Statement of Verification

BREG EN EPD No.: 000377 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

NatSteel Holdings Pte Ltd

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

1 tonne steel Cut and Bend Reinforcement Bars and Reinforcement Carpet

Company Address

NatSteel Holdings Pte Ltd
22 Tanjong Kling Road
Gate 1
Singapore
628048

Signed for BRE Global Ltd	Emma Baker Operator	25 October 2021 Date of this Issue
25 October 2021 Date of First Issue		24 October 2026 Expiry Date

Environmental Product Declaration

EPD Number: 000377

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013
Commissioner of LCA study	**LCA consultant/Tool**
NatSteel Holdings Pte Ltd 22 Tanjong Kling Road Gate 1 Singapore 628048	LCA consultant: Roger Connick Tool: BRE LINA v2.0
Declared Unit	**Applicability/Coverage**
1 tonne steel Cut and Bend Reinforcement Bars and Reinforcement Carpet	Manufacturer specific product
EPD Type	**Background database**
Cradle to Gate with options	ecoinvent v3.2

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b]) Third party verifier: Nigel Jones
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A1:2013 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑		☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site

NatSteel Holdings Pte Ltd
22 Tanjong Kling Road
Gate 1
Singapore
628048

Construction Product

Product Description

Cut and Bend Reinforcement Bars (CAB)

Cut-And-Bend Reinforcement Bars (CAB) are manufactured from Reinforcement Bars, the product is manufactured for concrete construction solutions. Typically, the products are used in Bored Pile, Pile Cap, Column, Beam, Slab, and Wall structural elements.

Like its name suggests, CAB are cut from the full-length Reinforcement Bars and bend exactly to the specifications required by shaping and sizing during its manufacturing process. NatSteel's CAB Reinforcement Bars conform to BS 8666.

The advantages of CAB products include controlled material wastage and enhanced on-site storage space, logistics, and reduced inventory requirement onsite. Despite manual installation works required on-site, lesser manpower is required in the installation process of CAB products.

The product allows in-house processes and procedures that ensure traceability through the order level, and is independent of weather conditions.

Reinforcement Carpet

Reinforcement Carpet is manufactured with Reinforcement Bars in the form of a carpet or roll for large areas of floor, providing an alternative to a Welded Steel Fabric Reinforcement solution. The product is typically applied to the structural elements of Basements, Heavy Slabs, RC Walls, Raft Foundations, Large Pile Caps, Cut-and-Cover tunnels, Bridge Decks, Roads, Underground and Above-ground Train Tunnels, and Airport Runway Wharves.

The manufacturing process involves the rationalisation of Reinforcement Bars to reduce variations in bar sizes and spacing, for welding into flexible strips through a welding machine, and rolling into the Reinforcement Carpet.

For installation, the product is transported to site and lifted into position by a crane to be placed at the required area, ready to be rolled-out like a carpet. With up to 60% less manpower required, the product increases productivity by up to 10 times compared to the conventional method of loose bar fixing onsite.

Technical Information

The below table covers the basic technical properties of the reinforcing steel products:

Property (TBC)	Value, Unit (TBC)
Production Route	EAF
Density	7.85 g/cm^3
Weldability	Yes
Yield Strength	250-700 Mpa
Tensile Strength	400-800 Mpa
Surface Geometry	Plain bar and ribbed bar in round bar form
Elongation	15-40%
Re-bond test	n/a
Recycled Content	95%

1 Standard density for mild steel as listed in Singapore Steel standard SS 560:2016 (note 6 of clause no. 7.3).
2 Mill certificates provided confirm samples fall within the tolerances for Yield Strength, Tensile Strength and Elongation.
3 Recycled content calculated from inputs listed in the Rebar, Wire Rod and Hot-Rolled DBIC data collection form.

