

**ENVIRONMENTAL PRODUCT DECLARATION  
IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930**

**FACING PANELS  
REINFORCED EARTH COMPANY Ltd**

## GENERAL INFORMATION

### MANUFACTURER

|                 |  |
|-----------------|--|
| Manufacturer    | Reinforced Earth Company Ltd   |
| Address         | Innovation House, Euston Way, Telford, Shropshire, TF3 4LT, United Kingdom |
| Contact details | info@reinforcedearth.co.uk   |
| Website         | www.reinforcedearth.co.uk  |

### 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         | Anais Grandclerc   |
| EPD verification   | Independent verification of this EPD and data, according to ISO 14025:<br><input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> 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                      | Facing panels  |
| Place of production               | 50 Creagh Road, Toomebridge, Co Antrim, Northern Ireland, BT41 3SE |
| Period for data                   | December 2022 - November 2023                                      |
| Averaging in EPD                  | No averaging   |
| Variation in GWP-fossil for A1-A3 | 0%   |

### ENVIRONMENTAL DATA SUMMARY

|   |                  |
|---|------------------|
| Declared unit                             | 1 m <sup>3</sup> |
| Declared unit mass                        | 2347.75 kg       |
| GWP-fossil, A1-A3 (kgCO <sub>2</sub> e)   | 2,27E+02         |
| GWP-total, A1-A3 (kgCO <sub>2</sub> e)    | 1,64E+02         |
| Secondary material, inputs (%)            | 1.29             |
| Secondary material, outputs (%)           | 92.5             |
| Total energy use, A1-A3 (kWh)             | 601              |
| Total water use, A1-A3 (m <sup>3</sup> e) | 1.61             |

## PRODUCT AND MANUFACTURER

### ABOUT THE MANUFACTURER

Reinforced Earth Company Ltd. (RECo) provide the design and supply of materials for retaining walls (MSE and precast), bridge abutments, slopes, seawalls, risk mitigation barriers and precast arches for use in civil engineering applications including roads, rail (including high speed), housing, military, sea and flood defence works, industrial and commercial structures.

### PRODUCT DESCRIPTION

Reinforced Earth have been designing and supplying precast panels for over 30 years. Standard precast concrete panels come in a variety of shapes (cruciform, square, rectangular and tee) and dimensions (from 2.25 m<sup>2</sup> to 4.5 m<sup>2</sup>) to fit to the technical and architectural requirements of the projects.

These precast concrete panels are used as facing for reinforced earth construction. Behind the panels, there is backfill reinforced with metal or geosynthetic reinforcements. These structures are part of the retaining structures. The compressive class strengths of these panels are typically between C35/45 and C45/55.

The manufacturing process of precast concrete involves the production of concrete elements in a controlled environment, typically a specialized precast concrete manufacturing plant. The process generally consists of the following steps: Design and Planning, Materials and Mix Design, Mould Preparation, Reinforcement placement, Concrete Mixing and Pouring, Curing, Demoulding, Quality Control and Finishing & Storage and Transportation.

Further information can be found at [www.reinforcedearth.co.uk](http://www.reinforcedearth.co.uk).

### PRODUCT RAW MATERIAL MAIN COMPOSITION

| Raw material category | Amount, mass- % | Material origin |
|-----------------------|-----------------|-----------------|
| Metals                | 1.41            | Ireland         |
| Minerals              | 98.59           | Ireland         |
| Fossil materials      | 0               |                 |
| Bio-based materials   | 0               |                 |

### BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

|  |    |
|--|----|
| Biogenic carbon content in product, kg C   | 0  |
| Biogenic carbon content in packaging, kg C | 17 |

### FUNCTIONAL UNIT AND SERVICE LIFE

|                        |                  |
|------------------------|------------------|
| Declared unit          | 1 m <sup>3</sup> |
| Mass per declared unit | 2347.75 kg       |

### 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 the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

For A1 phase, the main raw materials for pre-cast concrete are cement, aggregates and water. In the manufacturing, ground granulated blast furnace slag is used as secondary raw materials to replace cement as a binder (70% GGBS). Various additives, such as polymers, are also used in concrete to improve its workability (superplasticizer). The pre-cast concrete also includes steel bars which act as reinforcement. For the steel,

the EPD proposed by the supplier is used and it is 98% recycling.

Concrete does not harden by evaporation; it hardens or forms by a chemical process called hydration. The water added to concrete mix becomes a part of the concrete and never leaves concrete or evaporates.

