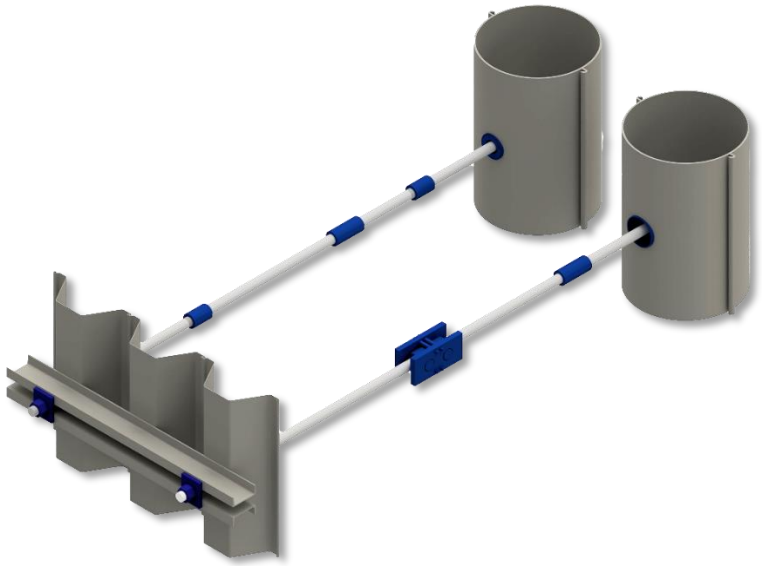

# ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

## Marine Tie Bars

Dextra Manufacturing Co., Ltd.



**EPD HUB, HUB-1225**

Publishing on 11.03.2024, last updated on 11.03.2024, valid until 11.03.2029.

# GENERAL INFORMATION

## MANUFACTURER

| | |
|---|---|
| Manufacturer | Dextra Manufacturing Co., Ltd. |
| Address | 191 Chalermprakiet Rama 9 Alley, 48 Alley, Dokmai Sub-District, Prawet District, Bangkok |
| Contact details | thailand@dextragroup.com |
| Website | www.dextragroup.com |

## EPD STANDARDS, SCOPE AND VERIFICATION

| | |
|---|---|
| Program operator | EPD Hub, hub@epdhub.com |
| Reference standard | EN 15804+A2:2019 and ISO 14025 |
| PCR | EPD Hub Core PCR version 1.0, 1 Feb 2022 |
| Sector | Construction product |
| Category of EPD | Third party verified EPD |
| Scope of the EPD | Cradle to gate with options, A4-A5, and modules C1-C4, D |
| EPD author | Tanyarade Nateweera |
| EPD verification | Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification |
| EPD verifier | Haiha Nguyen, as an authorized verifier acting for EPD Hub Limited |

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

## PRODUCT

| | |
|---|---|
| Product name | Marine Tie Bars |
| Additional labels | - |
| Product reference | - |
| Place of production | Thailand |
| Period for data | 2023 |
| Averaging in EPD | No averaging |
| Variation in GWP-fossil for A1-A3 | - % |

## ENVIRONMENTAL DATA SUMMARY

| | |
|---|---|
| **Declared unit** | 1 ton |
| **Declared unit mass** | 1000 kg |
| **GWP-fossil, A1-A3 ($kgCO_2e$)** | 2,69E+03 |
| **GWP-total, A1-A3 ($kgCO_2e$)** | 2,69E+03 |
| **Secondary material, inputs (%)** | 37.9 |
| **Secondary material, outputs (%)** | 55.3 |
| **Total energy use, A1-A3 (kWh)** | 8760.0 |
| **Total water use, A1-A3 (m3e)** | 1,63E+01 |

# PRODUCT AND MANUFACTURER

## ABOUT THE MANUFACTURER

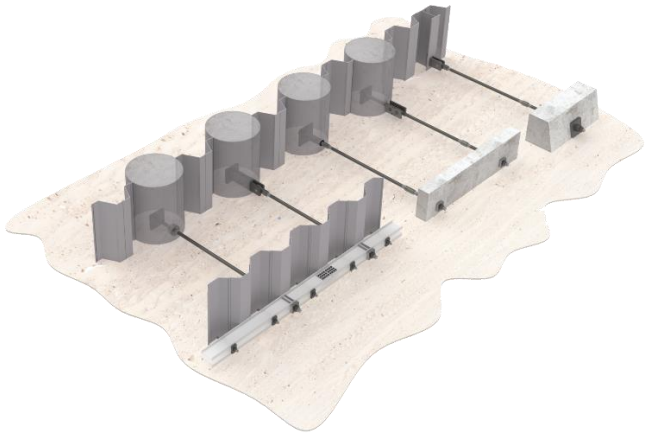
Dextra specializes in the design, manufacturing, and distribution of engineered construction solutions. Dextra business lines include:

- Products for the reinforcement concrete, for both civil and nuclear applications,
- Engineered bar systems (tie bars, tension rods, post-tensioning bars)
- Rock and soil anchors used in various applications such as geotechnical works.