NatSteel's steel reinforcing bar/coil product (incorporating rebar, wire rod and hot-rolled DBIC) conforms to the following standards:

- Singapore Standards Council SS 560:2016 – Specification for steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product.
- Malaysian Standard MS 146:2014 – Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification.
- Indian Standard IS 1786:2008 – High strength deformed steel bars and wires for concrete reinforcement – specification.
- Australian/New Zealand Standard AS/NZS 4671:2019 – Steel for the reinforcement of concrete.

Main Product Contents

Material/Chemical Input	Mass (%)
Iron	96-98%
Other additives	2-4%

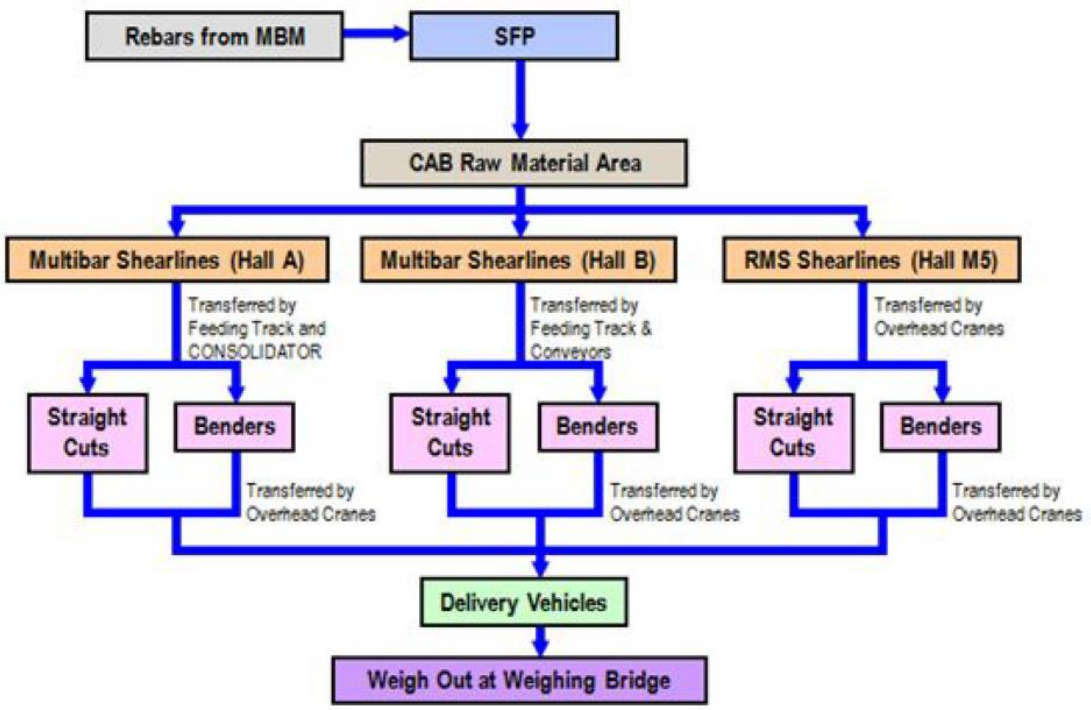
Manufacturing Process

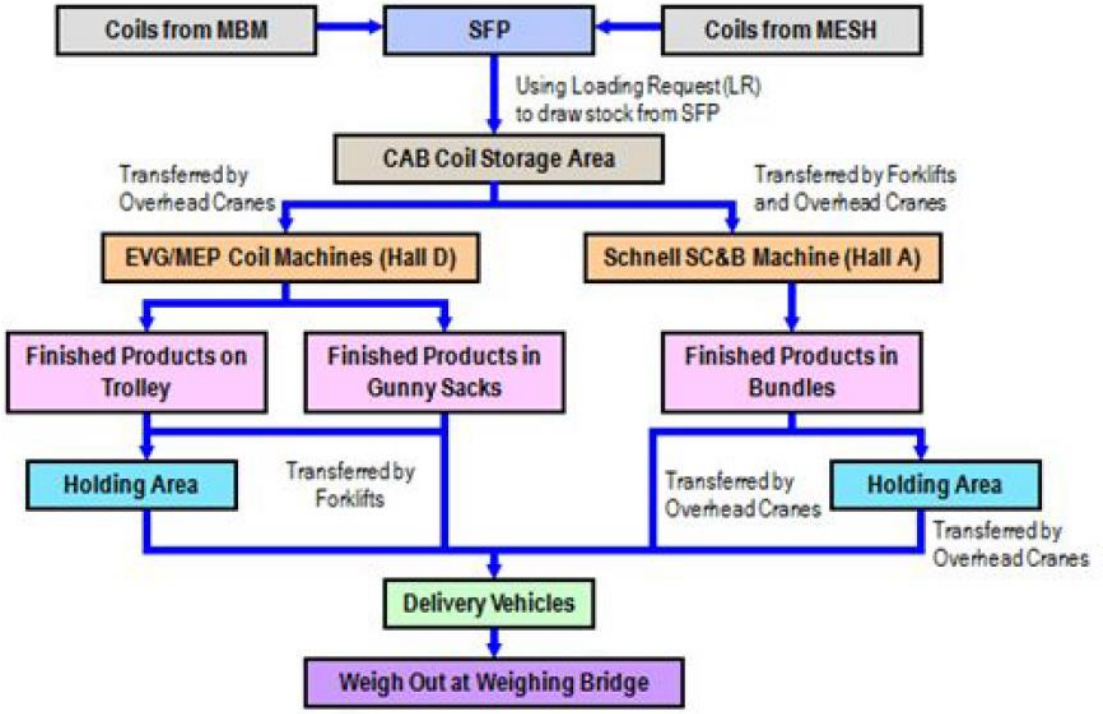
