Environmental Product Declaration

EPD In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

BarChip 48, **BarChip 54** and **BarChip 60** Macro Synthetic Fibre Concrete Reinforcement

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Licensee:	EPD Australasia, www.epd-australasia.com
Type of EPD:	EPD of multiple products, based on the average results of the product group
Products covered in the EPD:	BarChip 48, BarChip 54 and BarChip 60 Macro Synthetic Fibre Concrete Reinforcement
EPD registration number:	EPD-IES-0002054:002
Version date:	2025-12-12
Validity date:	2030-12-11

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

BarChip Inc.
The Synthetic Fibre Experts
www.barchip.com

Information About EPD Owner

BarChip is a global leader in the design, manufacture and distribution of macro synthetic fibre reinforcement for concrete. As part of Hagihara Industries, Japan, BarChip upholds a tradition of innovation and quality rooted in Japanese manufacturing excellence. BarChip operates on a global scale, with a worldwide presence and projects spanning diverse regions and market segments. BarChip brings international experience and insight to the challenge of reinforcing infrastructure that serves communities, drives economies and stands the test of time.

BarChip is certified to ISO 9001:2015 and ISO 14001:2015, and holds CE certification for sale within the European Union. BarChip fibres conform to ASTM C1116 – Type III and EN 14889-2 standards, and have Environmental Product Declaration (EPD) certification through the International EPD System.

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HAGIHARA INDUSTRIES INC

BarChip Inc.
The Synthetic Fibre Experts

Product Information

Product(s) Covered by EPD

This EPD provides weighted average results for BarChip 48, BarChip 54 and BarChip 60 macro synthetic fibre products manufactured at one facility in Indonesia (47 Kawasan Industri KIIC, Jl. Harapan I Lot KK-2a Karawang, 41361, Jawa Barat, Indonesia).

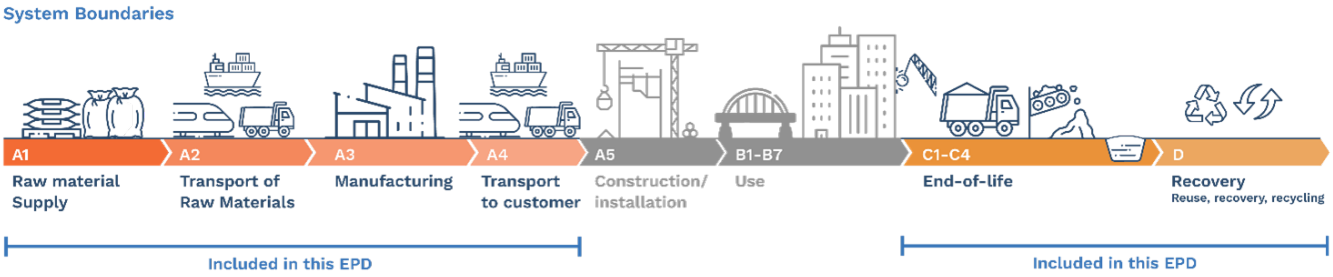
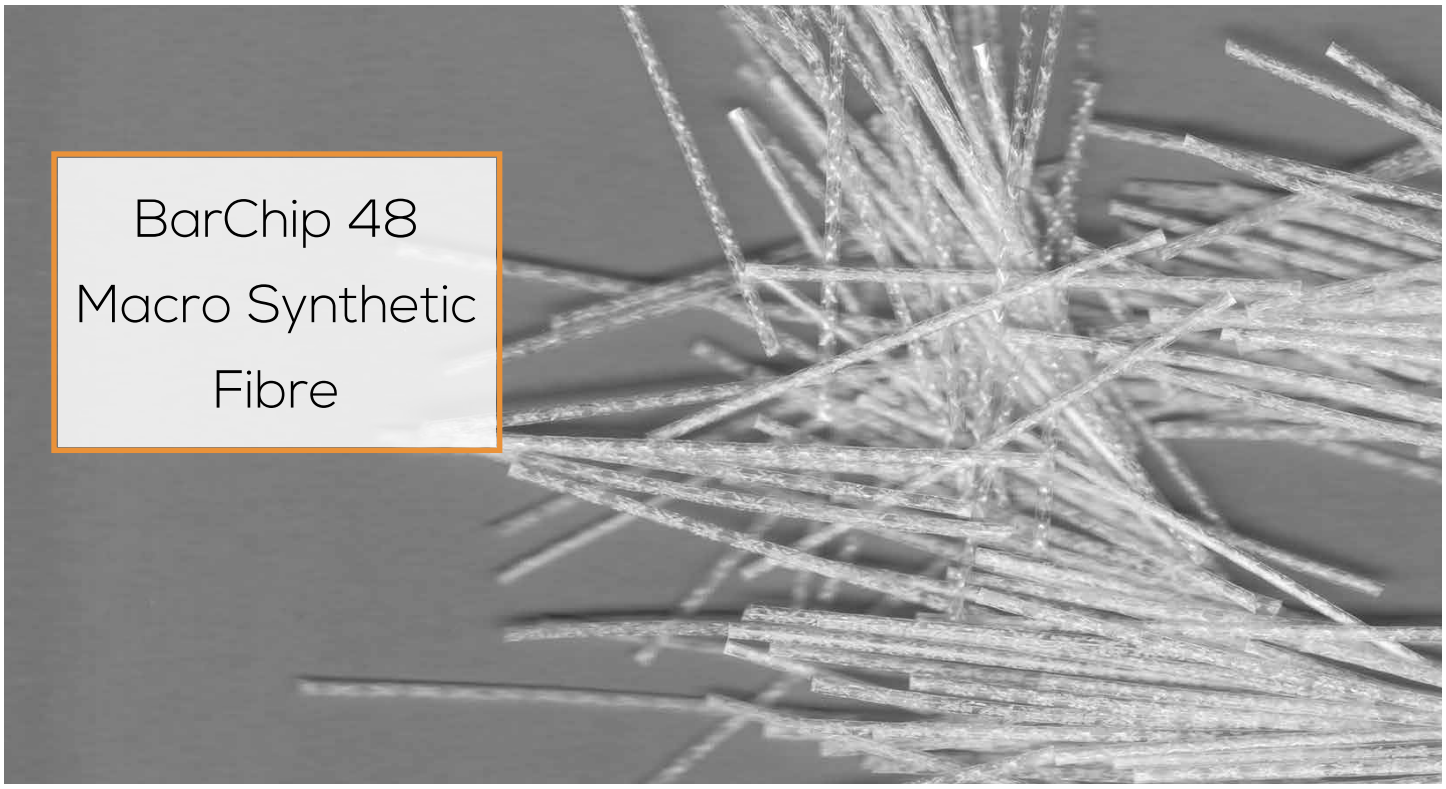


