AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

STEVENSON

ENVIRONMENTAL PRODUCT DECLARATION

FOR READY-MIX CONCRETE

Programme:	The International EPD® System www.environdec.com
Programme operator:	EPD Australasia www.epd-australasia.com
EPD registration number:	S-P-03727
Valid from:	2022-01-24
Valid until:	2027-01-24
Geographical scope:	New Zealand

In accordance with ISO 14025 and EN15804:2012 +A2:2019

PLANET EARTH.
ONE CONCRETE REASON WE'RE ASSESSING OUR PRODUCTS

Stevenson Concrete recognises the importance of providing transparent and independently verified environmental impact information about our products.

An Environmental Product Declaration (EPD) is a robust, science based, independently verified and standardised method for communicating the environmental impacts of products.

This is an average EPD which groups the environmental impacts of 57 concrete products produced at three batching plants located in East Tamaki, Penrose, and Drury into fifteen groups.. All products are manufactured in accordance with NZS 3104:2003 which ensures the products reach their respective target strength.

The creation of this EPD involved extensive data collection from raw material extraction and processing through to ready-mix concrete production. It is based on a cradle-to-gate Life Cycle Assessment (LCA), with end-of-life included. 'Cradle' refers to the raw material extraction and 'the gate' is the gate of Stevenson Concrete plants as the product is ready to go out to customers.

Stevenson, as the EPD owner has the sole ownership, liability, and responsibility for the EPD.

An 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).

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply withEN 15804+A2:2019.

DECLARATION

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ABOUT STEVENSON CONCRETE

We're an experienced team of industry forerunners dedicated to cutting-edge technology that takes care of our people and our planet. A division of Fulton Hogan, Stevenson delivers high-quality aggregates and a wide range of concrete products throughout the North Island of New Zealand.

Stevenson is environmentally responsible and committed to innovation. We focus on new technologies and processes to improve our products so we can provide the best quality solutions for our customers and the environment

OUR COMMITMENT TO SUSTAINABILITY

At Stevenson Concrete we make it a priority to reduce our impact on the environment. Our goal is to reduce our carbon emissions and to support New Zealand in meeting obligations under the Paris Agreement.

Our Environmental Product Declaration provides us with a baseline and we will continually measure ourselves against this to track our carbon-reduction performance.

How we are reducing our carbon:

INNOVATION

Developing new products that reduce the requirement for cement. These include water-reducer and super-plasticiser mixes.

ADMIXES

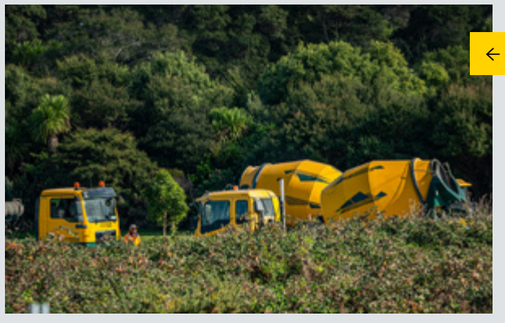
We have a range of admixes including Fly Ash that reduce the need for cement.

CARBON CURE™

Our CarbonCure technology replaces a portion of the cement with injected, captured CO_2. It is the same reliable concrete with a reduced carbon footprint.

Low carbon building materials like Stevenson CarbonCure enable a reduction of embodied carbon in buildings. Consistency of CO_2 mineralised concrete, means that Stevenson CarbonCure can contribute to a project's Green Star points.

The products in this EPD do not use CarbonCure technology.



At our quarry sites, we have extensive planting programmes which help to offset the carbon we create.

WHERE WE PRODUCE OUR READY-MIX CONCRETE

READY-MIX CONCRETE

This EPD covers ready-mix concrete produced at our concrete plants in Penrose, East Tamaki, and Drury.

Our plants are all ISO 9001 certified by the Concrete NZ Plant Audit Scheme. Our production quality control systems comply with the quality assurance requirements of NZS 3104:2003.

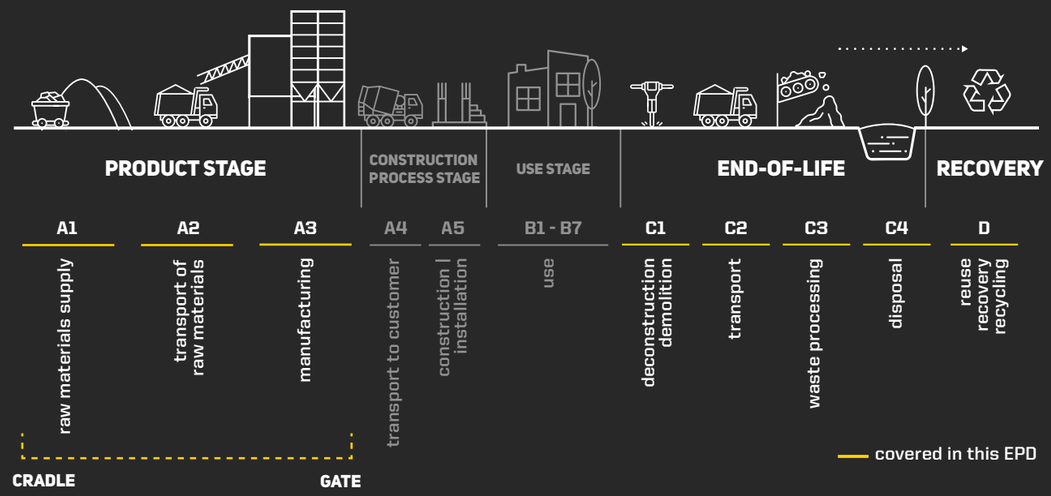
Stevenson operates an IANZ accredited civil engineering laboratory, ensuring all of our products meet the appropriate Australian and New Zealand standards.

