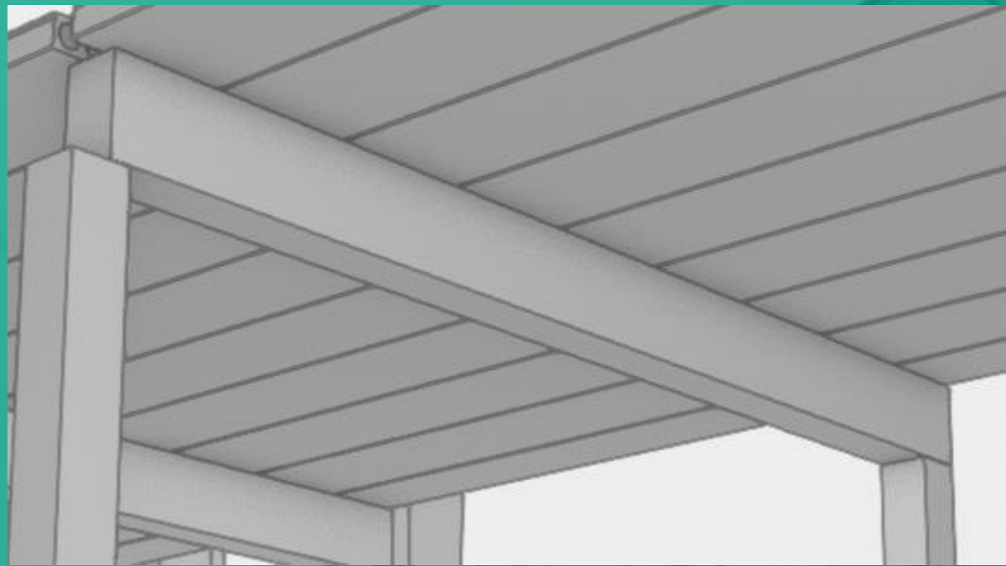
# ENVIRONMENTAL PRODUCT DECLARATION

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



## LOW CARBON PRECAST CONCRETE BEAM PRE-STRESSED

## CONSOLIS PARMA

# GENERAL INFORMATION

## MANUFACTURER INFORMATION

| | |
|---|---|
| **Manufacturer** | Consolis Parma |
| **Address** | Hiidenmäentie 20 03101 Nummela |
| **Contact details** | heini.saloinen@consolis.com |
| **Website** | https://parma.fi/ |

## PRODUCT IDENTIFICATION

| | |
|---|---|
| **Product name** | Low Carbon precast concrete beam pre-stressed |
| **Additional label(s)** | SFS- EN 13225, FI TR15 |
| **Product number / reference** | GJK |
| **Place(s) of production** | Nummela, Finland |

**The Building Information Foundation RTS sr**

*EPDs within the same product category but from different programmes may not be comparable.*

Jukka Seppänen
RTS EPD Committee Secretary

Laura Apilo
Managing Director

## EPD INFORMATION

The EPD owner has the sole ownership, liability, and responsibility for the EPD. Construction products EPDs may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

| | |
|---|---|
| **EPD program operator** | Building Information Foundation RTS sr / Building Information Ltd Malminkatu 16 A, 00100 Helsinki, Finland |
| **EPD standards** | This EPD is in accordance with EN 15804+A2 and ISO 14025 standards. |
| **Product category rules** | The CEN standard EN15904 serves as the core PCR. In addition, the RTS PCR (Finnish version, 22.12.2020) is used. |
| **EPD author** | Heini Saloinen Consolis Parma Hiidenmäentie 20 03101 Nummela |
| **EPD verification** | Independent verification of this EPD and data, according to ISO 14025:<br>☐ Internal certification ☑ External verification |
| **Verification date** | 21.02.2022 |
| **EPD verifier** | Ipek Goktas, One Click LCA |
| **EPD number** | RTS_176_22 |
| **ECO Platform nr.** | - |
| **Publishing date** | February 25, 2022 |
| **EPD valid until** | February 25, 2027 |

# PRODUCT INFORMATION

## PRODUCT DESCRIPTION

Precast concrete beams, pre-stressed, are structural building components. Pre-stressed components are produced in long lines utilizing high quality prestressing steel. Benefits of prestressing are better economy and capacity.