For A2 phase, the considered transportation impacts include exhaust emissions resulting from transportation of raw materials from suppliers to manufacturing facilities as well as the environmental impacts of the production of the diesel used. The manufacturing, maintenance, and disposal of the vehicles as well as tyre and road wear during transportation have also been included. The transportation distances and methods were provided by the Manufacturer.

Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as role of transportation emission in total results is small, the variety in load is assumed to be negligible. Empty returns are not considered as it is assumed that return trip is used by the transportation company to serve the needs of other clients.

For A3 phase, the packaging of precast concrete panels are white wood uprights, white wood support blocks, hard wood skid blocks and carbon steel banding. The quantity indicated in A3 phase is the wood and steel amounts used for 1 m3 of concrete.

Lifters and plastic based formers as ancillary materials are also used for lifting and handling concrete unit. Lifters are made of galvanized steel (from England - 692 km by lorry and 60 km by bulk cargo) and plastic based formers are made of polyurethane resin (from India - 7500 km by lorry and 550 km by bulk cargo). These formers are re-useable 100 times, so the value given here for the quantity of polyurethane resin is the quantity per m3 of panel divided by 100.

This certificate applies to panels manufactured using re-useable formers to make the connection to the polymeric soil reinforcement, if other soil reinforcement is used the certificate holder should be approached for guidance on the suitability of the values used.

Electricity consumption is averaged to 1 m3 of concrete panel (total electricity consumption of the plant averaged by total production of concrete panels in m3 during the period between December 2022 and November 2023).

Waste of steel quantity is calculated by averaging total waste steel production in the plant by total production of concrete panels in m3 during the period between December 2022 and November 2023. The steel wastes from the plant are sent to Chittahong in Bangladesh, where it is remelted and reprocessed. We consider 9 888 km by lorry and 317 km by bulk cargo for the transportation from Ireland to Bangladesh.

Concrete waste quantity is calculated from the consideration that there is concrete overmixed to ensure the panel pour is complete. This waste is used to make Kelly blocks for resale and for own internal usage. Concrete waste amount is estimated to 5% on the total concrete amount.

#### **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 types of transportation used are freight service overseas and transport by land euro 6 lorry > 32 tons. Due to the manufacture being in North Ireland, exact mileage can be detailed from manufacturer to the mainland UK and from within the UK an average has been estimated over a year's worth of deliveries using Reinforced Earth standard product deliveries.

Average distance of transportation from production plant to building site is assumed as 450 km and the transportation method is known to be 250 km over sea (mainly from Belfast harbour to Birkenhead harbour) and 200 km over land by a lorry. Vehicle capacity utilization volume factor is assumed to be 0.8 which means partial load (estimated by the manufacturer). Transportation does not cause losses as product are packaged properly.

Regarding the installation process (A5), we considered that 5580 hours of lifting panels over one year are necessary to install 442 992 m<sup>2</sup> of concrete panels (data from an installation company). 0.013 hours are then necessary for the lifting of 1 m<sup>2</sup> of panels equivalent to 0.14 m3 of concrete (the thicknesses of these panels measure 14 cm). As a result, 0.093 hours for 1 m3 of concrete are necessary. The crane used has a power around 50 kW.

There is no installation loss during A5 phase. Wood from the packaging is chipped and sold as fuel to create energy. 50 km is considered from the construction site to the waste treatment location.

#### **PRODUCT USE AND MAINTENANCE (B1-B7)**

This EPD does not cover the use phase.

Air, soil, and water impacts during the use phase have not been studied.