PRODUCT LIFE CYCLE

This is a 'cradle-to-gate' type EPD with modules C1-C4 and module D added. This means that the production (modules A1-A3), end-of-life (C1-C4) and recovery (D) stages are modelled in this EPD. The construction process (modules A4-A5) and use stages (B1-B7) are not modelled.

The product stage involves the extraction (cradle) of all raw materials, transport to the batching plant, and the manufacturing/mixing of these materials to make ready-mix concrete ready to be distributed to customers (gate). The end-of-life stage includes the deconstruction of the concrete structure, the transportation to landfill, and the landfilling of the concrete.

Figure 1: Product life cycle ready-mix concrete



PRODUCT COMPOSITION

Table 1: Material composition of Stevenson's ready-mix concrete

constituents	portion of concrete by weight (%)	CAS number
cement	3-19	65997-15-1
flyash	0-8	68131-74-8
microsilica	0-1.5	69012-64-2
aggregates	74-80	mix
chemical admixtures	<0.1	mix
water	6-13	7732-18-5

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.

TECHNICAL INFO

INDUSTRY CLASSIFICATION

The UN CPC and ANZSIC codes applicable to Stevenson ready-mix products in this EPD are shown in Table 2.

Table 2: The UN CPC and ANZSIC codes applicable to Stevenson

PRODUCT	CLASSIFICATION CODE	CATEGORY
Non-refractory mortars and concretes	UN CPC v2.1 37510	Articles of concrete, cement and plaster
Ready-mixed concrete	ANZSIC 2006 203300	Cement, lime, plaster and concrete product manufacturing

SYSTEM BOUNDARY

In Life Cycle Assessments (LCA), the system boundary is a line that divides the processes which are included from everything else. The system boundary of this EPD includes production ('cradle-to-gate', modules A1-A3), end-of-life (modules C1-C4) and the recovery potential of the concrete (module D) - as illustrated in Table 3 below.

Table 3: Modules of the production life cycle included in the EPD (X = declared module; ND = module not declared)

	PRODUCT STAGE			USE STAGE									END-OF-LIFE				RECOVERY
	Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	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
MODULE DECLARED	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x
GEOGRAPHY	NZ	NZ	NZ	-	-	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
SPECIFIC DATA	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION – PRODUCTS	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION - SITES	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

DECLARED UNIT

EPDs that do not cover the full product life cycle from raw material extraction through to end-of-life use the term "declared unit", rather than functional unit. "Declared unit" will be used in the EPDs themselves and is defined as:

1m³ of ready-mixed concrete at the batching plant gate, used for buildings and infrastructure in a range of structural and decorative applications.

PRODUCT STAGE

The product stage looks at the environmental impacts associated with manufacturing the concrete until it leaves the batching plant.

A1 – RAW MATERIAL SUPPLY

- Extraction and processing of raw materials.
- Generation of electricity.
- Processing up to the end-of-waste state.

A2 – TRANSPORTATION

- Transport of raw material to Stevenson batching plants.

A3 – MANUFACTURING

- Material handling, concrete batching and mixing, washing down of plant and equipment, and waste transport and disposal are included.

END-OF-LIFE

The end-of-life stage considers the environmental impacts associated with the concrete after it has reached the end of its useful life in the building.

C1 – DEMOLITION / DECONSTRUCTION

- Deconstruction of discarded concrete.

C2 – TRANSPORT

- Transport of concrete waste to waste processing.

C3 – WASTE PROCESSING

- Processing of concrete waste to prepare it for its final end-of-life fate.

C4 – DISPOSAL

- Landfilling of concrete waste.

D – RESOURCE RECOVERY STAGE

LIFE CYCLE INVENTORY (LCI) DATA AND ASSUMPTIONS

TECHNICAL INFO

Primary data were used for the quarry and batching plants for the period 1st April 2019 to 30th March 2020. Quarry data was taken from Stevenson's Drury quarry located south of Auckland. The cement production data comes from Golden Bay Cement, who provide Stevenson with their cement (S-P-01170, version 1.0).

Secondary data from the GaBi Life Cycle Inventory Database 2021, version 2021.1, (Sphera 2021) was used for input materials sourced from other suppliers such as the production of SCMs, additives and combusted fuels. Most of these datasets have a reference year between 2017 and 2020 and all fall within the 10-year limit allowable for generic data under EN 15804.

