

**Environmental
Product
Declaration**

According to EN15804+A2

This declaration is for:
Horn Bollard 100T

Provided by:
Trelleborg Ridderkerk BV



MRPI® registration:
1.1.00995.2025

Program operator:
Stichting MRPI®
Publisher:
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MRPI® REGISTRATION

1.1.00995.2025

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SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Tim Mol, EcoReview. The LCA study has been done by Ayan, Trelleborg Ridderkerk BV. The certificate is based on an LCA-dossier according to EN15804+A2. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043 GR
Amsterdam

PRODUCT

Horn Bollard 100T

DECLARED UNIT / FUNCTIONAL UNIT

1 Piece

DESCRIPTION OF PRODUCT

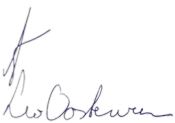
Horn Bollards, often referred to as Staghorn bollards, are marine dock bollards particularly suitable for applications where tidal range variations are large and can handle steep mooring line angles. They are also capable of accepting multiple mooring lines due to their complex profile.

VISUAL PRODUCT



MORE INFORMATION

<https://www.trelleborg.com/en/marine-and-infrastructure/products-solutions-and-services/marine/docking-and-mooring/bollards/horn-bollards>

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration an data according to EN15804+A2 Internal: External: X Third party verifier: Tim Mol, EcoReview 
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

This EPD covers Horn Bollard, model 100T which corresponds to a bollard weight capacity of 100 tonnes, produced by Trelleborg.

The marine bollards are a simple, cost-effective way to fulfill mooring requirements and safely secure vessels alongside jetties, berths, wharves, and dolphins in ports and harbors. The shape of Trelleborg bollards has been refined with finite element techniques to optimize the geometry and anchor layout. Even at full working load, Trelleborg bollards remain highly stable and provide a safe and secure mooring operation. It consists of two main parts- the bollard body and its fixings, all manufactured from premium-grade cast steel, providing superior service life and resistance to impact. Both Bollard's body and fixings are produced in China

The reference is 1 piece of Horn Bollard 100T, which consists of 323kg of a bollard body and 99kg of steel fixings. Wooden boxes are used as packaging material.

Product specification	Horn Bollard 100T
Product quantity [pc]	1
Product weight per 1 quantity without packaging material [kg]	422
Packaging weight [kg]	61
Product service life [years]	25
Area of application	Marine terminals and docking stations
Geographic region of manufacturing	China

Component (>0,5%)	%
Steel	100

SCOPE AND TYPE

This EPD is a specific EPD made for the Horn Bollard 100T produced in a factory in China. The material input is from suppliers across China.

The product is intended for use in the Neom city, Kingdom of Saudi Arabia. At the end of its service life, the product is also assumed to reach its End-of-Life (EoL) stage in the Kingdom of Saudi Arabia.