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

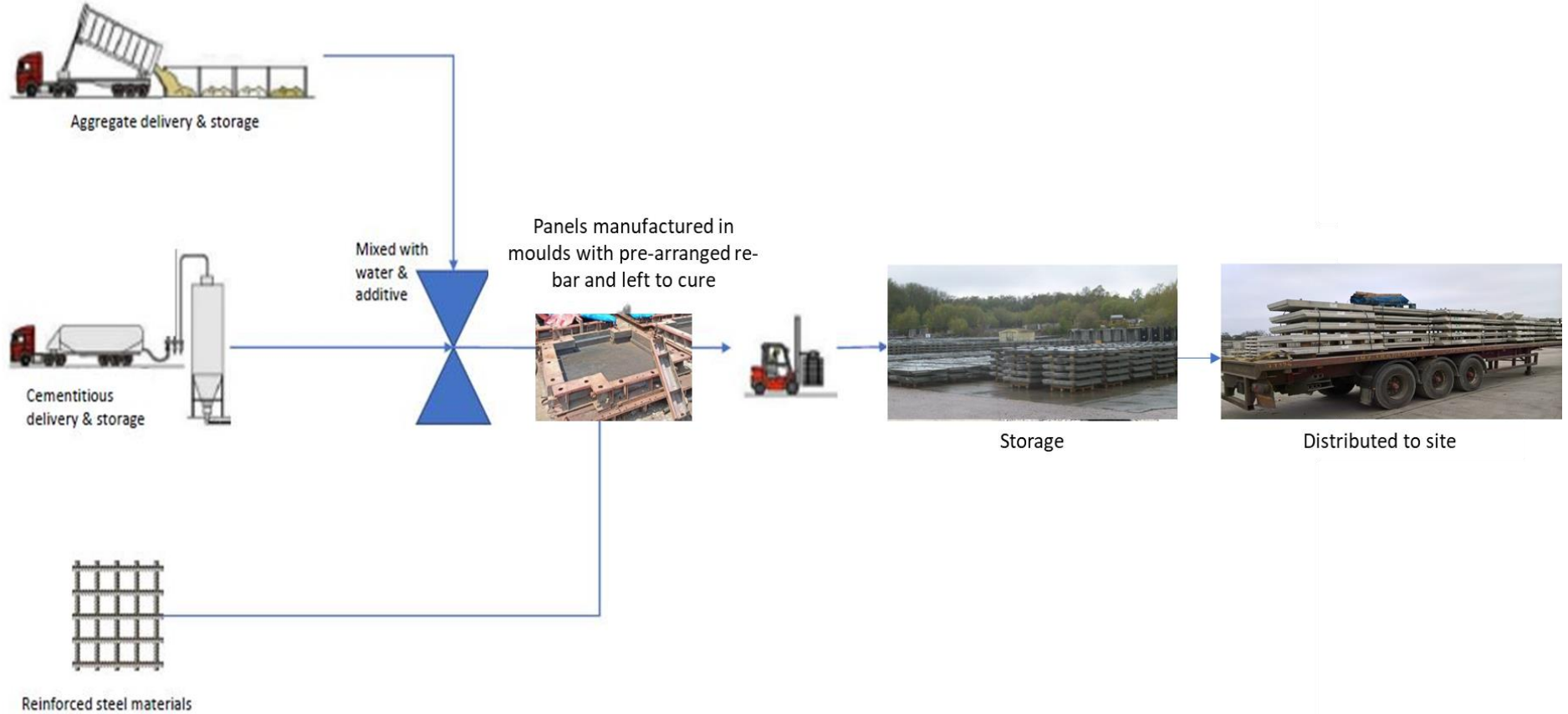
For C1 phase, the process for demolition of concrete panels requires demolition machine and standard crushing machines to remove the concrete from the reinforced steel on-site. We consider that 1.5L of diesel are used for 1 m3 of concrete in demolition and 0,22 L are consumed to crush concrete. A total of 1.72 L is consumed and with a calorific value of 10.74 kWh/L, we can estimate a diesel consumption for C1 phase equal to 18.5 kWh.

For C2 phase, it is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed that it has the same weight with the declared product (except the wastes of steel and concrete generated in the plant - A3). Transportation distance to the closest disposal area or the waste treatment plant is estimated as 50 km and the transportation method is assumed as lorry which is the most common.

For C3 phase, the steel is separated from the concrete and are sent directly to recycling facilities for 92.6% of the total amount. Concrete is sent directly to recycling facilities for 92.6% of the total amount. The steel of the ancillary materials is also sent to recycling facilities for 92.6% of the total amount. Per the UK statistics on waste (Updated 28 June 2023), the latest statistics on Recovery rate from non-hazardous construction and demolition (C&D) waste is 92.6% (<https://www.gov.uk/government/statistics/uk-waste-data/uk-statistics-on-waste#recovery-rate-from-non-hazardous-construction-and-demolition-cd-waste>).

For C4 phase, it is assumed that 7.4% of concrete and steel wastes are sent to landfill.