Waste data has all been modelled as inert matter going to replace clean fill in landfill, to reflect the real life behaviour of concrete after it is disposed. The end-of-life stage (Modules C1-C4) and resource recovery stage (Module D) are modelled on the assumptions that currently landfill is the main end-of-life option for discarded concrete. This means that modules C3 and D are equal to zero as no waste processing is required and there is no reuse or recycling of the products.

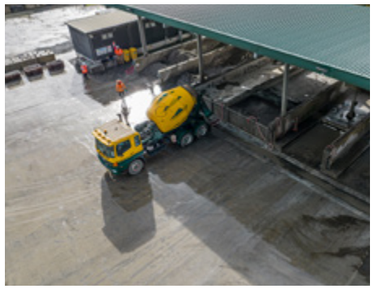
The de-construction of the building is assumed to be done by a 100 kW construction excavator. The transport of demolished concrete to landfill is assumed to be 50 km by truck.

SOFTWARE AND DATABASE

The LCA software used is the GaBi Lifecycle Assessment 10 from Sphera, using the CUP 2021.1 database.

CUT OFF CRITERIA

Environmental impacts relating to personnel, infrastructure, packaging, and production equipment not directly consumed in the process are excluded from the system boundary as per the PCR (EPD International 2021, section 7.5.4). All other reported data were incorporated and modelled using the best available life cycle inventory data.



ALLOCATION

For the batching plants, allocation is applied for the diesel, water for site use, electricity consumption, wastewater and waste outputs, on a per m^3 of concrete produced basis. For the quarry, allocation is applied on a mass basis.

Allocation of background data (such as energy and materials) taken from the GaBi LCI Database 2021 (Sphera, 2021) is documented online. For microsilica price allocation was applied. Fly-ash and other power plant by-products are allocated by market value.

DATA AND ASSUMPTIONS

ENVIRONMENTAL IMPACT INDICATORS

An introduction the core environmental impact indicators is provided below. The best-known effect of each indicator is listed in the descriptions and the abbreviations, in brackets, correspond to the labels in the following results tables.

CLIMATE CHANGE (GLOBAL WARMING POTENTIAL)
(GWP-total, GWPf, GWPb, GWPluc)

A measure of greenhouse gas emissions, such as CO_2 and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare. The Global Warming Potential (GWP) is split into three sub indicators: total (GWPt), fossil (GWPf), biogenic (GWPb), and land-use and land-use change (GWPluluc).

ACIDIFICATION POTENTIAL
(AP)

Acidification Potential is a measure of emissions that cause acidifying effects to the environment. A molecule's acidification potential indicates its capacity to increase the hydrogen ion (H^+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline, and the deterioration of building materials.

PHOTOCHEMICAL OZONE FORMATION POTENTIAL
(POCP)

Photochemical Ozone Formation Potential gives an indication of the emissions from precursors that contribute to ground level smog formation, mainly ozone (O3). Ground level ozone may be harmful to human health and ecosystems and may also damage crops. These emissions are produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides and UV light.

EUTROPHICATION POTENTIAL
(EP-fw, EP-fm, EP-tr)

Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen (N) and phosphorus (P). In aquatic ecosystems where this term is mostly applied, this typically describes a degradation in water quality. Eutrophication can result in an undesirable change in the type of species that flourish and an increase the production of biomass. As the decomposition of biomass consumes oxygen, eutrophication may decrease the available oxygen level in the water column and threaten fish in their ability to respire.

ABIOTIC RESOURCE DEPLETION
(ADP-mm, ADPf)

The consumption of non-renewable resources decreases the availability of these resources and their associated functions in the future. Depletion of mineral resources and non-renewable energy resources are reported separately. Depletion of mineral resources is assessed based on total reserves.

OZONE DEPLETION POTENTIAL
(ODP)

Depletion of the ozone leads to higher levels of UVB ultraviolet rays reaching the earth's surface with detrimental effects on humans and plants. The Ozone Depletion Potential is a measure of air emissions that contribute to the depletion of the stratospheric ozone layer.

WATER USE
(WDP)

Water scarcity is a measure of the stress on a region due to water consumption.

PRODUCT GROUPS

The EPD covers 57 products that are categorised into 15 groups. Grouping has been conducted according to the PCR (EPD International, 2021) .

The first letter of the mix code denotes whether the product is normal (N), pumped (P), precast (X) or blockfill (B).

The next two numbers denote the strength of the product in mega pascals (MPa). The two numbers after that shows the primary aggregate size in millimetres (mm). The letters and numbers after the aggregate size are for specialty mixes, including where fly ash is used to reduce the amount of cement required.

For example, Group 15 contains a mix which is normal (N), 2 MPa (02), and 6 mm aggregate (06).

Table 4: Grouping of Stevenson concrete products included in the EPD.

GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
DR **N2019**	DR **N2010**	DR **P2519**	DR **N3019**	DR **P2010**	DR **P2510**	DR **X4019**	PN **N5013SC**	DR **N4513**	DR **N5019MS8HS**	DR **N5019MS8**	PN **P5010MS8**	PN **N4010SCC**	PN **B5006MS8**	PN **N0206FLOFA**
PN N2019	DR P2019	PN P2519	ET N3019MS8S	DR P3019	PN P2510	PN X4019	PN X5013SRWPH	ET X4519AEA	PN N5019MS8HS	PN N5019MS8	PN P5019MS8	ET N4010SCC	PN X5013MS9	
ET N2019	PN N2010	ET P2519		PN P2010	PN P3010	PN N4019MS9	ET N5013SC		ET N5019MS8HS	ET N5019MS8	ET P5010MS8		ET X5013MS9	
	PN P2019			PN P3019		ET X4019								
	ET N2010			PN P4019FA		ET X4019HE								
	ET P2019			ET P2010		ET X4019S								
				ET P3019		ET P5019SPECFA								
				ET P4019FA		ET X5019FA30								
						ET N4019MS9								
						PN P4019								

DR = Drury

PN = Penrose

ET = East Tamaki

CORE ENVIRONMENTAL IMPACT INDICATORS A1-A3

Table 5: Environmental impact results covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
Climate change (total)	GWP-total	kg CO_2-eq.	204	224	240	258	266	275	310	333	343	366	376	386	391	409	92.2
Climate change (fossil)	GWPf	kg CO_2-eq.	205	225	241	260	268	277	312	334	345	368	379	389	394	411	92.2
Climate change (biogenic)	GWPb	kg CO_2-eq.	-1.01	-1.22	-1.37	-1.47	-1.56	-1.70	-1.89	-1.85	-2.43	-2.29	-2.38	-2.43	-2.56	-2.63	0.0148
Climate change (land use and land use change)	GWPluc	kg CO_2-eq.	0.0267	0.0287	0.0303	0.0333	0.0337	0.0348	0.0370	0.0495	0.0389	0.0450	0.0466	0.0474	0.0519	0.0483	0.0191
Ozone depletion potential	ODP	kg CFC11-eq.	6.65E-14	6.96E-14	7.55E-14	8.79E-14	7.99E-14	8.45E-14	8.82E-14	1.39E-13	9.55E-14	1.21E-13	1.23E-13	1.29E-13	1.45E-13	1.28E-13	3.11E-14
Acidification potential of land and water	AP	Mole of H^+ eq.	0.341	0.366	0.391	0.422	0.428	0.440	0.496	0.535	0.542	0.586	0.599	0.613	0.619	0.647	0.153
Eutrophication potential	EPfw	kg P eq.	1.62E-04	1.57E-04	1.67E-04	1.82E-04	1.68E-04	1.65E-04	1.82E-04	2.71E-04	1.90E-04	2.07E-04	2.19E-04	2.09E-04	2.69E-04	2.04E-04	8.14E-05
Eutrophication aquatic marine	EPm	kg N eq.	0.141	0.151	0.161	0.173	0.175	0.180	0.202	0.214	0.221	0.237	0.242	0.248	0.249	0.261	0.0623
Eutrophication terrestrial	EPt	Mole of N eq.	1.54	1.65	1.76	1.88	1.91	1.97	2.21	2.34	2.41	2.59	2.64	2.71	2.72	2.85	0.679
Photochemical ozone formation	POFP	kg NMVOC eq.	0.356	0.383	0.410	0.442	0.447	0.462	0.518	0.556	0.570	0.613	0.626	0.642	0.647	0.677	0.154
Depletion abiotic resources - minerals & metals*	ADPmm	kg Sb-eq.	2.55E-06	2.71E-06	2.85E-06	3.50E-06	3.04E-06	3.25E-06	3.41E-06	4.28E-06	3.43E-06	5.18E-06	4.91E-06	5.57E-06	4.57E-06	5.67E-06	1.72E-06
Depletion abiotic resources - fossil fuels*	ADPf	MJ	1,190	1,280	1,350	1,460	1,510	1,540	1,710	2,050	1,760	2,020	2,090	2,160	2,230	2,230	816
Water depletion potential*	WDP	m^3 world equiv.	17.2	18.0	18.9	19.6	19.9	20.4	22.3	24.1	23.8	25.1	25.5	26.5	27.2	27.4	14.1

*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.

RESULTS A1 - A3

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS A1-A3

Table 6: Additional environmental impact indicators covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	205	225	241	260	268	277	312	334	345	368	379	389	394	411	96.8
Particulate matter emissions	PM	Disease incidences	3.21E-05	3.02E-05	3.09E-05	3.25E-05	2.97E-05	2.77E-05	3.26E-05	3.18E-05	3.23E-05	3.28E-05	3.34E-05	3.04E-05	3.15E-05	3.11E-05	2.00E-05
Ionising radiation - human health***	IRP	kBq U235 eq.	0.628	0.644	0.709	0.881	0.750	0.792	0.810	1.68	0.830	1.24	1.27	1.36	1.64	1.29	0.326
Ecotoxicity - freshwater*	ETf	CTUe	697	743	797	847	859	894	972	1,150	1,100	1,130	1,170	1,170	1,300	1,220	284
Human toxicity, cancer effects*	HTc	CTUh	8.13E-09	8.58E-09	8.93E-09	1.14E-08	9.65E-09	1.01E-08	1.10E-08	1.36E-08	1.06E-08	1.73E-08	1.63E-08	1.83E-08	1.40E-08	1.89E-08	6.23E-09
Human toxicity, non-cancer effects*	HTnc	CTUh	3.80E-07	3.95E-07	4.08E-07	4.40E-07	4.39E-07	4.59E-07	4.42E-07	6.82E-07	4.53E-07	5.29E-07	5.46E-07	5.50E-07	6.59E-07	5.33E-07	3.41E-07
Land use related impacts / soil quality*	LU	Pt	554	522	537	565	516	484	566	570	566	574	585	533	568	543	337

*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.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***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.