Table 1: Industry classification

Product	Classification	Code	Category
BarChip macro synthetic fibre concrete reinforcement	UN CPC Ver.3	35510	Synthetic filament tow and staple fibres, not carded or combed
	UN CPC Ver.3	35540	Artificial filament tow and staple fibres, not carded or combed
	ANZSIC	1919	Other Polymer Product Manufacturing



Content Declaration

The content declaration for this EPD of multiple products is based on the average results of the product group.

Table 2: Content declaration for one kilogram of product

Product Content	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/ declared unit
Virgin polypropylene	0.984 (0.978 – 0.989)	0	0	0
Additives	0.0160 (0.0110 – 0.0219)	0	0	0
Sum	1	0	0	0

Table 3: Content declaration of Packaging for one kilogram of product

Packaging materials	Mass, kg	Mass -% (versus the product	Biogenic material, kg C/product or declared unit
Paper bag	0.0144 (0 – 0.0180)	1.44 (0 – 1.80)	0.00661 (0 - 0.00828)
Puck wrapping - polyvinyl alcohol wrapping	0.00192 (0 – 0.0140	0.192 (0 – 1.40)	0
Bulk bag - polypropylene	3.00E-04 (0 – 2.20E-03)	0.0300 (0 – 0.220)	0
Plastic pallet – recycled high-density polyethylene	0.0167	1.67	0
Pallet cover – low-density polyethylene	0.00162	0.162	0
Pallet label - paper	2.31E-05	2.31E-03	1.06E-05
Sum	0.0349 (0.0299 – 0.0363)	3.49 (2.99 – 3.63)	0.00662 (1.06E-05 - 0.00829)

Dangerous substances from the candidate list of SVHC for Authorisation

The product declared within this EPD

- Does not release dangerous substances to soil and water
- Does not contain hazardous substances requiring labelling
- Does not contain materials identified in the European Chemicals Agency's Candidate List of Substances of Very High Concern in the products at a concentration greater than 0.1% (ECHA, 2025)

Declared Unit

The declared unit for the EPD is 1 kg of product plus its packaging.

System boundaries

As shown in the table below, this EPD is of the type b Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and additional module A4). Other life cycle stages (modules A5 and B1-B7) are dependent on particular scenarios and best modelled at the building level.