Overall, Dextra provides a complete solution, encompassing engineering, manufacturing, and product delivery, including specialized equipment like bar-end preparation machines.

## PRODUCT DESCRIPTION

Marine tie bars are essential components in port and harbor construction, serving to anchor waterfront structures securely. This system comprises various steel components, including bars, pad eyes, couplers, turnbuckles, plates, and nuts. The specific components utilized in an assembly can vary based on the unique requirements of each application.



Further information can be found at www.dextragroup.com.

## PRODUCT RAW MATERIAL MAIN COMPOSITION

| Raw material category | Amount, mass- % | Material origin |
|---|---|---|
| Metals | 99.93 | China |
| Minerals | - | - |
| Fossil materials | 0.067 | Thailand, China |
| Bio-based materials | - | - |

## BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

| | |
|---|---|
| Biogenic carbon content in product, kg C | - |
| Biogenic carbon content in packaging, kg C | 0.00359 |

## FUNCTIONAL UNIT AND SERVICE LIFE

| | |
|---|---|
| Declared unit | 1 ton |
| Mass per declared unit | 1000 kg |
| Functional unit | N/A |
| Reference service life | N/A |

## SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

# PRODUCT LIFE-CYCLE

## SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

| Product stage | | | Assembly stage | | Use stage | | | | | | | End of life stage | | | | Beyond the system boundaries |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| x | x | x | x | x | MND | MND | MND | MND | MND | MND | MND | x | x | x | x | x |
| Raw materials | Transport | Manufacturing | Transport | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstr./demol. | Transport | Waste processing | Disposal | Reuse / Recovery / Recycling |

*Modules not declared = MND. Modules not relevant = MNR.*

## MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in production, as well as packaging materials and other ancillary materials. This stage also includes fuels used by machines and the handling of waste formed during production processes at manufacturing facilities. The study also takes into account material losses occurring during manufacturing processes, as well as losses during electricity transmission.

The marine tie bar system consists of several steel components such as bars, pad eyes, couplers, turnbuckles, plates, and nuts. The components used in an assembly can vary depending on the application. The raw materials are produced in China and delivered to the manufacturer's site in Thailand, where they are cut and machined to form the final shapes and sizes. The manufacturing process requires electricity to power the production equipment. The product is then packed with primer, thinner, several tapes, and placed in wooden boxes equipped with attachment elements.

During the manufacturing processes (cutting, machining, and threading), approximately 2% of the steel materials are lost. Additionally, there are also wastes from ancillary materials, including its packaging such as oil drums and buckets. All steel waste is transferred to a recycling company, and hazardous liquid wastes from ancillary materials are sent for incineration for proper disposal.

## TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

The average distance of transportation from the production plant to the customers' sites is calculated to be 11,429 km and the transportation method is assumed to be lorry. Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emissions in total results is small, the variety in load is assumed to be negligible. To be conservative, empty returns are included in this study, implemented through an average load factor in the Ecoinvent transport datapoints. Additionally, transportation does not result in losses as the product is properly packaged.

At the project site, an electric tower crane is assumed to be the equipment used for the installation of the product. The installation time for one assembly is estimated to be 8 hours.

Environmental impacts stemming from the installation of products into the building include the generation of waste packaging materials (A5) and the release of biogenic carbon dioxide from wooden pallets and boxes.

The waste from packaging materials consists of plastic, steel, and wooden waste. Treatment of plastic waste at the project site is assumed to be 50% landfill, 19% incineration, 9% recycling, and 22% mismanagement, according to OECD report 2019. For steel waste, it is assumed to be 85% recycling and 15% landfill, as per World Steel Association 2020 report. Wood waste is assumed to be untreated. The transportation distances to the waste treatment plant are assumed to be 25 km for mismanagement, 50 km for landfill, 100 km for incineration, and 150 km for recycling plants.