## PRODUCT APPLICATION

Precast concrete beams are typically used in building construction to support slabs.

## TECHNICAL SPECIFICATIONS

For precast concrete beam, concrete with various different strength classes can be used, but the minimum concrete strength class is C40/50.

## PRODUCT STANDARDS

EN 206, EN 13369, EN 13225 standards.

## PHYSICAL PROPERTIES OF THE PRODUCT

Product properties can be found on the manufacturer website at https://parma.fi

## ADDITIONAL TECHNICAL INFORMATION

Further information can be found at https://parma.fi/ .

## PRODUCT RAW MATERIAL COMPOSITION

| Product and Packaging Material | Weight, kg | Post-consumer % | Industrial by-product % | Renewable % | Country Region of origin |
|---|---|---|---|---|---|
| Aggregate, fine | 429 | - | - | - | Finland |
| Aggregate, coarse | 264 | - | - | - | Finland |
| Cement and secondary-cementitious binders | 197 | - | 44% | - | Finland |
| Reinforcement | 30 | 79% | - | - | EU |
| Water | 79 | - | - | - | Finland |
| Admixtures | 1 | - | - | - | Finland |

## PRODUCT RAW MATERIAL MAIN COMPOSITION

| Raw material category | Amount, mass- % | Material origin |
|---|---|---|
| Metals | 3 | EU |
| Minerals | 97 | Finland |
| Fossil materials | 0 | |
| Bio-based materials | 0 | |

## 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

## MANUFACTURING AND PACKAGING (A1-A3)

The production of the concrete precast beam pre-stressed elements begins with the preparation of the casting mold, which includes cleaning the casting platform. At the same time, reinforcement steel braids are put into place. When the reinforcements are in place, fresh concrete is poured onto the cast. After casting and finishing, the element is left to cure. When the element is cured the mould is removed. The final stage is finishing the product and transporting to the storage. Eventually, the elements are moved out and transported to the construction site.

## 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. Optional A5 module is not declared.

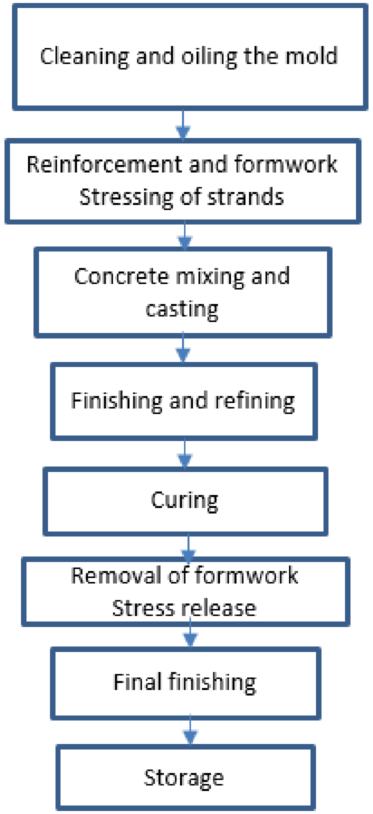
## PRODUCT USE AND MAINTENANCE (B1-B7)

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

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

At the end-of-life, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste. The demolition process consumes energy in the form of diesel fuel used by building machines (C1). The demolished low carbon precast beam element is delivered to the nearest construction waste treatment plant (C2). At the waste treatment plant, waste that can be reused, recycled or recovered for energy is separated and diverted for further use (C3). Unusable materials are disposed of in a landfill (C4). Due to the recycling potential of reinforcement steel and concrete, they can be used as secondary raw material. This avoids the use of virgin raw materials (D).