# 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                  | No allocation               |
| Packaging materials            | No allocation               |
| Ancillary materials            | No allocation               |
| 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 | 0%             |

This EPD is for one type of 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. The EPD Generator uses Ecoinvent v3.8, Plastics Europe, Federal LCA Commons and One Click LCA databases 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 <sup>1)</sup>           | kg CO <sub>2</sub> e   | 1,87E+02 | 1,66E+01 | -3,92E+01 | 1,64E+02  | 4,53E+01 | 6,45E+01 | MND | MND | MND | MND | MND | MND | MND | 6,11E+00 | 1,02E+01 | 1,05E+01 | 9,17E-01 | -2,97E+01 |
| GWP – fossil                        | kg CO <sub>2</sub> e   | 1,87E+02 | 1,66E+01 | 2,33E+01  | 2,27E+02  | 4,53E+01 | 2,02E+00 | MND | MND | MND | MND | MND | MND | MND | 6,11E+00 | 1,02E+01 | 1,05E+01 | 9,16E-01 | -2,96E+01 |
| GWP – biogenic                      | kg CO <sub>2</sub> e   | 0,00E+00 | 0,00E+00 | -6,25E+01 | -6,25E+01 | 0,00E+00 | 6,25E+01 | 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 <sub>2</sub> e   | 1,04E-01 | 6,23E-03 | 5,36E-02  | 1,63E-01  | 1,90E-02 | 7,16E-04 | MND | MND | MND | MND | MND | MND | MND | 6,09E-04 | 3,83E-03 | 1,05E-03 | 8,65E-04 | -2,49E-02 |
| Ozone depletion pot.                | kg CFC <sub>11</sub> e | 1,00E-05 | 4,14E-06 | 1,19E-06  | 1,53E-05  | 1,11E-05 | 4,00E-07 | MND | MND | MND | MND | MND | MND | MND | 1,31E-06 | 2,55E-06 | 2,25E-06 | 3,71E-07 | -3,05E-06 |
| Acidification potential             | mol H <sup>+</sup> e   | 6,12E-01 | 5,29E-02 | 7,60E-02  | 7,41E-01  | 2,45E-01 | 1,90E-02 | MND | MND | MND | MND | MND | MND | MND | 6,35E-02 | 3,26E-02 | 1,10E-01 | 8,61E-03 | -2,34E-01 |
| EP-freshwater <sup>2)</sup>         | kg Pe                  | 3,33E-03 | 1,19E-04 | 4,26E-04  | 3,87E-03  | 3,12E-04 | 2,92E-05 | MND | MND | MND | MND | MND | MND | MND | 2,03E-05 | 7,30E-05 | 3,49E-05 | 9,60E-06 | -1,00E-03 |
| EP-marine                           | kg Ne                  | 1,55E-01 | 1,17E-02 | 1,66E-02  | 1,83E-01  | 5,46E-02 | 7,98E-03 | MND | MND | MND | MND | MND | MND | MND | 2,81E-02 | 7,19E-03 | 4,85E-02 | 2,98E-03 | -3,87E-02 |
| EP-terrestrial                      | mol Ne                 | 1,81E+00 | 1,30E-01 | 1,75E-01  | 2,12E+00  | 6,07E-01 | 8,76E-02 | MND | MND | MND | MND | MND | MND | MND | 3,08E-01 | 7,97E-02 | 5,32E-01 | 3,28E-02 | -4,63E-01 |
| POCP (“smog”) <sup>3)</sup>         | kg NMVOCe              | 4,75E-01 | 5,10E-02 | 5,56E-02  | 5,81E-01  | 2,02E-01 | 2,42E-02 | MND | MND | MND | MND | MND | MND | MND | 8,48E-02 | 3,14E-02 | 1,46E-01 | 9,54E-03 | -1,26E-01 |
| ADP-minerals & metals <sup>4)</sup> | kg Sbe                 | 9,56E-04 | 4,06E-05 | 1,04E-04  | 1,10E-03  | 1,08E-04 | 1,76E-06 | MND | MND | MND | MND | MND | MND | MND | 3,10E-06 | 2,50E-05 | 5,35E-06 | 2,10E-06 | -1,71E-04 |
| ADP-fossil resources                | MJ                     | 1,27E+03 | 2,65E+02 | 2,91E+02  | 1,83E+03  | 7,10E+02 | 2,91E+01 | MND | MND | MND | MND | MND | MND | MND | 8,23E+01 | 1,63E+02 | 1,42E+02 | 2,51E+01 | -3,99E+02 |
| Water use <sup>5)</sup>             | m <sup>3</sup> e depr. | 4,68E+01 | 1,22E+00 | 1,02E+01  | 5,82E+01  | 3,22E+00 | 1,94E-01 | MND | MND | MND | MND | MND | MND | MND | 2,21E-01 | 7,54E-01 | 3,81E-01 | 7,97E-02 | -3,14E+01 |