Cut-And-Bend (CAB) fabrication involves cutting either straight bar or bar in coil to the required order length after compensating for any bending length reductions, then bending the cut bar to the required order shape and dimensions. The two types of material are fed into two different types of machine lines.

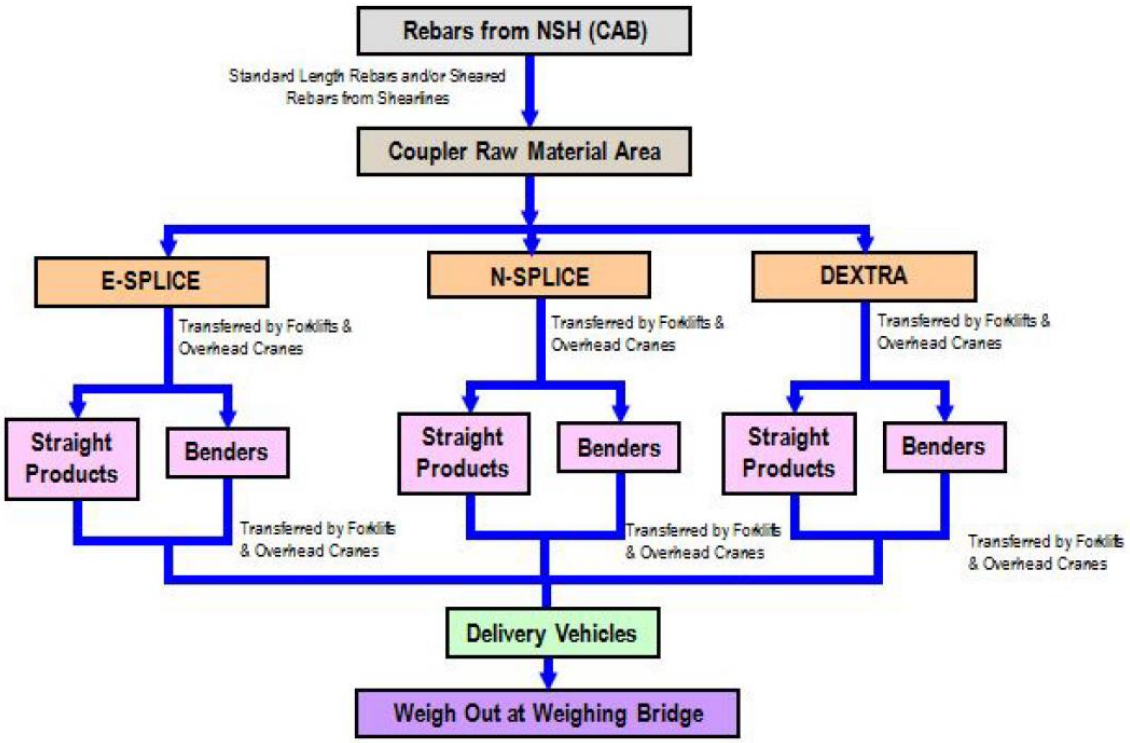
Straight bar materials of 10mm to 50mm in diameter are fabricated through the shearline-bender process. This fabrication process involves straight bar loading, cutting cycle, bar rolling to the required length, and consolidation. After the fabrication process is completed, the bars are transferred to the bender conveyor for bending into the required shapes and dimensions. Once completed, the bars are loaded onto a trailer for delivery.