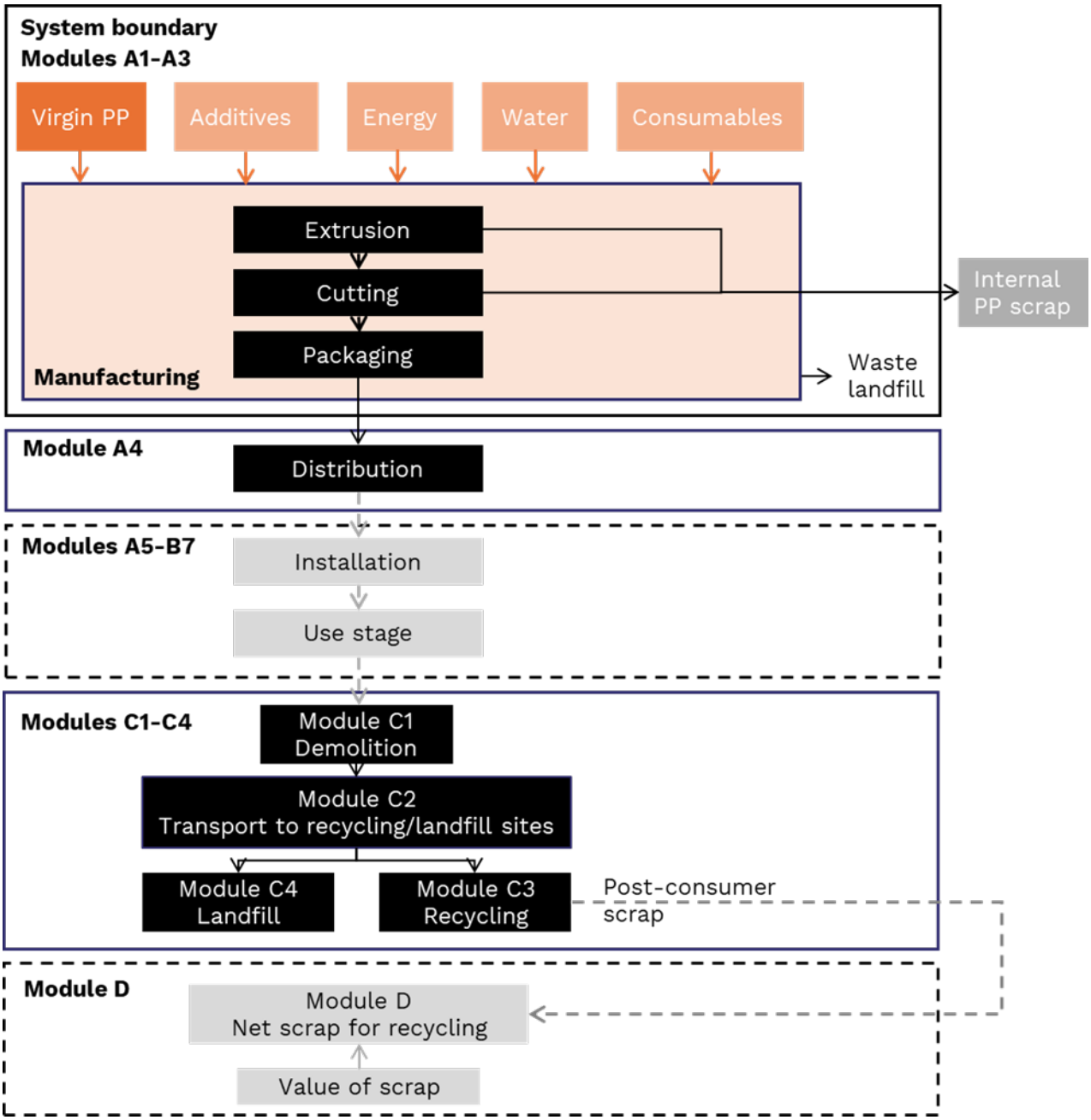
Table 4: Modules included in the scope of the EPD

	Product Stage			Con-struction process stage		Use Stage							End-of-life stage				Beyond product life cycle
	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	Reuse - Recovery - Recycling Potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	ID	GLO	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO

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

BarChip Packaging

Product system process flow diagram



LCA software and database

The LCA was conducted in Microsoft Excel. The Managed LCA Content (MLC) database CUP2024.2 (Sphera, 2024), formerly known as GaBi LCI database, provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

Electricity

The electricity used at BarChip's facility in Indonesia is modelled using the residual electricity mix on the market. Electricity is modelled using MLC datasets for each generation source in the composition detailed below.

The composition of the residual electricity grid

mix of Indonesia is modelled in MS Excel with MLC database based on published data for the calendar year 2023 (I-TRACK Foundation, 2025). The Indonesia residual electricity mix is made up of coal (69.9%), natural gas (19.7%), hydro (7.93%), oil (2.13%), solar (0.226%) and wind (0.161%).