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 | 4,82E-06 | 1,93E-06 | 7,93E-07 | 7,54E-06 | 4,92E-06 | 4,86E-07 | MND | MND | MND | MND | MND | MND | MND | 1,70E-06 | 1,19E-06 | 1,89E-05 | 1,73E-07 | -2,38E-06 |
| Ionizing radiation <sup>6)</sup> | kBq U235e | 1,01E+01 | 1,37E+00 | 1,47E+00 | 1,29E+01 | 3,63E+00 | 2,37E-01 | MND | MND | MND | MND | MND | MND | MND | 3,78E-01 | 8,42E-01 | 6,52E-01 | 1,14E-01 | -4,45E+00 |
| Ecotoxicity (freshwater)         | CTUe      | 1,58E+03 | 2,20E+02 | 2,29E+02 | 2,03E+03 | 5,82E+02 | 1,80E+01 | MND | MND | MND | MND | MND | MND | MND | 4,94E+01 | 1,36E+02 | 8,53E+01 | 1,64E+01 | -3,73E+02 |
| Human toxicity, cancer           | CTUh      | 1,20E-07 | 5,73E-09 | 2,17E-08 | 1,47E-07 | 1,70E-08 | 6,99E-10 | MND | MND | MND | MND | MND | MND | MND | 1,90E-09 | 3,53E-09 | 3,27E-09 | 4,10E-10 | -2,07E-08 |
| Human tox. non-cancer            | CTUh      | 3,47E-06 | 2,24E-07 | 2,75E-07 | 3,97E-06 | 5,80E-07 | 1,42E-08 | MND | MND | MND | MND | MND | MND | MND | 3,57E-08 | 1,38E-07 | 6,16E-08 | 1,07E-08 | -3,04E-07 |
| SQP <sup>7)</sup>                | -         | 2,28E+03 | 3,09E+02 | 3,82E+02 | 2,98E+03 | 7,77E+02 | 5,88E+00 | MND | MND | MND | MND | MND | MND | MND | 1,07E+01 | 1,90E+02 | 1,84E+01 | 5,37E+01 | -2,51E+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 <sup>8)</sup> | MJ             | 2,41E+02 | 3,43E+00 | 1,50E+02 | 3,94E+02 | 8,95E+00 | 9,56E-01  | MND | MND | MND | MND | MND | MND | MND | 4,70E-01 | 2,11E+00 | 8,11E-01  | 2,18E-01  | -2,27E+01 |
| Renew. PER as material             | MJ             | 0,00E+00 | 0,00E+00 | 3,63E+02 | 3,63E+02 | 0,00E+00 | -3,63E+02 | 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             | 2,41E+02 | 3,43E+00 | 5,14E+02 | 7,58E+02 | 8,95E+00 | -3,62E+02 | MND | MND | MND | MND | MND | MND | MND | 4,70E-01 | 2,11E+00 | 8,11E-01  | 2,18E-01  | -2,27E+01 |
| Non-re. PER as energy              | MJ             | 1,28E+03 | 2,65E+02 | 2,19E+02 | 1,77E+03 | 7,10E+02 | 2,91E+01  | MND | MND | MND | MND | MND | MND | MND | 8,23E+01 | 1,63E+02 | 1,42E+02  | 2,51E+01  | -3,99E+02 |
| Non-re. PER as material            | MJ             | 2,70E+01 | 0,00E+00 | 5,52E+00 | 3,25E+01 | 0,00E+00 | 0,00E+00  | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | -2,50E+01 | -1,99E+00 | 0,00E+00  |
| Total use of non-re. PER           | MJ             | 1,31E+03 | 2,65E+02 | 2,25E+02 | 1,80E+03 | 7,10E+02 | 2,91E+01  | MND | MND | MND | MND | MND | MND | MND | 8,23E+01 | 1,63E+02 | 1,17E+02  | 2,31E+01  | -3,99E+02 |
| Secondary materials                | kg             | 3,03E+01 | 7,47E-02 | 1,98E-01 | 3,05E+01 | 2,13E-01 | 1,11E-02  | MND | MND | MND | MND | MND | MND | MND | 3,22E-02 | 4,60E-02 | 5,55E-02  | 5,28E-03  | -2,73E-01 |
| Renew. secondary fuels             | MJ             | 2,87E-03 | 6,59E-04 | 3,39E-04 | 3,87E-03 | 1,71E-03 | 3,65E-05  | MND | MND | MND | MND | MND | MND | MND | 1,05E-04 | 4,06E-04 | 1,81E-04  | 1,38E-04  | -2,01E-03 |
| 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 <sup>3</sup> | 1,46E+00 | 3,52E-02 | 1,13E-01 | 1,61E+00 | 9,12E-02 | 5,51E-03  | MND | MND | MND | MND | MND | MND | MND | 5,00E-03 | 2,17E-02 | 8,61E-03  | 2,75E-02  | -1,62E+00 |