Bar in coil material of 8mm to 16mm in diameter are fabricated through a Polybender machine. The machine unwinds bar in coil by pulling and straightening it via rollers to the required length, and bends it into the required shape and dimensions. After the fabrication process is complete, the finished products are loaded onto a trailer for delivery. The Polybender machine allows an efficient production process, as the technology provides speed while preventing loss of material from cutting.

Process flow diagram







Life Cycle Assessment Calculation Rules

Declared unit description

1 tonne steel Cut and Bend Reinforcement Bars and Reinforcement Carpet.

System boundary

In accordance with the modular approach as defined in EN15804:2012+A1:2013, this cradle-to-gate with options EPD includes the processes covered in the product manufacturing stages A1 to A3, end of life scenarios in modules C3, C4, and material and energy recovery scenarios in module D.

Data sources, quality and allocation

Specific primary data derived from the NatSteel Holdings Pte Ltd production process in Singapore have been modelled using Simapro v9.1 LCA software and the BRE LINA database v2.0.33. In accordance with the requirements of EN15804, the most current available data has been used. The manufacturer-specific data from NatSteel Holdings Pte Ltd covers a period of 1 year (01/04/19 – 31/03/20). Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.2 database. All ecoinvent datasets are complete within the context used, and confirm to the system boundary and the criteria for the exclusion of inputs and outputs according to the requirements specified in EN15804. Calculations were performed to enable allocation of processes to the steel products. Allocation procedures were by physical allocation and are according to EN15804 and are based on ISO14044 guidance.

Cut-off criteria

No inputs or outputs have been excluded. All raw materials and packaging inputs, plus their transport, process and general energy and water use, production and non-production waste, have been included, except for direct emissions to air, water and soil, which are not measured.

End of life scenarios

This EPD includes two sets of results which are published below. The first set of results present the impacts of a 100% steel waste to landfill scenario in end of life Module C4. The second set of results present the impacts of a 100% steel waste to recycling scenario in end of life Module C4. Both sets of results also include Module D, which presents the results of the environmental loads or benefits that have been calculated according to each respective end of life scenario.

NatSteel export their product to many different countries where the end of life scenario varies considerably. The two sets of results for Modules C4 and D presented in this EPD are therefore intended to allow flexibility for end-users of the EPD to calculate the impacts applicable to their own country or region.

LCA Results (Module C4 = 100% to landfill scenario)

Results per declared unit, 1 tonne steel reinforcing bar/coil, for the declared modules, can be found in the following tables:

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	5.04e+2	6.79e-5	2.98e+0	6.83e-1	4.64e-1	4.16e-4	9.33e+3
	Transport	A2	1.77e-2	3.26e-9	5.93e-5	1.56e-5	1.03e-5	4.67e-8	2.68e-1
	Manufacturing	A3	6.58e+0	1.10e-6	4.19e-2	9.73e-3	6.12e-3	7.83e-6	1.40e+2
	Total (of product stage)	A1-3	5.11e+2	6.90e-5	3.02e+0	6.93e-1	4.70e-1	4.24e-4	9.47e+3
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	5.19e+0	1.76e-6	4.00e-2	9.87e-3	6.91e-3	5.61e-6	1.51e+2
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	4.81e+2	6.48e-5	2.84e+0	6.52e-1	4.43e-1	3.97e-4	8.90e+3

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels.