The modelling accounts for losses in distribution. The grid's transmission and distribution losses is 8.63%, according to the data from the Ministry of Energy and Mineral Resources (MEMR, 2024). The losses at the generation facility (onsite consumption) has been included in the data.

The emission factor for the Indonesia residual grid mix for the GWP-GHG indicator is 0.924 kg CO_2-eq/ kWh (based on EF3.1)

Modelling of infrastructure/capital goods

In general, the production and end-of-life processes of infrastructure and capital goods used in the product system are not included within the system boundary. An exception is for capital goods for electricity generation, where the capital goods are very important for modelling of changes towards more renewable generation. Capital goods related to electricity generation is included in all electricity datasets used in this study. This is not regarded as limiting the scope of the inventory or as an incomplete inventory (i.e. a cut-off).

Allocation

Allocation of co-products

Following the requirements of PCR 2019:14 v2.0.1 section 4.5.1 (EPD International, 2025b), co-product allocation was applied for polypropylene scrap losses during manufacturing. Synthetic fibres are the main product produced and sold by BarChip. Polypropylene scrap losses during manufacture are wastes with an economic value that are not sold but recycled internally for different product systems. The difference in revenue per mass from the product and co-products is greater than 25%. This is therefore considered a co-product, to which economic allocation of A1-A3 impacts is applied. Adopting economic allocation has minimal impacts on the results.

Allocation of waste

The study follows the polluter pays principle for allocation of waste, following the requirements of PCR 2019:14 v2.0.1 section 4.5.2 (EPD International, 2025b) and the system boundary is set where the waste reaches the end-of-waste state. Packaging of raw materials and manufacturing waste materials do not fulfil end-of-waste criteria. Transport of the waste to a disposal (landfill) facility and the disposal (landfill) of the material are included.

Other allocation in production

Packaging is only used for final products. For direct product packaging (puck wrapping, paper bag, bulk bag), the mass of packaging is included in the product bill of materials and no allocation is required.

The total annual mass of distribution/shipping packaging is provided and is allocated by mass across the total throughput of packaged product.

BarChip has sub-meters measuring electricity use across the different process steps. Often the measured electricity accounts for production stages that include multiple unit processes. In such cases, electricity is allocated to a unit process based on whether the process requires electricity use and the mass of valuable output from the unit process. All electricity is allocated within the production system.

Data Quality Assessment

This EPD covers BarChip products from one manufacturing site in Indonesia. Manufacturing data for calendar year 2024 (2024-01-01 to 2024-12-31) is collected. Macro synthetic fibre products are made based on virgin polypropylene via extrusion and cutting processes. The manufacturing site uses electricity from grid. This EPD covers production in Indonesia and end-of-life disposal worldwide. Background data was sourced from the MLC database. The data has fair geographical representativeness, fair technological representativeness and good temporal representativeness.

Production of virgin PP data has fair geographical and technological representativeness. No available data of PP production in Thailand and Indonesia. It accounts for 20 to 55% of GWP-total impact, and 5% to 85% of other core impact indicators.

Proxy datasets are used in modelling additives, consumables, packaging, recycling process, waste treatment. These proxy datasets have poor technological or geographic representativeness. No more representative data is available. Additives, consumables, packaging, recycling process and waste treatment together contribute to less than 5% of GWP-total impact. They account for less than 5% of AP, EP-marine, EP-terrestrial, POCP and ADP-fossil impacts. However, they contribute to 11 to 30% of ODP, EP-freshwater, ADP-minerals&metals and WDP impacts. In addition, consumables have significant impacts on ADP-minerals&metals results.

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

BarChip 48 Reinforcing a Precast Segmental Tunnel Lining

Table 5: Data quality assessment – share of primary data

Process	Source type	Unit	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Generation of electricity used in manufacturing of product	Database	Sphera	2020-2023	Primary data	38.4%
Transport of raw material to manufacturing site	Database	Sphera	2020-2023	Primary data	2.36%
Production of virgin polypropylene	Database	Sphera	2019-2023	Rep. secondary data	0%
Production of virgin high-density polyethylene	Database	Sphera	2023	Rep. secondary data	0%
Production of packaging	Database	Sphera	2023	Rep. secondary data, proxy data	0%
Other processes	Database	Sphera	2020-2023	Rep. secondary data, proxy data	0%
Total share of primary data, of GWP-GHG results for A1-A3*					40.8%

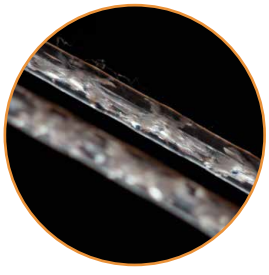
*Note: Total share of primary data may not add up due to rounding.