RESOURCE USE INDICATORS A1-A3

Table 7: Resource use indicators results covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
Renewable primary energy as energy carrier	PERE	MJ	227	244	262	357	281	297	356	333	373	596	551	626	402	672	78.3
Renewable primary energy resources as material utilisation	PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	227	244	262	357	281	297	356	333	373	596	551	626	402	672	78.3
Non-renewable primary energy as energy carrier	PENRE	MJ	1,190	1,280	1,350	1,460	1,510	1,540	1,710	2,060	1,760	2,030	2,090	2,160	2,230	2,230	875
Non-renewable primary energy as material utilisation	PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,190	1,280	1,350	1,460	1,510	1,540	1,710	2,060	1,760	2,030	2,090	2,160	2,230	2,230	875
Use of secondary material	SM	kg	0	0	0	0	30.9	0	40.5	175	0	0	46.3	0	115	0	100.0
Use of renewable secondary fuels	RSF	MJ	393	434	470	490	514	542	599	589	706	684	704	717	747	764	99.6
Use of non-renewable secondary fuels	NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water	FW	m^3	0.860	0.828	0.879	1.09	1.04	1.07	1.23	1.29	1.22	1.61	1.58	1.75	1.46	1.85	0.638

WASTE MATERIAL AND OUTPUT FLOW INDICATORS A1-A3

Table 8: Waste categories and output flow indicators covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
Hazardous waste disposed	HWD	kg	6.65E-08	7.24E-08	7.31E-08	7.90E-08	7.81E-08	8.64E-08	7.86E-08	8.78E-08	7.95E-08	1.03E-07	9.65E-08	1.13E-07	9.60E-08	1.11E-07	6.65E-08
Non-hazardous waste disposed	NHWD	kg	59.7	60.8	60.2	63.1	57.6	66.4	48.6	45.8	62.5	59.7	53.6	49.9	44.8	49.0	57.3
Radioactive waste disposed	RWD	kg	0.00395	0.00405	0.00445	0.00578	0.00476	0.00497	0.00526	0.0107	0.00521	0.00849	0.00857	0.00927	0.0104	0.00896	0.00226
Components for re-use	CRU	kg	0.0225	0.0249	0.0269	0.0280	0.0294	0.0310	0.0343	0.0337	0.0404	0.0391	0.0402	0.0410	0.0427	0.0437	0.00570
Materials for recycling	MFR	kg	0.151	0.151	0.151	0.159	0.142	0.165	0.122	0.122	0.159	0.151	0.137	0.122	0.116	0.122	0.136
Materials for energy recovery	MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EN 15804 +A1 CORE ENVIRONMENTAL IMPACT CATEGORIES A1-A3

Table 9: EN 15804+A1 Core environmental impact categories covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
Climate change (total)	GWP	kg CO_2-eq.	203	222	238	256	264	273	308	329	341	363	373	383	388	406	95.3
Ozone depletion potential	ODP	kg CFC11-eq.	8.87E-14	9.28E-14	1.01E-13	1.17E-13	1.07E-13	1.13E-13	1.18E-13	1.85E-13	1.27E-13	1.62E-13	1.64E-13	1.73E-13	1.93E-13	1.71E-13	4.26E-14
Acidification potential of land and water	AP	kg SO_2-eq.	0.247	0.266	0.284	0.307	0.311	0.320	0.361	0.391	0.395	0.427	0.438	0.448	0.452	0.472	0.121
Eutrophication potential	EP	kg PO_4^3-eq.	0.0569	0.0611	0.0653	0.0697	0.0711	0.0732	0.0823	0.0883	0.0905	0.0956	0.0982	0.1000	0.103	0.105	0.0268
Photochemical ozone creation	POCP	kg C_2H_4 eq.	-8.28E-04	8.00E-04	0.00176	0.00354	0.00362	0.00425	0.00552	0.00947	0.00871	0.00997	0.0109	0.0111	0.0128	0.0123	-0.00560
Depletion abiotic resources - minerals & metals	ADPmm	kg Sb-eq.	2.64E-06	2.81E-06	2.95E-06	3.61E-06	3.15E-06	3.37E-06	3.54E-06	4.44E-06	3.58E-06	5.34E-06	5.07E-06	5.74E-06	4.76E-06	5.84E-06	1.83E-06
Depletion abiotic resources - fossil fuels	ADPf	MJ	1,170	1,270	1,330	1,440	1,490	1,530	1,680	2,020	1,740	2,000	2,050	2,130	2,190	2,200	865