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	3.25e+2	9.78e-4	3.25e+2	9.28e+3	0.00e+0	9.28e+3
	Transport	A2	3.55e-3	1.32e-8	3.55e-3	2.66e-1	0.00e+0	2.66e-1
	Manufacturing	A3	2.43e+1	2.73e-5	2.43e+1	1.33e+2	0.00e+0	1.33e+2
	Total (of product stage)	A1-3	3.49e+2	1.01e-3	3.49e+2	9.42e+3	0.00e+0	9.42e+3
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	3.89e+0	5.90e-6	3.89e+0	1.50e+2	0.00e+0	1.50e+2
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	3.10e+2	9.33e-4	3.10e+2	8.85e+3	0.00e+0	8.85e+3

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;

PERT = Total use of renewable primary energy resources; PENRT = Total use of non-renewable primary energy resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	1.18e+3	0.00e+0	0.00e+0	2.81e+1
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	5.80e-5
	Manufacturing	A3	0.00e+0	0.00e+0	0.00e+0	5.31e-2
	Total (of product stage)	A1-3	1.18e+3	0.00e+0	0.00e+0	2.81e+1
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	1.72e-1
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	1.13e+3	0.00e+0	0.00e+0	2.68e+1

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water.

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	5.66e+1	1.94e+1	2.09e-2
	Transport	A2	1.12e-4	1.25e-2	1.85e-6
	Manufacturing	A3	1.08e-1	4.94e-1	3.28e-4
	Total (of product stage)	A1-3	5.67e+1	1.99e+1	2.12e-2
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	5.41e-2	1.00e+3	1.02e-3
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	5.40e+1	1.85e+1	1.99e-2

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed.

LCA Results (continued)

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00e+0	1.85e+2	0.00e+0	0.00e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Manufacturing	A3	0.00e+0	2.95e+1	0.00e+0	0.00e+0
	Total (of product stage)	A1-3	0.00e+0	2.15e+2	0.00e+0	0.00e+0
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	1.77e+2	0.00e+0	0.00e+0

CRU = Components for reuse;
MFR = Materials for recycling;
MER = Materials for energy recovery;
EE = Exported energy.

LCA Results (Module C4 = 100% to recycling scenario)

Results per declared unit, 1 tonne steel reinforcing bar/coil, for the declared modules, can be found in the following tables:

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	5.04e+2	6.79e-5	2.98e+0	6.83e-1	4.64e-1	4.16e-4	9.33e+3
	Transport	A2	1.77e-2	3.26e-9	5.93e-5	1.56e-5	1.03e-5	4.67e-8	2.68e-1
	Manufacturing	A3	6.58e+0	1.10e-6	4.19e-2	9.73e-3	6.12e-3	7.83e-6	1.40e+2
	Total (of product stage)	A1-3	5.11e+2	6.90e-5	3.02e+0	6.93e-1	4.70e-1	4.24e-4	9.47e+3
End of life	Waste processing	C3	1.86e+0	8.35e-8	8.40e-3	2.75e-3	6.55e-4	7.03e-7	2.72e+1
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.31e+1	-3.11e-6	-1.36e-1	-3.13e-2	-2.13e-2	-1.91e-5	-4.27e+2

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels.