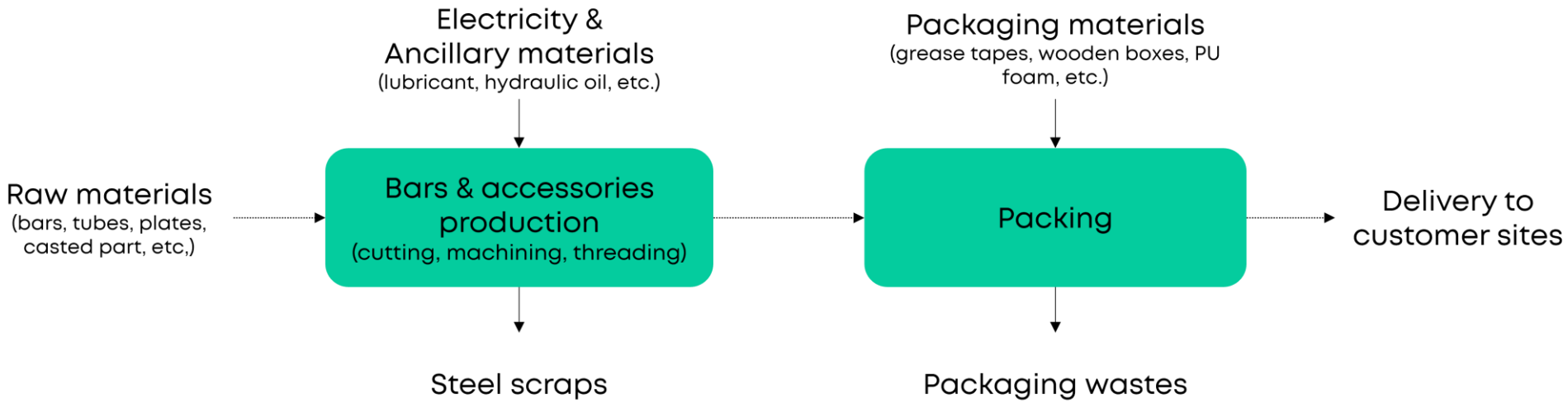
## PRODUCT USE AND MAINTENANCE (B1-B7)

The use phase is not included in the assessment as it is not relevant for the product. Air, soil, and water impacts during the use phase have not been studied.

## PRODUCT END OF LIFE (C1-C4, D)

The disassembly of the product is assumed to be conducted using an electric tower crane over a period of 8 hours. It is assumed that different waste materials will be collected separately and transported to a waste treatment facility. Treatment of plastic waste at the project site is assumed to consist of 50% landfill, 19% incineration, 9% recycling, and 22% mismanagement, according to OECD report 2019. Steel waste is assumed to undergo 85% recycling and 15% landfill, as per World Steel Association report 2020. Wood waste is assumed to be untreated. Transportation distances to waste treatment plants are assumed to be 25 km for mismanagement, 50 km for landfill, 100 km for incineration, and 150 km for recycling plants, with transportation conducted by lorry (C2). Module C3 encompasses energy and resource inputs for sorting and treating materials for recycling, while landfilled and incinerated materials are addressed in Module C4. The product's material recovery potential, as well as that of its packaging, contributes to the avoidance of virgin material production. Module D encompasses the benefits and burdens from incineration and recycling.

# MANUFACTURING PROCESS



# LIFE-CYCLE ASSESSMENT

## CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

## ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

| Data type | Allocation |
|---|---|
| Raw materials | Allocated by mass or volume |
| Packaging materials | Allocated by mass or volume |
| Ancillary materials | Allocated by mass or volume |
| Manufacturing energy and waste | Allocated by mass or volume |

## AVERAGES AND VARIABILITY

| | |
|---|---|
| Type of average | No averaging |
| Averaging method | Not applicable |
| Variation in GWP-fossil for A1-A3 | - % |

The variations in shapes and sizes of the steel components do not lead to variations in environmental impacts for one ton of the product.

## LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent v3.8 and One Click LCA databases were used as sources of environmental data.