Modelling of downstream stages

The processes below are included in the product system to be studied. For modules beyond A3, the scenarios included are currently in use and are representative for one of the most probable alternatives.

Distribution stage (module A4)

Distribution includes transport of product to customer (A4). The weighted average distances from Indonesia to the different distribution destinations were calculated based on the percentage of global sales.



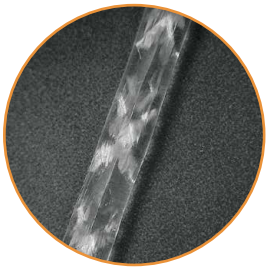


Table 6: Transport to building site

Scenario information	Unit (expressed per declared unit)
Vehicle type used for transport	• 100% of sea transport via container ship, 5,000 to 200,000 dwt payload capacity, deep sea • 99.7% of land transport via truck, Euro mix, 20 - 26t gross weight / 17.3t payload capacity • 0.3% of land transport via rail transport cargo - Diesel, average train, gross tonne weight 1,000t / 726t payload capacity
Distance	• Truck transport: 420 km • Sea transport: 14,200 km • Rail transport: 1.28 km
Capacity utilisation (including empty returns)	• Truck transport: 0.55 • Sea transport: 0.7 • Rail transport: 0.4
Bulk density of transported products	890 – 910 kg/m3
Volume capacity utilisation factor (factor: =1 or < 1 o r ≥ 1 for compressed or nested packaged products)	1

End of Life (Modules C1-C4)

The end-of-life stage (Modules C1-C4) is modelled using a scenario reflecting end-of-life recycling/ landfilling rates for concrete waste in the construction sector. The European Union Guidance on PEF does not have an R2 value for concrete waste (European Commission, 2020). In addition, there is no available data of average recycling rates of reinforced concrete with synthetic fibres. It is assumed that recycling rate is 0%. This is considered a conservative approach. Therefore, no environmental benefits and burdens are calculated in module D. This scenario is currently in use and is representative for one of the most likely scenario alternatives.

Table 7: End of life scenarios for products

Process	Unit (expressed per declared unit of products)
	EOL Main Scenario
Collection process specified by type	1 kg collected with mixed construction waste
Recovery system specified by type	0 kg for recycling*
Disposal specified by type	1 kg for final deposition
Assumptions for scenario development	• C1: Demolition/deconstruction – diesel use of 10 kWh/tonne • C2: 80 km of transport by truck, Euro mix, 20 - 26t gross weight / 17.3t payload capacity, 50% load factor • C4: Compacting of inert construction waste for landfills (including backfilling) – diesel use of 1.6 kWh/tonne

*The European Union Guidance on PEF does not have an R2 value for concrete waste (European Commission, 2020). It is assumed that recycling rate is 0%.

Cut off criteria

Inbound packaging of auxiliary materials has been cut off. Auxiliary material consumption is only about 2.27E-04 kg per kg of product. The exclusion of packaging of auxiliary materials does not have impact on the overall results and conclusions.

Key assumptions

Proxy datasets with poor geographical and technological representativeness were used to model some additives, packaging and consumables inputs. This has impacts on ODP, EP-freshwater, ADP-minerals&metals, and WDP results.

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, February 2023 is used.

- Table 8 contains the core environmental impact indicators in accordance with EN 15804:2012+A2:2019, describing the potential environmental impacts of the product.
- Table 9 provides additional environmental impact indicators in accordance with EN 15804:2012+A2:2019.
- Table 10 shows the life cycle inventory indicators for resource use.
- Table 11 displays the life cycle inventory indicators for waste and other outputs.
- Table 12 displays biogenic carbon content indicators.
- Table 13 contains results for environmental impact indicators in accordance with EN 15804:2012+A1:2013 to aid backward comparability.

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.

Table 8: EN15804+A2 Core Environmental Impact Indicators

Impact Category	Indicator	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 metals1	ADP-minerals&metals	kg Sb-eq.
Depletion of abiotic resources – fossil fuels1	ADP-fossil	MJ
Water use1	WDP	m^3 world equiv.