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   | 3,47E+00 | 2,84E-01 | 1,67E+00 | 5,42E+00 | 7,87E-01 | 5,13E-02 | MND | MND | MND | MND | MND | MND | MND | 1,10E-01 | 1,75E-01 | 1,90E-01 | 0,00E+00 | -1,54E+00 |
| Non-hazardous waste | kg   | 1,04E+02 | 4,94E+00 | 1,34E+01 | 1,22E+02 | 1,30E+01 | 1,28E+00 | MND | MND | MND | MND | MND | MND | MND | 7,74E-01 | 3,05E+00 | 1,33E+00 | 1,74E+02 | -1,71E+01 |
| Radioactive waste   | kg   | 5,85E-03 | 1,83E-03 | 1,12E-03 | 8,80E-03 | 4,90E-03 | 2,06E-04 | MND | MND | MND | MND | MND | MND | MND | 5,79E-04 | 1,13E-03 | 9,99E-04 | 0,00E+00 | -2,45E-03 |

### 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   | 5,92E+00 | 0,00E+00 | 2,54E+02 | 2,59E+02 | 0,00E+00 | 1,12E+00 | MND | MND | MND | MND | MND | MND | MND | 0,00E+00 | 0,00E+00 | 2,18E+03 | 0,00E+00 | 0,00E+00 |
| Materials for energy rec | kg   | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 2,70E+01 | 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 <sub>2</sub> e               | 2,03E+02 | 1,64E+01 | 1,54E+01 | 2,35E+02 | 4,49E+01 | 2,00E+00 | MND | MND | MND | MND | MND | MND | MND | 6,05E+00 | 1,01E+01 | 1,04E+01 | 8,97E-01 | -2,92E+01 |
| Ozone depletion Pot. | kg CFC <sub>11</sub> e             | 8,73E-06 | 3,28E-06 | 1,02E-06 | 1,30E-05 | 8,78E-06 | 3,18E-07 | MND | MND | MND | MND | MND | MND | MND | 1,03E-06 | 2,02E-06 | 1,78E-06 | 2,93E-07 | -2,46E-06 |
| Acidification        | kg SO <sub>2</sub> e               | 6,31E-01 | 4,29E-02 | 4,56E-02 | 7,19E-01 | 1,98E-01 | 1,38E-02 | MND | MND | MND | MND | MND | MND | MND | 4,53E-02 | 2,64E-02 | 7,81E-02 | 6,51E-03 | -1,92E-01 |
| Eutrophication       | kg PO <sub>4</sub> <sup>3</sup> e  | 2,14E-01 | 9,09E-03 | 2,00E-02 | 2,43E-01 | 3,21E-02 | 3,75E-03 | MND | MND | MND | MND | MND | MND | MND | 1,05E-02 | 5,60E-03 | 1,81E-02 | 1,40E-03 | -4,42E-02 |
| POCP ("smog")        | kg C <sub>2</sub> H <sub>4</sub> e | 2,74E-02 | 2,00E-03 | 2,87E-03 | 3,23E-02 | 7,50E-03 | 3,30E-04 | MND | MND | MND | MND | MND | MND | MND | 9,91E-04 | 1,23E-03 | 1,71E-03 | 2,73E-04 | -9,78E-03 |
| ADP-elements         | kg Sbe                             | 8,56E-04 | 3,95E-05 | 1,08E-04 | 1,00E-03 | 1,05E-04 | 1,73E-06 | MND | MND | MND | MND | MND | MND | MND | 3,05E-06 | 2,43E-05 | 5,26E-06 | 2,07E-06 | -1,69E-04 |
| ADP-fossil           | MJ                                 | 1,58E+03 | 2,65E+02 | 2,89E+02 | 2,13E+03 | 7,10E+02 | 2,91E+01 | MND | MND | MND | MND | MND | MND | MND | 8,23E+01 | 1,63E+02 | 1,42E+02 | 2,51E+01 | -3,99E+02 |

## 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 compliance 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  
18.04.2024