# ENVIRONMENTAL IMPACT DATA

## CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP – total[1)] | kg $CO_2$e | 2,34E+03 | 7,25E+01 | 2,86E+02 | 2,69E+03 | 1,20E+02 | 3,93E+02 | MND | MND | MND | MND | MND | MND | MND | 3,93E+02 | 2,26E+01 | 2,07E+01 | 1,07E+00 | -5,02E+02 |
| GWP – fossil | kg $CO_2$e | 2,33E+03 | 7,25E+01 | 2,86E+02 | 2,69E+03 | 1,20E+02 | 3,93E+02 | MND | MND | MND | MND | MND | MND | MND | 3,92E+02 | 2,26E+01 | 2,06E+01 | 1,07E+00 | -5,03E+02 |
| GWP – biogenic | kg $CO_2$e | 5,32E-02 | 0,00E+00 | -7,18E-02 | -1,86E-02 | 0,00E+00 | 1,86E-02 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| GWP – LULUC | kg $CO_2$e | 1,89E+00 | 4,16E-02 | 1,39E-02 | 1,94E+00 | 8,58E-02 | 8,24E-01 | MND | MND | MND | MND | MND | MND | MND | 8,24E-01 | 9,20E-03 | 2,69E-02 | 9,95E-04 | 8,94E-01 |
| Ozone depletion pot. | kg $CFC_{-11}$e | 1,11E-04 | 1,52E-05 | 2,35E-05 | 1,50E-04 | 2,38E-05 | 1,32E-05 | MND | MND | MND | MND | MND | MND | MND | 1,32E-05 | 4,98E-06 | 2,22E-06 | 4,26E-07 | -5,36E-06 |
| Acidification potential | mol $H^+$e | 1,00E+01 | 1,45E+00 | 1,60E+00 | 1,31E+01 | 3,57E+00 | 2,00E+00 | MND | MND | MND | MND | MND | MND | MND | 2,00E+00 | 9,34E-02 | 2,36E-01 | 9,91E-03 | -9,43E-01 |
| EP-freshwater[2)] | kg Pe | 1,06E-01 | 4,32E-04 | 5,92E-03 | 1,12E-01 | 5,17E-04 | 2,06E-02 | MND | MND | MND | MND | MND | MND | MND | 2,06E-02 | 1,90E-04 | 8,97E-04 | 1,10E-05 | 1,30E-02 |
| EP-marine | kg Ne | 2,16E+00 | 3,89E-01 | 2,90E-01 | 2,84E+00 | 8,87E-01 | 3,37E-01 | MND | MND | MND | MND | MND | MND | MND | 3,37E-01 | 2,73E-02 | 5,02E-02 | 3,43E-03 | 3,09E-01 |
| EP-terrestrial | mol Ne | 2,23E+01 | 4,31E+00 | 3,97E+00 | 3,05E+01 | 9,85E+00 | 3,75E+00 | MND | MND | MND | MND | MND | MND | MND | 3,75E+00 | 3,01E-01 | 5,78E-01 | 3,77E-02 | -4,49E+00 |
| POCP ("smog")[3)] | kg NMVOCe | 9,96E+00 | 1,13E+00 | 8,82E-01 | 1,20E+01 | 2,56E+00 | 1,01E+00 | MND | MND | MND | MND | MND | MND | MND | 1,01E+00 | 9,16E-02 | 1,59E-01 | 1,10E-02 | -3,68E+00 |
| ADP-minerals & metals[4)] | kg Sbe | 2,68E-02 | 1,75E-04 | 6,76E-05 | 2,71E-02 | 2,20E-04 | 1,84E-03 | MND | MND | MND | MND | MND | MND | MND | 1,84E-03 | 7,85E-05 | 2,36E-03 | 2,42E-06 | 2,40E-03 |
| ADP-fossil resources | MJ | 2,42E+04 | 9,82E+02 | 4,96E+01 | 2,53E+04 | 1,52E+03 | 5,11E+03 | MND | MND | MND | MND | MND | MND | MND | 5,10E+03 | 3,27E+02 | 2,47E+02 | 2,89E+01 | -2,65E+03 |
| Water use[5)] | $m^3$e depr. | 1,08E+03 | 3,63E+00 | 3,49E+01 | 1,12E+03 | 4,95E+00 | 1,07E+02 | MND | MND | MND | MND | MND | MND | MND | 1,07E+02 | 1,43E+00 | 4,20E+00 | 9,21E-02 | 4,22E+02 |