# MANUFACTURING PROCESS



# LIFE-CYCLE ASSESSMENT

## LIFE-CYCLE ASSESSMENT INFORMATION

| | |
|---|---|
| **Period for data** | Calendar year 2020 |

## DECLARED AND FUNCTIONAL UNIT

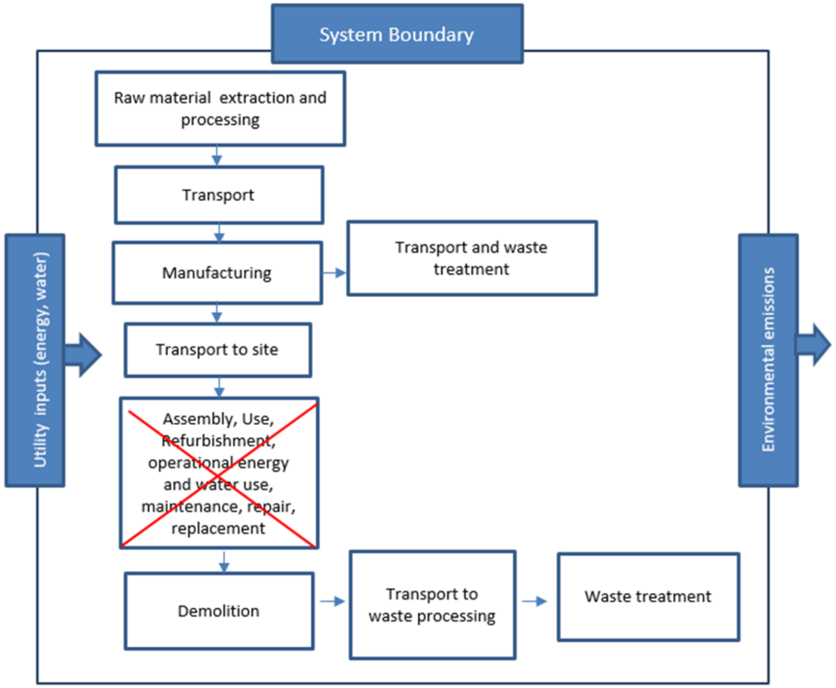
| | |
|---|---|
| **Declared unit** | 1 tonne |
| **Mass per declared unit** | 1000 |

## BIOGENIC CARBON CONTENT

Product does not content biogenic carbon at the factory gate

## SYSTEM BOUNDARY

This EPD covers cradle to gate with module A4, modules C1-C4 and module D; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary is included.




| 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 | D | D |
| x | x | x | x | MND | MND | MND | MND | MND | MND | MND | MND | x | x | x | x | MND | 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.*

## CUT-OFF CRITERIA

T All inputs and outputs of the unit processes are available and included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total neglected input and output flows do also not exceed 5% of energy usage or mass. The life cycle analysis includes all industrial processes from raw material acquisition to production, distribution and end-of-life stages.

For easier modelling and because of lack of accuracy in available modelling resources many constituents under 1% of product mass are excluded. These include for example lifting loops which are all present in the product only in very small amounts and have no serious impact on the emissions of the product. The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

## ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material and energy data cannot be measured separately for the product under investigation. In this study, as per EN 15804, allocation is conducted in the following order;

1. Allocation should be avoided.

2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.

3. Allocation should be based on economic values.

As it is impossible to collect raw material, ancillary material amd energy consumption data separately for each product produced the in the plant, data is allocated. Allocation is based on annual production rate of pre-stressed concrete beam and made with high accuracy and precision.

The values for 1 tonne of element are calculated by considering the total product weight per annual production. In the factory, several kinds of concrete elements are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to the ratio of the annual production of the declared product to the total annual production at the factory, the annual total raw materials, energy consumption per the declared product are allocated. Subsequently, the product output fixed to 1000 kg and the corresponding amount of product is used in the calculations. This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. All estimations and assumptions are given below:

• Module A4: The transportation distance is defined according to RTS PCR. It was assumed that typical installation place is situated in the region of the production plant. Average distance of transportation from production plant to building site is equal to 70 km. Transportation method is assumed to be lorry. The transportation doesn’t cause losses as products are fixed properly. Also, volume capacity utilisation factor is assumed to be 1 for the product.