Table 9: EN15804+A2 Additional Environmental Impact Indicators

Impact Category	Indicator	Unit
Climate Change[2]	GWP-GHG	kg CO_2-eq.
Climate Change[3]	GWP-GHG (IPCC AR5)	kg CO_2-eq.
Particulate Matter emissions	PM	Disease incidences
Ionising Radiation – human health[4]	IRP	kBq U235 eq.
Eco-toxicity (freshwater)1	ETP-fw	CTUe
Human Toxicity, cancer1	HTP-c	CTUh
Human Toxicity, non-cancer1	HTP-nc	CTUh
Land use related impacts / soil quality1	SQP	Dimensionless (Pt)

Table 10: Life cycle inventory indicators on use of resources

Parameter	Indicator	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
Net use of fresh water	FW	m^3

Table 11: Life cycle inventory indicators on waste categories and output flows

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

Table 12: Biogenic carbon content indicators

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

Table 13: EN15804+A1 Environmental Impact Indicators

Impact Category	Indicator	Unit
Global warming potential	GWP (EN15804+A1)	kg CO_2-eq.
Ozone depletion potential	ODP (EN15804+A1)	kg CFC11-eq.
Acidification potential	AP (EN15804+A1)	kg SO_2-eq.
Eutrophication potential	EP (EN15804+A1)	kg PO_4^{3-}-eq.
Photochemical ozone creation potential	POCP (EN15804+A1)	kg Ethene-eq.
Abiotic depletion potential for non-fossil resources	ADPE (EN15804+A1)	kg Sb-eq.
Abiotic depletion potential for fossil resources	ADPF (EN15804+A1)	MJ

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]This indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2025b).

[3]GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14v1.11). It excludes biogenic carbon and indirect radiative forcing.

[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.

BarChip Fibre Reinforcing a Concrete Track Slab in a Metro Tunnel

Environmental performance

The following tables show the results for one kg of BarChip synthetic fibre concrete reinforcement product.

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 results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

The results include 'balancing-out reporting' for the biogenic CO_2 of distribution packaging. This is because module A5 is not included in the system boundary for this study. This was done according to Annex 2 of PCR 2019:14 v2.0.1 (EPD International, 2025b). However, the paper bag packaging will be added to concrete mix directly and incorporated into the concrete product. Therefore, this LCA assumed a virtual emission of sequestered carbon as carbon dioxide to air in model C4, as required by EN 15804+A2. Therefore, the overall biogenic carbon balance of modules A-C is numerically positive. The LCA does not claim permanent carbon storage (carbon sequestration) in the product, its packaging or end of life.

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, 2025b).

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

Results for primary scenario

Table 14: EN15804+A2 Core environmental impact indicators

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D	Max A-C Variation
GWP-total	kg CO_2-eq.	2.27E+00	2.00E-01	9.85E-03	8.15E-03	0.00E+00	2.58E-02	0.00E+00	1.8%
GWP-fossil	kg CO_2-eq.	2.29E+00	1.99E-01	9.85E-03	7.86E-03	0.00E+00	1.58E-03	0.00E+00	1.8%
GWP-biogenic	kg CO_2-eq.	-1.92E-02	5.16E-04	1.46E-06	9.42E-05	0.00E+00	2.42E-02	0.00E+00	5.9%
GWP-luluc	kg CO_2-eq.	2.23E-03	9.88E-04	2.58E-07	1.95E-04	0.00E+00	4.13E-08	0.00E+00	0.4%
ODP	kg CFC11-eq.	1.41E-12	6.94E-15	9.85E-16	3.38E-16	0.00E+00	1.58E-16	0.00E+00	14.2%
AP	Mole of H^+ eq.	1.01E-02	5.39E-03	5.85E-05	2.04E-05	0.00E+00	9.35E-06	0.00E+00	0.1%
EP-freshwater	kg P eq.	3.56E-06	6.18E-08	1.51E-09	9.07E-09	0.00E+00	2.42E-10	0.00E+00	0.9%
EP-marine	kg N eq.	2.96E-03	1.35E-03	2.87E-05	9.02E-06	0.00E+00	4.60E-06	0.00E+00	0.2%
EP-terrestrial	Mole of N eq.	3.25E-02	1.48E-02	3.15E-04	1.04E-04	0.00E+00	5.04E-05	0.00E+00	0.2%
POCP	kg NMVOC eq.	9.21E-03	3.80E-03	7.75E-05	1.92E-05	0.00E+00	1.24E-05	0.00E+00	0.1%
ADP-m&m[1]	kg Sb-eq.	8.81E-08	1.49E-08	1.30E-10	2.52E-09	0.00E+00	2.07E-11	0.00E+00	1.4%
ADP-fossil[1]	MJ	7.65E+01	2.49E+00	1.30E-01	1.04E-01	0.00E+00	2.08E-02	0.00E+00	1.6%
WDP[1]	m^3 world equiv.	1.29E-01	5.49E-04	3.70E-05	3.62E-05	0.00E+00	5.93E-06	0.00E+00	7.4%