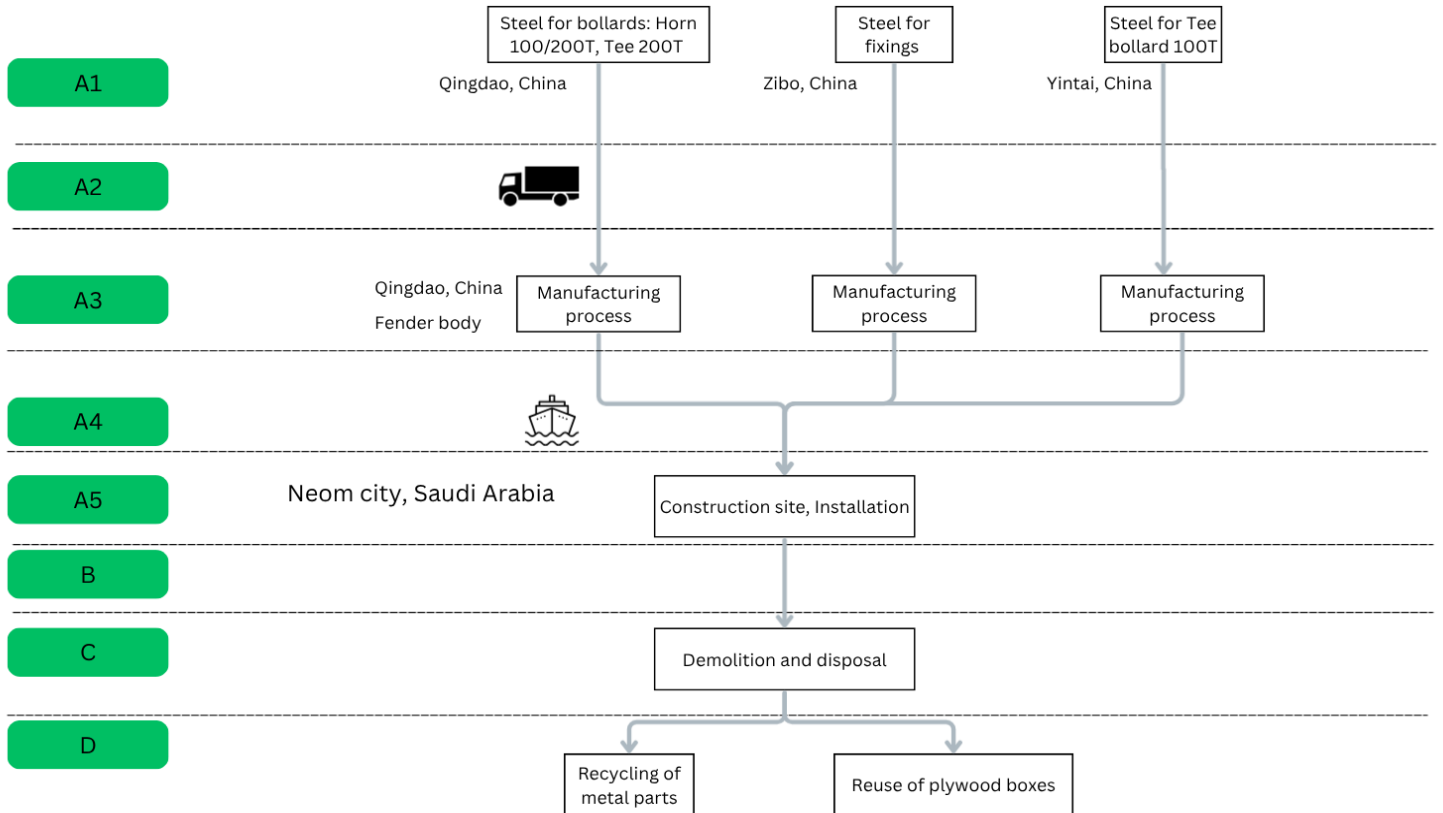
Data collection was completed in 2025. The results are calculated with SimaPro 9.6.0.1, using the Ecoinvent 3.10 database (cut-off).

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	X	X	X	X	X	x	X	ND	ND	ND	ND	X	X	X	X	X