• Module C1: Energy consumption of a demolition process is on the average 1 l of diesel/ tonne (Kivikolmio 2020). Therefore, energy consumption demolition is 10 kWh/ 1000 kg. The source of energy is diesel fuel used by work machines.

• Module C2: 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. All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 40 km and the transportation method is lorry which is the most common.

• Module A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, 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 taken into account as it is assumed that return trip is used by the transportation company to serve the needs of other clients.

• Module C3: At the beginning of 2020 waste restrictions in Finland were tightened and the amount of waste going to landfill is restricted compared to the last years, so it can be assumed that 100% of low carbon precast concrete beam prestressed are transported to a waste treatment plant, where the slabs are crushed and steel is separated. About 99% of steel and concrete (Kivikolmio 2020) are recycled. The process losses of the waste treatment plant are assumed to be negligible. Share of losses in sorting process are assumed to be very small, about 1 %.

• Module C4: The remaining 1% of concrete and 1% of steel are assumed to be send to the landfill. Loss is minimal because products consist only of concrete and steel.

• Module D: The recycled 99% of concrete and 99% of steel are converted into a raw materials after recycling.

# ENVIRONMENTAL IMPACT DATA

Note: additional environmental impact data may be presented in annexes.

## 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 | kg $CO_2e$ | 1,2E2 | 7,58E0 | 7,13E0 | 1,35E2 | 8,84E0 | MND | MND | MND | MND | MND | MND | MND | MND | 3,3E0 | 5,15E0 | 4,54E0 | 5,28E-2 | -7,85E0 |
| GWP – fossil | kg $CO_2e$ | 1,18E2 | 7,57E0 | 6,94E0 | 1,32E2 | 8,92E0 | MND | MND | MND | MND | MND | MND | MND | MND | 3,3E0 | 5,15E0 | 4,58E0 | 5,27E-2 | -7,76E0 |
| GWP – biogenic | kg $CO_2e$ | 2,51E0 | 4,56E-3 | 1,16E-1 | 2,63E0 | 5,46E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 9,17E-4 | 3,15E-3 | -4,09E-2 | 1,04E-4 | -8,69E-2 |
| GWP – LULUC | kg $CO_2e$ | 5,51E-2 | 2,7E-3 | 7,36E-2 | 1,31E-1 | 3,15E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 2,79E-4 | 1,82E-3 | 1,16E-3 | 1,56E-5 | -9,44E-3 |
| Ozone depletion pot. | kg $CFC_{11}e$ | 6,17E-6 | 1,73E-6 | 1,07E-6 | 8,97E-6 | 2,04E-6 | MND | MND | MND | MND | MND | MND | MND | MND | 7,12E-7 | 1,18E-6 | 9,35E-7 | 2,17E-8 | -6,7E-7 |
| Acidification potential | mol $H^+e$ | 3,93E-1 | 3,34E-2 | 3,94E-2 | 4,66E-1 | 3,67E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 3,45E-2 | 2,12E-2 | 4,91E-2 | 5E-4 | -4,98E-2 |
| EP-freshwater[2)] | kg Pe | 4,32E-3 | 6,51E-5 | 4,86E-4 | 4,87E-3 | 7,71E-5 | MND | MND | MND | MND | MND | MND | MND | MND | 1,33E-5 | 4,45E-5 | 6,61E-5 | 6,36E-7 | -4,96E-4 |
| EP-marine | kg Ne | 1E-1 | 9,77E-3 | 8,74E-3 | 1,19E-1 | 1,09E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 1,52E-2 | 6,28E-3 | 1,97E-2 | 1,72E-4 | -1,05E-2 |
| EP-terrestrial | mol Ne | 1,15E0 | 1,08E-1 | 1,18E-1 | 1,37E0 | 1,2E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 1,67E-1 | 6,94E-2 | 2,17E-1 | 1,9E-3 | -1,37E-1 |
| POCP (“smog”) | kg NMVOCe | 3,07E-1 | 3,35E-2 | 2,79E-2 | 3,68E-1 | 3,77E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,59E-2 | 2,18E-2 | 5,97E-2 | 5,51E-4 | -3,59E-2 |
| ADP-minerals & metals | kg Sbe | 1,13E-3 | 1,88E-4 | 3,23E-5 | 1,35E-3 | 2,23E-4 | MND | MND | MND | MND | MND | MND | MND | MND | 5,03E-6 | 1,29E-4 | 4,65E-5 | 4,81E-7 | -8,04E-4 |
| ADP-fossil resources | MJ | 7,48E2 | 1,15E2 | 2,04E2 | 1,07E3 | 1,36E2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,54E1 | 7,86E1 | 6,3E1 | 1,47E0 | -1,08E2 |
| Water use[1)] | $m^3e$ depr. | 2,89E1 | 4,08E-1 | 1,7E0 | 3,1E1 | 4,83E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 8,46E-2 | 2,79E-1 | 2,43E-1 | 6,81E-2 | -1,31E1 |

1) GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) 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 experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get $PO_4e$.

## 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 | 2,17E-6 | 5,81E-7 | 2,57E-7 | 3,01E-6 | 6,88E-7 | MND | MND | MND | MND | MND | MND | MND | MND | 9,14E-7 | 3,97E-7 | 4,99E-6 | 9,72E-9 | -5,93E-7 |
| Ionizing radiation[3)] | kBq U235e | 2,55E0 | 5,04E-1 | 4,81E0 | 7,86E0 | 5,95E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 1,94E-1 | 3,43E-1 | 2,77E-1 | 6,04E-3 | -6,54E-1 |
| Ecotoxicity (freshwater) | CTUe | 1,14E3 | 8,99E1 | 2,12E2 | 1,44E3 | 1,06E2 | MND | MND | MND | MND | MND | MND | MND | MND | 2,66E1 | 6,13E1 | 7,42E1 | 9,29E-1 | -1,58E2 |
| Human toxicity, cancer | CTUh | 2,05E-8 | 2,57E-9 | 3,4E-9 | 2,65E-8 | 3,01E-9 | MND | MND | MND | MND | MND | MND | MND | MND | 9,53E-10 | 1,74E-9 | 2,17E-9 | 2,2E-11 | -9,5E-9 |
| Human tox. non-cancer | CTUh | 8,27E-7 | 1,03E-7 | 1,05E-7 | 1,03E-6 | 1,22E-7 | MND | MND | MND | MND | MND | MND | MND | MND | 2,35E-8 | 7,04E-8 | 7,8E-8 | 6,79E-10 | -8,37E-8 |
| SQP | - | 1,51E3 | 1,27E2 | 7,39E0 | 1,65E3 | 1,52E2 | MND | MND | MND | MND | MND | MND | MND | MND | 1,16E0 | 8,75E1 | 3,89E0 | 2,5E0 | -7,27E1 |

4) SQP = Land use related impacts/soil quality.5) 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.

## 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 | MJ | 1,64E2 | 1,63E0 | 1,4E2 | 3,06E2 | 1,93E0 | MND | MND | MND | MND | MND | MND | MND | MND | 2,45E-1 | 1,12E0 | 1,88E0 | 1,19E-2 | -9,26E0 |
| Renew. PER as material | MJ | 8,55E-2 | 0E0 | 0E0 | 8,55E-2 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Total use of renew. PER | MJ | 1,64E2 | 1,63E0 | 1,4E2 | 3,06E2 | 1,93E0 | MND | MND | MND | MND | MND | MND | MND | MND | 2,45E-1 | 1,12E0 | 1,88E0 | 1,19E-2 | -9,26E0 |
| Non-re. PER as energy | MJ | 7,48E2 | 1,15E2 | 2,04E2 | 1,07E3 | 1,36E2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,54E1 | 7,86E1 | 6,3E1 | 1,47E0 | -1,08E2 |
| Non-re. PER as material | MJ | 1,62E1 | 0E0 | 0E0 | 1,62E1 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Total use of non-re. PER | MJ | 7,64E2 | 1,15E2 | 2,04E2 | 1,08E3 | 1,36E2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,54E1 | 7,86E1 | 6,3E1 | 1,47E0 | -1,08E2 |
| Secondary materials | kg | 1,14E2 | 0E0 | 8,9E-4 | 1,14E2 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 2,28E-1 |
| Renew. secondary fuels | MJ | 1,44E0 | 0E0 | 0E0 | 1,44E0 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Non-ren. secondary fuels | MJ | 1,34E1 | 0E0 | 0E0 | 1,34E1 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Use of net fresh water | $m^3$ | 5,56E0 | 2,18E-2 | 5,55E-2 | 5,64E0 | 2,58E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,01E-3 | 1,49E-2 | 8,82E-3 | 1,61E-3 | -1,03E0 |