Table 15: EN15804+A2 Additional Environmental Impact Indicators

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D	Max A-C Variation
GWP-GHG[2]	kg CO2-eq.	2.29E+00	2.00E-01	9.85E-03	8.06E-03	0.00E+00	1.58E-03	0.00E+00	1.8%
GWP-GHG (IPCC AR5)[3]	kg CO2-eq.	2.29E+00	1.99E-01	9.85E-03	7.96E-03	0.00E+00	1.58E-03	0.00E+00	1.8%
PM	Disease incidences	2.28E-07	9.61E-08	1.17E-09	1.42E-10	0.00E+00	1.87E-10	0.00E+00	0.2%
IRP[4]	kBq U235 eq.	8.76E-03	4.99E-05	2.72E-06	1.63E-06	0.00E+00	4.35E-07	0.00E+00	43.9%
ETP-fw[1]	CTUe	3.64E+01	2.43E+00	5.80E-02	1.93E-02	0.00E+00	9.28E-03	0.00E+00	1.4%
HTP-c[1]	CTUh	1.07E-09	3.85E-11	9.54E-13	4.02E-13	0.00E+00	1.53E-13	0.00E+00	1.4%
HTP-nc[1]	CTUh	4.22E-08	7.83E-10	2.09E-11	1.31E-11	0.00E+00	3.35E-12	0.00E+00	1.3%
SQP[1]	Pt	6.70E+00	5.95E-01	2.65E-04	1.17E-01	0.00E+00	4.24E-05	0.00E+00	7.9%

Table 16: Use of resources

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	5.84E+00	5.26E-02	5.62E-04	9.64E-03	0.00E+00	9.00E-05	0.00E+00
PERM	MJ	2.15E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.05E+00	5.26E-02	5.62E-04	9.64E-03	0.00E+00	9.00E-05	0.00E+00
PENRE	MJ	3.30E+01	2.49E+00	1.30E-01	1.04E-01	0.00E+00	2.08E-02	0.00E+00
PENRM	MJ	4.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	7.65E+01	2.49E+00	1.30E-01	1.04E-01	0.00E+00	2.08E-02	0.00E+00
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	8.58E-03	9.25E-05	7.53E-07	1.63E-05	0.00E+00	1.20E-07	0.00E+00

Table 17: Waste production and output flows

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	5.77E-09	3.80E-11	2.09E-12	7.71E-13	0.00E+00	3.35E-13	0.00E+00
NHWD	kg	2.16E-02	1.03E-04	3.19E-06	5.41E-06	0.00E+00	1.00E+00	0.00E+00
RWD	kg	5.81E-05	6.62E-07	2.54E-08	1.63E-08	0.00E+00	4.06E-09	0.00E+00
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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 18: Biogenic Carbon Content

INDICATOR	UNIT	A1-A3
BCC-prod	kg C	0.00E+00
BCC-pack	kg C	6.60E-03

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

Table 19: EN15804+A1 Environmental Impact Indicators

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
GWP (EN15804+A1)	kg CO_2-eq.	2.22E+00	1.97E-01	9.75E-03	7.87E-03	0.00E+00	1.56E-03	0.00E+00
ODP (EN15804+A1)	kg CFC11-eq.	1.65E-12	8.18E-15	1.16E-15	3.98E-16	0.00E+00	1.86E-16	0.00E+00
AP (EN15804+A1)	kg SO_2-eq.	7.84E-03	4.32E-03	4.04E-05	1.40E-05	0.00E+00	6.46E-06	0.00E+00
EP (EN15804+A1)	kg PO_4^{3-}-eq.	1.12E-03	4.52E-04	9.63E-06	3.21E-06	0.00E+00	1.54E-06	0.00E+00
POCP (EN15804+A1)	kg Ethene-eq.	9.27E-04	2.37E-04	4.39E-06	0.00E+00	0.00E+00	7.02E-07	0.00E+00
ADPE (EN15804+A1)	kg Sb-eq.	8.84E-08	1.49E-08	1.30E-10	2.51E-09	0.00E+00	2.08E-11	0.00E+00
ADPF (EN15804+A1)	MJ	7.60E+01	2.48E+00	1.29E-01	1.03E-01	0.00E+00	2.07E-02	0.00E+00

Variation in results

The variation between products is minimal. Exceptions are the results of ODP and IRP, which have variations of 13% and 44%, respectively. This is due to the different packaging options of products included in this group.

Table 20: GWP-GHG A1-A3 variation

LCA result of one declared unit product (A1-A3)	Unit	Variation of products
GWP-GHG	kg CO_2-eq.	<10%

Differences to previous versions

This EPD involves updating the full life cycle inventory (LCI) of BarChip synthetic fibre products and includes:

- Update of primary LCI data for synthetic fibre products with data from the period 2018-04-01 to 2019-03-31 to calendar year (CY) 2024 (2024-01-01 to 2024-12-31).
- Update of system boundary to include distribution (A4) and end-of-life (C1-C4 and D).
- Updated of Managed LCA Content (MLC) database (previously known as GaBi LCI database) from version 2020.1 to version 2024.2.
- Change of modelling software from Life Cycle for Experts (LCA FE) (formerly known as GaBi) Software to Microsoft Excel.
- Update of electricity modelling based on residual electricity mix.
- Update of LCA methodology from PCR 2012:01 version 2.31 and GPI 3.0.0 to PCR 2019:14 version 2.0.1 and GPI 5.0.1.