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	3.25e+2	9.78e-4	3.25e+2	9.28e+3	0.00e+0	9.28e+3
	Transport	A2	3.55e-3	1.32e-8	3.55e-3	2.66e-1	0.00e+0	2.66e-1
	Manufacturing	A3	2.43e+1	2.73e-5	2.43e+1	1.33e+2	0.00e+0	1.33e+2
	Total (of product stage)	A1-3	3.49e+2	1.01e-3	3.49e+2	9.42e+3	0.00e+0	9.42e+3
End of life	Waste processing	C3	1.36e+0	9.20e-7	1.36e+0	2.70e+1	0.00e+0	2.70e+1
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.49e+1	-4.48e-5	-1.49e+1	-4.25e+2	0.00e+0	-4.25e+2

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	1.18e+3	0.00e+0	0.00e+0	2.81e+1
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	5.80e-5
	Manufacturing	A3	0.00e+0	0.00e+0	0.00e+0	5.31e-2
	Total (of product stage)	A1-3	1.18e+3	0.00e+0	0.00e+0	2.81e+1
End of life	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	1.86e-2
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.40e+1	0.00e+0	0.00e+0	-1.29e+0

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water.

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	5.66e+1	1.94e+1	2.09e-2
	Transport	A2	1.12e-4	1.25e-2	1.85e-6
	Manufacturing	A3	1.08e-1	4.94e-1	3.28e-4
	Total (of product stage)	A1-3	5.67e+1	1.99e+1	2.12e-2
End of life	Waste processing	C3	3.44e-3	1.13e-1	3.55e-5
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.59e+0	-8.89e-1	9.57e-4

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed.

LCA Results (continued)

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00e+0	1.85e+2	0.00e+0	0.00e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Manufacturing	A3	0.00e+0	2.95e+1	0.00e+0	0.00e+0
	Total (of product stage)	A1-3	0.00e+0	2.15e+2	0.00e+0	0.00e+0
End of life	Waste processing	C3	0.00e+0	1.00e+3	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	-8.47e+0	0.00e+0	0.00e+0

CRU = Components for reuse;
MFR = Materials for recycling;
MER = Materials for energy recovery;
EE = Exported energy.

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C1 to C4 End of life	Description of scenario		
C3	NatSteel utilise their own waste pre-processing facility (NSR). Approximately 22% of the throughput of the scrap steel comes from construction and demolition sites, and includes Cut and Bend products. After cleaning and sorting, the majority of this then undergoes a further cutting process, where the remainder are already small enough and ready for input to the electric arc furnace.		
C4	Disposal steel waste to landfill (100% scenario)	Kg	1,000
	Disposal steel waste to recycling (100% scenario)	Kg	1,000
Module D	Description of scenario		
	After building demolition, Cut and Bend Reinforcement Bars (CAB) are transported to NatSteel's pre-processing facility and can be used as an input material for the steelmaking process. Since the composition of the manufactured steel includes 95% recycled content, the pre-processed Cut and Bend Reinforcement Bars (CAB) can be used as a replacement for the 5% virgin material. Therefore, 1,000 kg of scrap steel waste recovered from building demolition sites can be used to offset the impacts of 45.8 kg of virgin material. The dataset used to represent avoided impacts of the virgin material used in the Cut and Bend Reinforcement Bars (CAB) manufacture was: 'Billet (intermediate), Steel Reinforcing Bar, Coil'.		

Additional information

Interpretation

The scrap-based carbon steel feedstock of NatSteel Holdings Pte Ltd is made via the electric arc furnace (EAF) route. The bulk of the environmental impacts and primary energy demand are attributed to the manufacturing phase, covered by information modules A1-A3 of EN15804:2012+A1:2013.

References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – Requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.

Singapore Standards Council SS 560:2016 – Specification for steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product.

Malaysian Standard MS 146:2014 – Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification.

Indian Standard IS 1786:2008 – High strength deformed steel bars and wires for concrete reinforcement – specification.

Australian/New Zealand Standard AS/NZS 4671:2019 – Steel for the reinforcement of concrete.

Pre Consultants bv. SimaPro 8 LCA Software 2013. http://www.pre-sustainability.com

ecoinvent Centre. Swiss Centre for life Cycle Inventories. http://www.ecoinvent.org