6) 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 | 2,71E0 | 1,2E-1 | 4,47E-1 | 3,28E0 | 1,42E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 4,88E-2 | 8,17E-2 | 0E0 | 1,37E-3 | -7,58E-1 |
| Non-hazardous waste | kg | 7,85E1 | 9,9E0 | 1,15E1 | 9,99E1 | 1,18E1 | MND | MND | MND | MND | MND | MND | MND | MND | 5,22E-1 | 6,79E0 | 0E0 | 1E1 | -2,38E1 |
| Radioactive waste | kg | 5,13E-3 | 7,89E-4 | 2,09E-3 | 8,01E-3 | 9,31E-4 | MND | MND | MND | MND | MND | MND | MND | MND | 3,18E-4 | 5,37E-4 | 0E0 | 9,74E-6 | -4,76E-4 |

## 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 | 7,11E-2 | 0E0 | 0E0 | 7,11E-2 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Materials for recycling | kg | 2,66E0 | 0E0 | 0E0 | 2,66E0 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 9,9E2 | 0E0 | 0E0 |
| Materials for energy rec | kg | 1,56E-2 | 0E0 | 0E0 | 1,56E-2 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |
| Exported energy | MJ | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 0E0 |

## KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP – total | kg $CO_2e$ | 1,2E-1 | 7,58E-3 | 7,13E-3 | 1,35E-1 | 8,93E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 3,3E-3 | 5,15E-3 | 4,54E-3 | 5,28E-5 | -7,85E-3 |
| ADP-minerals & metals | kg Sbe | 1,13E-6 | 1,88E-7 | 3,23E-8 | 1,35E-6 | 2,23E-7 | MND | MND | MND | MND | MND | MND | MND | MND | 5,03E-9 | 1,29E-7 | 4,65E-8 | 4,81E-10 | -8,04E-7 |
| ADP-fossil | MJ | 7,48E-1 | 1,15E-1 | 2,04E-1 | 1,07E0 | 1,36E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 4,54E-2 | 7,86E-2 | 6,3E-2 | 1,47E-3 | -1,08E-1 |
| Water use | $m^3$e depr. | 2,89E-2 | 4,08E-4 | 1,7E-3 | 3,1E-2 | 4,83E-4 | MND | MND | MND | MND | MND | MND | MND | MND | 8,46E-5 | 2,79E-4 | 2,43E-4 | 6,81E-5 | -1,31E-2 |
| Secondary materials | kg | 1,14E-1 | 0E0 | 8,9E-7 | 1,14E-1 | 0E0 | MND | MND | MND | MND | MND | MND | MND | MND | 0E0 | 0E0 | 0E0 | 0E0 | 2,28E-4 |
| Biog. C in product | kg C | N/A | N/A | 0E0 | 0E0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Biog. C in packaging | kg C | N/A | N/A | 0E0 | 0E0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

7) Biog. C in product = Biogenic carbon content in product

# SCENARIO DOCUMENTATION

## Manufacturing energy scenario documentation

| Scenario parameter | Value |
|---|---|
| Electricity data source and quality | Market for electricity, medium voltage (Reference product: electricity, medium voltage), Finland, Ecoinvent 3.6, year: 2019 |
| Electricity $CO_2e$ / kWh | 0.24 kg CO2/kWh |
| District heating data source and quality | Heat and power co-generation, wood chips, 6667 kw, state-of-the-art 2014 (Reference product: heat, district or industrial, other than natural gas ) Finland, Ecoinvent 3.6, year: 2019 |
| District heating $CO_2e$ / kWh | 0.0031 kg CO2/MJ |
| Diesel data source and quality | Diesel, burned in diesel-electric generating set, 10mw (Reference product: diesel, burned in diesel-electric generating set, 10mw ) Ecoinvent 3.6, Global, year: 2019 |
| Diesel CO2e/kWh | 0.09 kg $CO_2e$ / MJ |