GREENSTAR INDICATORS A1-A3

Table 10: Green Star indicators covering modules A1-A3

INDICATOR	ABB.	UNIT	GROUP 01	GROUP 02	GROUP 03	GROUP 04	GROUP 05	GROUP 06	GROUP 07	GROUP 08	GROUP 09	GROUP 10	GROUP 11	GROUP 12	GROUP 13	GROUP 14	GROUP 15
Human toxicity cancer effects	HTc	CTUh	3.14E-09	3.41E-09	3.54E-09	5.24E-09	3.86E-09	4.10E-09	4.85E-09	4.70E-09	4.46E-09	9.12E-09	8.15E-09	9.78E-09	5.25E-09	1.04E-08	2.02E-05
Human toxicity non-cancer effects	HTnc	CTUh	4.90E-11	5.17E-11	5.33E-11	5.39E-11	6.41E-11	5.71E-11	6.98E-11	1.29E-10	5.81E-11	7.06E-11	8.53E-11	7.57E-11	1.16E-10	7.19E-11	0.328
Land use	LU	kg C deficit eq.	94.9	88.1	90.4	94.6	85.3	78.5	93.4	92.8	92.1	92.7	94.7	84.1	90.9	85.0	308
Resource depletion – water (related to local scarcity of water)	GS-RDw	m^3 equiv	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.65E-09
Ionizing radiation	IR	kBq U235 eq	0.628	0.644	0.709	0.878	0.747	0.789	0.807	1.68	0.826	1.24	1.27	1.36	1.64	1.29	3.63E-07
Particulate matter	PM	kg PM2,5-Equiv	0.137	0.128	0.132	0.137	0.125	0.117	0.138	0.135	0.136	0.141	0.143	0.131	0.136	0.129	338

RESULTS A1 - A3

CORE ENVIRONMENTAL IMPACT INDICATORS C1-C4 + D

Table 11: Environmental impact categories covering modules C1-C4 + D

INDICATOR	ABB.	UNITS	C1	C2	C3	C4	D
Climate change (total)	GWP-total	kg CO_2-eq.	1.54	8.02	0	35.3	0
Climate change (fossil)	GWPf	kg CO_2-eq.	1.55	7.68	0	36.3	0
Climate change (biogenic)	GWPb	kg CO_2-eq.	-0.00158	0.344	0	-1.05	0
Climate change (land use and land use change)	GWPluc	kg CO_2-eq.	3.11E-05	1.22E-04	0	0.107	0
Ozone depletion potential	ODP	kg CFC11-eq.	2.27E-16	9.11E-16	0	1.41E-13	0
Acidification potential of land and water	AP	Mole of H+ eq.	0.00776	0.0435	0	0.259	0
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.54E-07	1.42E-06	0	6.09E-05	0
Eutrophication aquatic marine	EPm	kg N eq.	0.00368	0.0218	0	0.0671	0
Eutrophication terrestrial	EPt	Mole of N eq.	0.0403	0.239	0	0.737	0
Photochemical ozone formation	POFP	kg NMVOC eq.	0.0103	0.0417	0	0.203	0
Depletion abiotic resources - minerals & metals*	ADPmm	kg Sb-eq.	2.39E-08	1.32E-07	0	3.43E-06	0
Depletion abiotic resources - fossil fuels*	ADPf	MJ	20.5	107	0	482	0
Water depletion potential*	WDP	m^3 world equiv.	0.0101	0.0628	0	3.90	0

*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

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS C1-C4 + D

Table 12: Additional environmental impact categories covering modules C1-C4 + D

INDICATOR	ABB.	UNIT	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	1.54	7.66	0	24.1	0
Particulate matter emissions	PM	Disease incidences	8.92E-08	1.46E-07	0	2.14E-06	0
Ionising radiation - human health***	IRP	kBq U235 eq.	3.32E-04	2.82E-04	0	0.355	0
Ecotoxicity - freshwater*	ETf	CTUe	7.83	28.7	0	183	0
Human toxicity, cancer effects*	HTc	CTUh	1.34E-10	4.87E-10	0	2.70E-08	0
Human toxicity, non-cancer effects*	HTnc	CTUh	6.87E-09	2.15E-08	0	2.98E-06	0
Land use related impacts / soil quality*	LU	Pt	0.0526	0.223	0	64.8	0

RESOURCE USE INDICATORS C1-C4 + D

Table 13: Resource use indicators results covering modules C1-C4 + D

INDICATOR	VABB.	UNIT	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	0.1000	0.458	0	64.9	0
Renewable primary energy resources as material utilisation	PERM	MJ	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	0.1000	0.458	0	64.9	0
Non-renewable primary energy as energy carrier	PENRE	MJ	20.5	107	0	482	0
Non-renewable primary energy as material utilisation	PENRM	MJ	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	20.5	107	0	482	0
Use of secondary material	SM	kg	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0	0	0	0	0
Use of net fresh water	FW	m^3	1.99E-04	9.42E-04	0	0.119	0

RESULTS C1-C4 + D

*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.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***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.