> Up to 500,000 BarChip fibres are evenly distributed in every cubic metre of concrete. Not one will ever suffer from corrosion.

List of Abbreviations

ADP	Abiotic Depletion Potential
AP	Acidification Potential
EoL	End-of-Life
EP	Eutrophication Potential
GaBi	Ganzheitliche Bilanzierung (German for holistic balancing)
GPI	General Programme Instructions
PCR	Product Category Rules
GWP	Global Warming Potential
LCA FE	Life Cycle Assessment for Experts (software)
LCI	Life Cycle Inventory
m&m	minerals and metals
PP	Polypropylene
PM	Potential incidence of disease due to PM emissions
ODP	Depletion potential of the stratospheric ozone layer
POCP	Formation potential of tropospheric ozone
VOC	Volatile Organic Compound
WDP	Water (user) deprivation potential, deprivation-weighted water consumption

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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 published in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. To support backwards comparability and compatibility, environmental performance results have also been provided for the indicators required in EN15804+A1, although the study does not claim compliance with this standard.

Programme Information	
EPD programme operator: EPD INTERNATIONAL EPD SYSTEM	EPD International AB Web: www.environdec.com Email: support@environdec.com Post: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden
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Product Category Rules (PCR)	
CEN standard EN 15804 served as the core Product Category Rules (PCR)	
PCR:	PCR 2019.14 Construction Products, version 2.0.1 (published on 2025-06-05, valid until 2030-04-07)
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com for a list of members.
Review Chairs:	Rob Rouwette, Start2See Pty Ltd (chair), Noa Meron, thinkstep Ltd (co-chair). The review panel may be contacted via the Secretariat: www.environdec.com/contact
Verification	
External and independent ('third-party') verification of the declaration and data, according to ISO 14025:2006, via EPD verification through: ☑ Individual EPD verification without a pre-verified LCA/EPD tool ☐ Individual EPD verification with a pre-verified LCA/EPD tool ☐ EPD Process Certification* without a pre-verified LCA/EPD tool ☐ EPD Process Certification* with a pre-verified LCA/EPD tool ☐ Fully pre-verified EPD tool	
Third party verifier : Life Cycle Logic	Andrew D. Moore (Life Cycle Logic) Email: andrew@lifecyclelogic.com.au
Verifier approved by:	EPD Australasia and The International EPD System
Procedure for follow-up of data during EPD validity involves third-party verifier	☐ Yes ☑ No
Information about EPD Owner	
Declaration owner: BarChip Inc. The Synthetic Fibre Experts	BarChip Inc. Web: https://www.barchip.com Email: info@barchip.com Post: Kanda System Building 7F 7 Kanda Konya-cho, Chiyoda-ku, Tokyo, Japan 101-0035
LCA accountability: thinkstep anz	thinkstep Pty Ltd Barbara Nebel Haoran Lei Web: www.thinkstep-anz.com Email: info@thinkstep-anz.com Post: 25 Jubilee Street, Perth, Western Australia 6151, Australia
Geographical Scope	Global
Reference Year for Data	2024-01-01 to 2024-12-31
Version history	
1 2020-12-01	Original version of the EPD (reg number S-P-02054 , expired on 2025-12-01).
2 2025-12-12	Five-year update of EPD with full update to underlying LCI and additional declaration of distribution (A4) and end-of-life (C1-C4) modules.

AUSTRALASIA EPD®
INTERNATIONAL EPD SYSTEM

EPD
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BarChip 48, BarChip 54, BarChip 60 Environmental Product Declaration

OUR VISION

BarChip has a simple vision - revolutionise the world of concrete reinforcement. For over 100 years the technology of concrete reinforcement has barely changed. We set out to create a new reinforcement for the 21st century. We created BarChip synthetic fibre reinforcement.

OUR PROCESS

We believe that long term business relationships can only be sustained by a commitment to provide the highest quality products and services. We make sure to understand your concrete, know the performance requirements and work with you to get the right design and the right performance outcomes.

YOUR PRODUCT

When you work with BarChip you know that your concrete asset has been reinforced to the latest engineering standards. It will never suffer from corrosion. It will be cheaper and quicker to build. It will be safer and it will keep performing throughout its entire design life.

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