*1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.*

## ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Particulate matter | Incidence | 1,89E-04 | 5,25E-06 | 4,12E-06 | 1,99E-04 | 4,37E-06 | 1,51E-05 | MND | MND | MND | MND | MND | MND | MND | 1,51E-05 | 2,00E-06 | 3,42E-06 | 1,50E-07 | -6,71E-06 |
| Ionizing radiation[6)] | kBq U235e | 9,84E+01 | 4,54E+00 | 8,78E-01 | 1,04E+02 | 6,99E+00 | 5,72E+01 | MND | MND | MND | MND | MND | MND | MND | 5,72E+01 | 1,58E+00 | 1,57E+00 | 9,80E-02 | 5,65E+01 |
| Ecotoxicity (freshwater) | CTUe | 7,52E+04 | 7,70E+02 | 2,13E+03 | 7,81E+04 | 1,03E+03 | 7,75E+03 | MND | MND | MND | MND | MND | MND | MND | 7,75E+03 | 3,13E+02 | 1,23E+03 | 1,42E+01 | -4,96E+03 |
| Human toxicity, cancer | CTUh | 1,75E-05 | 4,38E-08 | 1,77E-07 | 1,77E-05 | 7,28E-08 | 1,18E-07 | MND | MND | MND | MND | MND | MND | MND | 1,18E-07 | 8,78E-09 | 3,67E-08 | 3,54E-10 | 1,10E-05 |
| Human tox. non-cancer | CTUh | 7,21E-05 | 7,24E-07 | 5,35E-05 | 1,26E-04 | 7,24E-07 | 4,37E-06 | MND | MND | MND | MND | MND | MND | MND | 4,37E-06 | 2,91E-07 | 1,59E-06 | 9,28E-09 | 6,46E-05 |
| SQP[7)] | - | 7,60E+03 | 4,18E+02 | 1,85E+02 | 8,20E+03 | 2,68E+02 | 8,28E+02 | MND | MND | MND | MND | MND | MND | MND | 8,28E+02 | 2,35E+02 | 5,23E+02 | 4,63E+01 | -3,24E+02 |

*6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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 from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.*

## USE OF NATURAL RESOURCES

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Renew. PER as energy[8)] | MJ | 2,21E+03 | 9,22E+00 | 1,32E+02 | 2,35E+03 | 1,20E+01 | 6,63E+02 | MND | MND | MND | MND | MND | MND | MND | 6,63E+02 | 3,98E+00 | 4,04E+01 | 1,88E-01 | 5,30E+02 |
| Renew. PER as material | MJ | 0,00E+00 | 0,00E+00 | 1,49E-01 | 1,49E-01 | 0,00E+00 | -1,49E-01 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Total use of renew. PER | MJ | 2,21E+03 | 9,22E+00 | 1,32E+02 | 2,35E+03 | 1,20E+01 | 6,63E+02 | MND | MND | MND | MND | MND | MND | MND | 6,63E+02 | 3,98E+00 | 4,04E+01 | 1,88E-01 | 5,30E+02 |
| Non-re. PER as energy | MJ | 2,42E+04 | 9,82E+02 | 3,96E+03 | 2,92E+04 | 1,52E+03 | 5,11E+03 | MND | MND | MND | MND | MND | MND | MND | 5,11E+03 | 3,39E+02 | 2,62E+02 | 2,17E+01 | -2,65E+03 |
| Non-re. PER as material | MJ | 1,44E-01 | 0,00E+00 | 1,07E+00 | 1,21E+00 | 0,00E+00 | -1,07E+00 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | -1,44E-01 | 0,00E+00 |
| Total use of non-re. PER | MJ | 2,42E+04 | 9,82E+02 | 3,96E+03 | 2,92E+04 | 1,52E+03 | 5,10E+03 | MND | MND | MND | MND | MND | MND | MND | 5,11E+03 | 3,39E+02 | 2,62E+02 | 2,15E+01 | -2,65E+03 |
| Secondary materials | kg | 3,79E+02 | 3,82E-01 | 2,84E-02 | 3,79E+02 | 7,03E-01 | 4,70E-01 | MND | MND | MND | MND | MND | MND | MND | 4,70E-01 | 1,12E-01 | 2,81E-01 | 4,55E-03 | 5,49E+02 |
| Renew. secondary fuels | MJ | 2,56E-01 | 2,75E-03 | 6,09E-04 | 2,59E-01 | 2,88E-03 | 3,27E-03 | MND | MND | MND | MND | MND | MND | MND | 3,27E-03 | 1,45E-03 | 1,43E-02 | 1,19E-04 | 3,89E-02 |
| Non-ren. secondary fuels | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Use of net fresh water | $m^3$ | 1,59E+01 | 9,03E-02 | 3,68E-01 | 1,63E+01 | 1,10E-01 | 3,01E+00 | MND | MND | MND | MND | MND | MND | MND | 3,01E+00 | 4,01E-02 | 1,27E-01 | 2,37E-02 | -2,06E+01 |