WASTE MATERIAL AND OUTPUT FLOW INDICATORS C1-C4 + D

Table 14: Waste categories and output flow indicators covering modules C1-C4 + D

INDICATOR	ABB.	UNIT	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	7.40E-11	3.23E-10	0	5.12E-08	0
Non-hazardous waste disposed	NHWD	kg	4.90E-04	0.00170	0	2,400	0
Radioactive waste disposed	RWD	kg	2.83E-06	2.52E-06	0	0.00506	0
Components for re-use	CRU	kg	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0
Exported thermal energy	EET	MJ	0	0	0	0	0

EN 15804 +A1 CORE ENVIRONMENTAL IMPACT CATEGORIES C1-C4 + D

Table 15: EN 15804+A1 Core environmental impact categories covering modules C1-C4 + D

INDICATOR	ABB.	UNIT	C1	C2	C3	C4	D
Climate change (total)	GWP	kg CO_2-eq.	1.52	7.93	0	34.4	0
Ozone depletion potential	ODP	kg CFC11-eq.	3.03E-16	1.21E-15	0	1.88E-13	0
Acidification potential of land and water	AP	kg SO_2-eq.	0.00543	0.0296	0	0.206	0
Eutrophication potential	EP	kg PO_4^3-eq.	0.00123	0.00733	0	0.0233	0
Photochemical ozone creation	POCP	kg C_2H_4 eq.	5.09E-04	-0.0118	0	0.0158	0
Depletion abiotic resources - minerals & metals	ADPmm	kg Sb-eq.	2.39E-08	1.32E-07	0	3.46E-06	0
Depletion abiotic resources - fossil fuels	ADPf	MJ	20.5	107	0	467	0

GREENSTAR INDICATORS C1-C4 + D

Table 16: GreenStar indicators covering modules C1-C4 + D

INDICATOR	ABB.	UNIT	C1	C2	C3	C4	D
Human toxicity cancer effects	HTc	CTUh	3.96E-12	1.32E-11	0	8.98E-10	0
Human toxicity non-cancer effects	HTnc	CTUh	1.36E-12	3.58E-12	0	3.70E-11	0
Land use	LU	kg C deficit eq.	0.00358	0.0191	0	9.95	0
Resource depletion – water (related to local scarcity of water)	GS-RDw	m^3 equiv	0	0	0	0.0574	0
Ionizing radiation	IR	kBq U235 eq	3.31E-04	2.82E-04	0	0.532	0
Particulate matter	PM	kg PM2,5-Equiv.	3.96E-04	7.90E-04	0	0.0163	0

GLOSSARY

Life Cycle

A view of a product system as "consecutive and interlinked stages … from raw material acquisition or generation from natural resources to final disposal" (ISO 14040:2006, section 3.1). This includes all material and energy inputs as well as emissions to air, land and water.

Life Cycle Assessment (LCA)

"Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle" (ISO 14040:2006, section 3.2).

Life Cycle Inventory (LCI)

"Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle" (ISO 14040:2006, section 3.3).

Life Cycle Impact Assessment (LCIA)

"Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product" (ISO 14040:2006, section 3.4).

Life Cycle Interpretation

"Phase of life cycle assessment in which the findings of either the inventory analysis or the impact assessment, or both, are evaluated in relation to the defined goal and scope in order to reach conclusions and recommendations" (ISO 14040:2006, section 3.5).

Environmental Product Declaration (EPD)

"Independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products."

Product Category Rule (PCR)

"Defines the rules and requirements for EPDs of a certain product category."

Functional / Declared Unit

"Quantified performance of a product system for use as a reference unit." (ISO 14040:2006, section 3.20).

Functional unit = LCA/EPD covers entire life cycle "cradle to grave".

Declared unit = LCA/EPD is not based on a full "cradle to grave" LCA, common in construction product EPDs.

Allocation

"Partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems" (ISO 14040:2006, section 3.17).

Foreground System

"Those processes of the system that are specific to it … and/or directly affected by decisions analysed in the study." (JRC, 2010, p. 97) This typically includes first-tier suppliers, the manufacturer itself and any downstream life cycle stages where the manufacturer can exert significant influence. As a general rule, specific (primary) data should be used for the foreground system.

Background System

"Those processes, where due to the averaging effect across the suppliers, a homogenous market with average (or equivalent, generic data) can be assumed to appropriately represent the respective process … and/or those processes that are operated as part of the system but that are not under direct control or decisive influence of the producer of the good…." (JRC, 2010, pp. 97-98) As a general rule, secondary data are appropriate for the background system, particularly where primary data are difficult to collect.

Closed-loop and Open-Loop Allocation of Recycled Material

"An open-loop allocation procedure applies to open-loop product systems where the material is recycled into other product systems and the material undergoes a change to its inherent properties."

"A closed-loop allocation procedure applies to closed-loop product systems. It also applies to open-loop product systems where no changes occur in the inherent properties of the recycled material. In such cases, the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials." (ISO 14044:2006, section 4.3.4.3.3).