X = Modules Assessed

ND = Not Declared

SYSTEM BOUNDARY



ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total kg CO2 eq.	1,05E+03	5,13E+00	3,90E+02	1,44E+03	5,66E+01	1,26E+02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,01E+01	1,03E+02	0,00E+00	0,00E+00	-1,58E+02
GWP-fossil kg CO2 eq.	1,14E+03	5,13E+00	3,90E+02	1,53E+03	5,66E+01	3,53E+01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,01E+01	1,03E+02	0,00E+00	0,00E+00	-1,58E+02
GWP-biogenic kg CO2 eq.	-9,06E+01	0,00E+00	0,00E+00	-9,06E+01	-1,76E-02	9,06E+01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,20E-03	1,76E-02	0,00E+00	0,00E+00	0,00E+00
GWP-luluc kg CO2 eq.	6,72E-01	2,06E-03	2,10E-01	8,84E-01	2,95E-02	7,35E-03	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	7,83E-04	3,97E-02	0,00E+00	0,00E+00	-8,35E-02
ODP kg CFC11 eq.	5,87E-06	7,56E-08	1,09E-06	7,03E-06	8,12E-07	5,41E-07	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,62E-07	1,50E-06	0,00E+00	0,00E+00	-2,75E-07
AP mol H+ eq.	4,72E+00	1,75E-02	1,98E+00	6,71E+00	1,62E+00	2,25E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	8,22E-02	4,15E-01	0,00E+00	0,00E+00	-5,31E-01
EP-fresh water kg PO4 eq.	5,65E-02	4,68E-05	7,78E-03	6,43E-02	2,25E-04	2,00E-04	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	3,09E-05	9,50E-04	0,00E+00	0,00E+00	1,22E-02
EP-marine kg N eq.	1,05E+00	5,67E-03	4,11E-01	1,47E+00	4,04E-01	8,84E-02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	3,36E-02	1,47E-01	0,00E+00	0,00E+00	-1,24E-01
EP-terrestrial mol N eq.	1,17E+01	6,25E-02	4,51E+00	1,62E+01	4,49E+00	9,70E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	3,68E-01	1,61E+00	0,00E+00	0,00E+00	-1,92E+00
POCP kg NMVOC eq.	4,04E+00	2,58E-02	1,23E+00	5,29E+00	1,22E+00	3,06E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,12E-01	5,66E-01	0,00E+00	0,00E+00	-5,73E-01
ADP-minerals & metals kg Sb eq.	5,21E-03	1,39E-05	2,80E-04	5,51E-03	5,68E-05	5,75E-05	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	4,97E-06	3,27E-04	0,00E+00	0,00E+00	9,94E-05
ADP-fossil MJ, net calorific value	1,19E+04	7,44E+01	4,29E+03	1,63E+04	6,95E+02	4,79E+02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,35E+02	1,43E+03	0,00E+00	0,00E+00	-1,41E+03
WDP m3 world eq. Deprived	4,71E+02	4,55E-01	4,58E+01	5,17E+02	2,15E+00	2,03E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	4,65E-01	7,58E+00	0,00E+00	0,00E+00	4,02E+00

GWP-total	=	Global Warming Potential total
GWP-fossil	=	Global Warming Potential fossil fuels
GWP-biogenic	=	Global Warming Potential biogenic total
GWP-luluc	=	Global Warming Potential land use and land use change
ODP	=	Depletion potential of the stratospheric ozone layer
AP	=	Acidification Potential, Accumulated Exceedence
EP-freshwater	=	Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine	=	Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial	=	Eutrophication Potential, Accumulated Exceedence
POCP	=	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals & metals	=	Abiotic Depletion Potential for non-fossil resources [1]
ADP-fossil	=	Abiotic Depletion for fossil resources potential [1]
WDP	=	Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [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.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

Unit		A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	1,03E-04	5,11E-07	2,72E-05	1,31E-04	1,77E-06	5,15E-06	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	2,04E-06	7,35E-06	0,00E+00	0,00E+00	-1,97E-05
IRP	kBq U235 eq.	1,35E+01	2,56E-02	1,32E+01	2,67E+01	1,27E-01	1,08E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,94E-02	4,74E-01	0,00E+00	0,00E+00	6,63E-01
ETP-fw	CTUe	3,32E+04	1,28E+01	9,53E+02	3,41E+04	8,99E+01	6,51E+01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,23E+01	2,79E+02	0,00E+00	0,00E+00	-7,39E+03
HTP-c	CTUh	1,04E-04	2,55E-08	3,25E-07	1,04E-04	2,39E-07	1,33E-07	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	3,25E-08	4,67E-07	0,00E+00	0,00E+00	-2,61E-05
HTP-nc	CTUh	1,97E-05	4,92E-08	2,03E-06	2,18E-05	1,86E-07	1,65E-07	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,95E-08	8,62E-07	0,00E+00	0,00E+00	1,04E-05
SQP	-	1,32E+04	7,48E+01	7,05E+02	1,40E+04	7,30E+01	1,25E+02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	8,45E+00	7,40E+02	0,00E+00	0,00E+00	-6,29E+03

