossil	GWP-fossil	kg CO_2-eq.
Climate change – biogenic	GWP-biogenic	kg CO_2-eq.
Climate change – land use and land use change	GWP-luluc	kg CO_2-eq.
Ozone depletion	ODP	kg CFC11-eq.
Acidification	AP	Mole of H+ eq.
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.
Eutrophication aquatic marine	EP-marine	kg N eq.
Eutrophication terrestrial	EP-terrestrial	Mole of N eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources – minerals and metals[1,2]	ADP-m&m	kg Sb-eq.
Depletion of abiotic resources – fossil fuels[1]	ADP-fossil	MJ
Water use[1]	WDP	m^3 world equiv.

Table 8: Life cycle inventory indicators on use of resources

Indicator	Abbreviation	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ
Use of renewable primary energy resources used as raw materials	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ
Total use of non-renewable primary energy resources	PENRT	MJ
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Total use of net fresh water	FW	m^3

Table 9: Life cycle inventory indicators on waste categories and output flows

Indicator	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for reuse	CRU	kg
Materials for energy recovery	MER	kg
Materials for recycling	MFR	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Table 10: EN15804+A2 Additional Environmental Impact Indicators

Indicator	Abbreviation	Unit
Climate Change[3]	GWP-GHG	kg CO_2-eq
Particulate Matter emissions	PM	Disease incidences
Ionising Radiation – human health[4]	IRP	kBq U235 eq.
Eco-toxicity (freshwater)[1, 4]	ETP-fw	CTUe
Human Toxicity, cancer[1, 4]	HTP-c	CTUh
Human Toxicity, non-cancer[1, 4]	HTP-nc	CTUh
Land use related impacts / soil quality[1, 4]	SQP	Dimensionless

Table 11: Biogenic carbon content indicators

Indicator	Abbreviation	Unit
Biogenic carbon content - product	BCC-prod	kg C
Biogenic carbon content - packaging	BCC-pack	kg C

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Disclaimers

[1] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

[2] The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/ infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

[3] This indicator should be identical to GWP-total except that the CF for biogenic CO_2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2024). In this study it is calculated by subtracting the value of Climate change – biogenic (GWP-biogenic) from the value of Climate change – total (GWP-total) since the ecoinvent Excel LCIA results do not include the indicator.

[4] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is also not measured by this indicator.

Environmental performance

Results for 1 L of AQURON 1000

Table 12: EN15804+A2 Core environmental impact indicators

PARAMETER	UNIT	A1-A3
GWP-total	kg CO_2-eq.	0.317
GWP-fossil	kg CO_2-eq.	0.316
GWP-biogenic	kg CO_2-eq.	8.47E-04
GWP-luluc	kg CO_2-eq.	1.49E-04
ODP	kg CFC11-eq.	1.14E-08
AP	Mole of H+ eq.	0.00159
EP-freshwater	kg P eq.	6.94E-05
EP-marine	kg N eq.	2.98E-04
EP-terrestrial	Mole of N eq.	0.00352
POCP	kg NMVOC eq.	0.00150
ADP-m&m	kg Sb-eq.	4.16E-06
ADP-fossil	MJ	6.47
WDP	m^3 world equiv.	0.0958

Table 13: Use of resources

PARAMETER	UNIT	A1-A3
PERE	MJ	2.08
PERM	MJ	0.579
PERT	MJ	2.65
PENRE	MJ	3.94
PENRM	MJ	0.579
PENRT	MJ	4.51
SM	kg	0.00286
RSF	MJ	0.00115
NRSF	MJ	0
FW	m^3	0.00345

Table 14: Waste production and output flows

PARAMETER	UNIT	A1-A3
HWD	kg	0.0120
NHWD	kg	1.35
RWD	kg	3.92E-06
CRU	kg	0
MER	kg	6.58E-05
MFR	kg	4.27E-07
EEE	MJ	0.00231
EET	MJ	0.0417

Table 15: EN15804+A2 Additional Environmental Impact Indicators

PARAMETER	UNIT	A1-A3
GWP-GHG	kg CO_2-eq	0.315
PM	Disease incidences	1.16E-08
IRP	kBq U235 eq.	0.0155
ETP-fw	CTUe	16.7
HTP-c	CTUh	1.30E-09
HTP-nc	CTUh	3.22E-09
SQP	Dimensionless	8.03

Table 16: Biogenic Carbon Content

PARAMETER	UNIT	A1-A3
BCC-prod	kg C	0
BCC-pack	kg C	0.0102

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

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General information

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

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

The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different.

Declaration owner: MARKHAM adding life to concrete	Markham Distributing Limited Web: www.markhamglobal.com Email: hello@markhamglobal.com Post: 43 Niven Street, Onekawa, Napier 4110, New Zealand
Geographical Scope	New Zealand
Reference Year for Data	2023-01-01 to 2023-12-31
EPD programme operator: EPD® THE INTERNATIONAL EPD® SYSTEM	The International EPD® System Operator: EPD International AB Web: www.environdec.com Email: info@environdec.com Post: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden
Regional programme: AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION	EPD Australasia Limited Web: www.epd-australasia.com Email: info@epd-australasia.com Post: EPD Australasia Limited, 315a Hardy Street, Nelson 7010, New Zealand
Product Category Rules (PCR)	
CEN standard EN 15804 served as the core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction Products, version 1.3.4 (published on 2024-04-30, valid until 2025-06-20)
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com for a list of members
Review Chair:	The most recent review chair: Claudia Peña, PINDA LCT SpA. The review panel may be contacted via the Secretariat: www.environdec.com/contact.

Life cycle assessment (LCA)	
LCA accountability: thinkstep anz	thinkstep Ltd. LCA Practitioner: Barbara Nebel LCA PM: Chanjief Chandrakumar LCA Analyst: Edwin Chu Web: www.thinkstep-anz.com Email: anz@thinkstep-anz.com Post: 11 Rawhiti Road, Pukerua Bay, Wellington 5026, New Zealand
Third-party verification	
Independent verification of the declaration and data, according to ISO 14025:2006, via: EPD verification by individual verifier	
Third party verifier:	Claudia A. Peña (Director of PINDA LCT SpA) Email: pinda.lct@gmail.com
Verifier approved by:	EPD Australasia
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ Yes ☑ No