Critical Review

"Process intended to ensure consistency between a life cycle assessment and the principles and requirements of the International Standards on life cycle assessment" (ISO 14044:2006, section 3.45).

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PROGRAMME-RELATED INFORMATION AND VERIFICATION

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 from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Declaration owner		**Stevenson**
	Web:	stevenson.co.nz
	Email:	action@stevenson.co.nz
	Post:	Stevenson Private Bag 94000, Manukau City Auckland, 2241
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	Web:	thinkstep-anz.com
	Email:	anz@thinkstep.com
	Post:	thinkstep-anz ltd 11 Rawhiti Road, Pukerua Bay, 5026 Wellington, New Zealand
EPD programme operator:		**EPD Australasia Limited**
	Web:	epd-australasia.com
	Email:	info@epd-australasia.com
	Post:	EPD Australasia Limited, 315a Hardy Street 7010 Nelson, New Zealand
CEN standard EN 15804+A2 served as the core PCR		PCR 2019:14, version 1.11 Construction Products. EPD International., 2021-02-05 C-PCR-003 (TO PCR 2019:14) Concrete and concrete elements, Version 2019-12-20v
PCR review conducted by:		The Technical Committee of the International EPD® System Massimo Marino info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	☐	EPD process certification (Internal)
	☑	EPD verification (External)
Third party verifier:		**Andrew D. Moore**
		Life Cycle Logic Pty. Ltd.
	Web:	lifecyclelogic.com.au
	Email:	Andrew@lifecyclelogic.com.au
	Post:	PO Box 571 Fremantle WA 6959 Australia
	Phone:	+61 4 2432 0057
Approved by:		**EPD Australasia**
Procedure for follow-up of data during EPD validity involved third-party verifier	☑	yes
	☐	no
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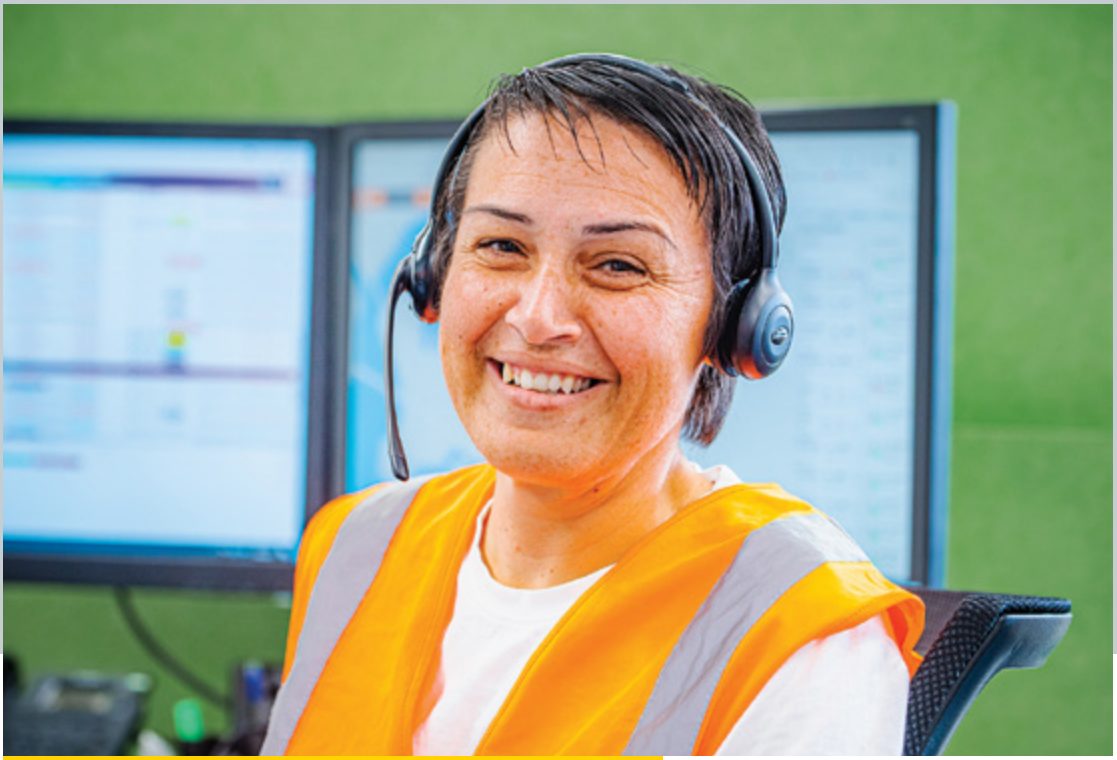
PROGRAMME INFO

AUSTRALASIA EPD®

ENVIRONMENTAL PRODUCT DECLARATION

ENVIRONMENTAL PRODUCT DECLARATION

FOR READY-MIX CONCRETE



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Geographical scope:	New Zealand

In accordance with ISO 14025 and EN15804:2012 +A2:2019

CONTACT

To find out more about Stevenson Concrete's Environmental Product Declaration, talk to our technical team or call 0800 800 611.

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