- PM = Potential incidence of disease due to PM emissions
- IRP = Potential Human exposure efficiency relative to U235 [1]
- ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
- HTP-c = Potential Comparative Toxic Unit for humans, cancer [2]
- HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
- SQP = Potential soil quality index [2]

Disclaimer [1]:

- 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.

Disclaimer [2]:

- 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.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 en A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	3,52E+02	1,27E-01	4,50E+01	3,97E+02	9,31E-01	6,13E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,27E-01	2,46E+00	0,00E+00	0,00E+00	5,33E-01
NHWD	kg	3,94E+03	2,35E+00	3,21E+02	4,26E+03	1,28E+01	1,05E+01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,78E+00	4,75E+01	0,00E+00	0,00E+00	2,01E+03
RWD	kg	8,70E-03	1,61E-05	9,99E-03	1,87E-02	7,92E-05	6,66E-05	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,20E-05	2,93E-04	0,00E+00	0,00E+00	3,82E-04
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	2,20E-01	5,56E-04	2,59E-01	4,80E-01	8,08E-02	4,29E-03	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,36E-03	1,08E-02	0,00E+00	0,00E+00	1,88E-02
MER	kg	3,06E-03	3,30E-06	1,31E-04	3,20E-03	1,34E-05	2,04E-05	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,75E-06	1,16E-04	0,00E+00	0,00E+00	-4,90E-05
EEE	MJ	2,91E+00	6,00E-03	1,29E-01	3,04E+00	3,29E-02	2,45E-02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	4,84E-03	1,02E-01	0,00E+00	0,00E+00	9,43E-02
ETE	MJ	4,60E+00	7,57E-03	2,17E-01	4,83E+00	2,36E-02	2,46E-02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	3,20E-03	1,25E-01	0,00E+00	0,00E+00	3,93E-02

HWD = Hazardous Waste Disposed
 NHWD = Non Hazardous Waste Disposed
 RWD = Radioactive Waste Disposed
 CRU = Components for reuse
 MFR = Materials for recycling
 MER = Materials for energy recovery
 EEE = Exported Electrical Energy
 ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	2,99E+03	9,76E-01	2,31E+02	3,23E+03	5,26E+00	4,24E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	6,84E-01	1,97E+01	0,00E+00	0,00E+00	-1,30E+03
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,99E+03	9,76E-01	2,31E+02	3,23E+03	5,26E+00	4,24E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	6,84E-01	1,97E+01	0,00E+00	0,00E+00	-1,30E+03
PENRE	MJ	1,19E+04	7,44E+01	4,29E+03	1,63E+04	6,95E+02	4,79E+02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,35E+02	1,43E+03	0,00E+00	0,00E+00	-1,41E+03
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,19E+04	7,44E+01	4,29E+03	1,63E+04	6,95E+02	4,79E+02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,35E+02	1,43E+03	0,00E+00	0,00E+00	-1,41E+03
SM	kg	1,58E+02	3,16E-02	4,10E-01	1,58E+02	3,30E-01	1,78E-01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	4,44E-02	6,11E-01	0,00E+00	0,00E+00	8,57E+01
RSF	MJ	9,67E-02	4,02E-04	2,53E-03	9,96E-02	8,08E-04	1,30E-03	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,19E-04	7,33E-03	0,00E+00	0,00E+00	3,54E-03
NSRF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	1,16E+01	1,11E-02	1,22E+00	1,28E+01	5,25E-02	4,95E-02	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	1,12E-02	1,86E-01	0,00E+00	0,00E+00	1,05E-01