*8) PER = Primary energy resources.*

## END OF LIFE – WASTE

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hazardous waste | kg | 8,96E+02 | 1,38E+00 | 6,55E+00 | 9,03E+02 | 2,18E+00 | 3,30E+01 | MND | MND | MND | MND | MND | MND | MND | 3,30E+01 | 4,88E-01 | 2,02E+00 | 0,00E+00 | 3,74E+01 |
| Non-hazardous waste | kg | 3,96E+03 | 1,70E+01 | 2,47E+02 | 4,23E+03 | 2,02E+01 | 8,85E+02 | MND | MND | MND | MND | MND | MND | MND | 8,85E+02 | 7,80E+00 | 5,11E+01 | 1,50E+02 | -6,23E+02 |
| Radioactive waste | kg | 4,62E-02 | 6,71E-03 | 1,08E-03 | 5,40E-02 | 1,06E-02 | 1,58E-02 | MND | MND | MND | MND | MND | MND | MND | 1,58E-02 | 2,24E-03 | 1,16E-03 | 0,00E+00 | 1,62E-02 |

## END OF LIFE – OUTPUT FLOWS

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Components for re-use | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Materials for recycling | kg | 0,00E+00 | 0,00E+00 | 2,01E+01 | 2,01E+01 | 0,00E+00 | 5,22E-03 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 8,50E+02 | 0,00E+00 | 0,00E+00 |
| Materials for energy rec | kg | 0,00E+00 | 0,00E+00 | 5,22E-01 | 5,22E-01 | 0,00E+00 | 2,02E-02 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

## ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Warming Pot. | kg $CO_2$e | 2,24E+03 | 7,19E+01 | 2,86E+02 | 2,60E+03 | 1,19E+02 | 3,84E+02 | MND | MND | MND | MND | MND | MND | MND | 3,84E+02 | 2,32E+01 | 2,15E+01 | 7,86E-01 | -4,44E+02 |
| Ozone depletion Pot. | kg $CFC_{-11}$e | 1,08E-04 | 1,21E-05 | 1,81E-05 | 1,38E-04 | 1,88E-05 | 1,11E-05 | MND | MND | MND | MND | MND | MND | MND | 1,11E-05 | 4,10E-06 | 1,90E-06 | 2,53E-07 | -1,89E-05 |
| Acidification | kg $SO_2$e | 8,17E+00 | 1,14E+00 | 1,26E+00 | 1,06E+01 | 2,85E+00 | 1,66E+00 | MND | MND | MND | MND | MND | MND | MND | 1,66E+00 | 7,56E-02 | 2,03E-01 | 5,61E-03 | -6,65E-01 |
| Eutrophication | kg $PO_4^3$e | 4,20E+00 | 1,50E-01 | 2,84E-01 | 4,64E+00 | 3,25E-01 | 7,23E-01 | MND | MND | MND | MND | MND | MND | MND | 7,22E-01 | 1,73E-02 | 6,31E-02 | 1,21E-03 | -4,31E-01 |
| POCP (“smog”) | kg $C_2H_4$e | 9,84E-01 | 3,02E-02 | 4,85E-02 | 1,06E+00 | 7,37E-02 | 6,67E-02 | MND | MND | MND | MND | MND | MND | MND | 6,67E-02 | 3,07E-03 | 7,71E-03 | 2,35E-04 | -5,50E-01 |
| ADP-elements | kg Sbe | 2,66E-02 | 1,71E-04 | 3,76E-04 | 2,72E-02 | 2,16E-04 | 1,83E-03 | MND | MND | MND | MND | MND | MND | MND | 1,83E-03 | 7,96E-05 | 2,51E-03 | 1,79E-06 | 2,36E-03 |
| ADP-fossil | MJ | 2,42E+04 | 9,82E+02 | 3,97E+03 | 2,92E+04 | 1,52E+03 | 5,10E+03 | MND | MND | MND | MND | MND | MND | MND | 5,10E+03 | 3,39E+02 | 2,62E+02 | 2,17E+01 | -2,65E+03 |

# VERIFICATION STATEMENT

## VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

## THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of
the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

HaiHa Nguyen, as an authorized verifier acting for EPD Hub Limited
11.03.2024

VERIFIED ISO 14025