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 resources excluding non-renewable 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 resources
SM	=	Use of secondary materials
RSF	=	Use of renewable secondary fuels
NSRF	=	Use of non-renewable secondary fuels
FW	=	Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,79E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
BCCpa	kg C	2,47E+01	0,00E+00	0,00E+00	2,47E+01	0,00E+00	2,47E+01	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

BCCpr	=	Biogenic carbon content in product
BCCpa	=	Biogenic carbon content in packaging

CALCULATION RULES

No cut-offs were intentionally applied to inputs and outputs within the system boundaries of the models. All known energy and material flows within the system boundaries are considered.

Specific data was collected from Trelleborg's suppliers and all packaging material suppliers through a questionnaire, covering details such as exact raw material composition, energy consumption, packaging, logistics (e.g., transport), and production information. The end-of-life scenario is based on industry practices and regulations in a specific region. The data collection period for specific data was the year 2025.

As the manufacturing process takes place in China, country and region-specific datasets for electricity were used:

Electricity, medium voltage {CN-ECGC}| market for electricity, medium voltage | EN15804, U for electricity grid, ECGC - East Grid, where the manufacturing operation happens.

Global warming potential of the electricity used	value
GWP-total of the electricity in kg CO2e/kWh	0.85
GWP-total [kg]	388
Total electricity used [kWh]	455

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

A1. Raw Material Supply

This module considers the extraction and processing of all raw materials and energy used upstream in the manufacturing process of the Horn Bollard.

A2. Transport of Raw Materials to Manufacturer

This module accounts for the transportation of raw materials and spare parts to the manufacturing facility via road. Distances and transport modes were modeled using primary data.

A3. Manufacturing

This stage describes the production process of Horn Bollard, including steel processing.

Transportation distances and modes for steel, packaging materials, and deliveries to customers were provided by Trelleborg and its suppliers.

The construction site data includes factors such as lights, heating, and office facilities. However, the manufacture of production equipment and infrastructure is excluded from the system boundary. Manufacturing waste and production loss treatment are included in this module.

A4. Transport to Customer

Bollards are transported from the production facility to customers primarily via road and sea transport. Neom City, Kingdom of Saudi Arabia, has been chosen as the final destination for this assessment.

A5. Installation Process

This module covers the environmental aspects and impacts of fixing of bollards to the marine terminal and assembly of the full installation. Additionally, product packaging is discarded, and its waste treatment is included in this module.

B1 – B3. Use stage.

B1 (Use Stage), B2 (Maintenance) & B3 (Repair): The Horn Bollard is installed on the terminal block and settled in a stable position. User stage includes regular inspections with minor adjustments, such as strengthening of fixings and other related operations. No further inputs or outputs are related to the use stage, as there are no emissions from the product exploitation.

C1. Deconstruction and demolition. This module includes the disassembly and demolition of the bollards and its parts at the end of life. The removal of the bollards from the marine terminal is done using the building equipment.

C2. Transport of waste. This module includes the transportation distance to the steel secondary processing site for steel parts.

C3. Waste processing C4. Disposal: The end-of-life stage is encompassed in these modules. The end-of-life scenario of the bollard is based on a specific country regulation, company policy, and industry practices. Biogenic carbon uptake and release were manually adjusted as wooden packaging leaves the system for reuse.

D. Reuse potential in module D provides information on the potential burdens and benefits from secondary use of the steel materials

Scenario	value
Product share goes to Recycling [%]	100
Total distance to processing sites [km]	1000

DECLARATION OF SVHC

No SVHCs were present in the product or factory during the manufacturing of the materials in concentrations exceeding 0.1% w/w. This determination is based on engineering evaluations, testing conducted in a manufacturing facility, and supplier declarations.

REFERENCES

1. EN 15804:2012+A2:2019 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products;
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