## Transport scenario documentation (A4)

| Scenario parameter | Value |
|---|---|
| Specific transport $CO_2e$ emissions, kg $CO_2e$ / tkm | 0,132 |
| Average transport distance, km | 70 |
| Capacity utilization (including empty return) % | 100 |
| Bulk density of transported products | 2500 |
| Volume capacity utilization factor | 100 |

## End of life scenario documentation

| Scenario parameter | Value |
|---|---|
| Collection process – kg collected separately | 1000 |
| Collection process – kg collected with mixed waste | - |
| Recovery process – kg for re-use | - |
| Recovery process – kg for recycling | 990 |
| Recovery process – kg for energy recovery | - |
| Disposal (total) – kg for final deposition | 10 |
| Scenario assumptions e.g. transportation | End-of-life product is transported 40 km with an average lorry. |

## BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.

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Ecoinvent database v3.6 (2019) and One Click LCA database.

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

RTS PCR EN 15804:2019 RTS PCR in line with EN 15804+A2. Published by the Building Information Foundation RTS 1.6.2020.

Low Carbon Precast beam, pre-stressed LCA background report 22.11.2021

Kivikolmio 2020 Heikkilä Iivari production manager email

## ABOUT THE MANUFACTURER

Consolis Parma is leading precast concrete producer in Finland belonging to CONSOLIS group. The company operates in 16 locations with around 700 employees. www.parma.fi

CONSOLIS is a European leader industrial group providing sustainable and smart precast concrete structures for the building and utilities sectors. www.consolis.com

## EPD AUTHOR AND CONTRIBUTORS

| | |
|---|---|
| **Manufacturer** | Consolis Parma |
| **EPD author** | Heini Saloinen Consolis Parma Hiidenmäentie 20 03101 Nummela |
| **EPD verifier** | Ipek Goktas, One Click LCA |
| **EPD program operator** | The Building Information Foundation RTS sr |
| **Background data** | This EPD is based on Ecoinvent 3.6 (cut-off) and One Click LCA databases. |
| **LCA software** | The LCA and EPD have been created using One Click LCA Pre-Verified EPD Generator for Cementitious Products |

# 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 EN 15804, 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 background report (project report) for this EPD

Why does verification transparency matter? Read more online.

## VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

| EPD verification information | Answer |
|---|---|
| Independent EPD verifier | Ipek Goktas, One Click LCA |
| EPD verification started on | 15.01.2022 |
| EPD verification completed on | 21.02.2022 |
| Approver of the EPD verifier | The Building Information Foundation RTS sr |

| Author & tool verification | Answer |
|---|---|
| EPD author | Heini Saloinen, Consolis Parma |
| EPD author training completion | 30.9.2020 |
| EPD Generator module | Cementitious Products |
| Independent software verifier | Anni Oviir, Rangi Maja OÜ |
| Software verification date | 27.6.2020 |

## 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 EN 15804:2012+A2:2019.

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.

Ipek Goktas, One Click LCA

# ANNEX 1 : 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 | 1,08E2 | 7,5E0 | 6,84E0 | 1,22E2 | 8,84E0 | MND | MND | MND | MND | MND | MND | MND | MND | 3,27E0 | 5,1E0 | 4,54E0 | 5,17E-2 | -7,58E0 |
| Ozone depletion Pot. | kg $CFC_{-11}$e | 4,15E-6 | 1,38E-6 | 1,35E-6 | 6,87E-6 | 1,63E-6 | MND | MND | MND | MND | MND | MND | MND | MND | 5,63E-7 | 9,39E-7 | 7,46E-7 | 1,72E-8 | -6,11E-7 |
| Acidification | kg $SO_2$e | 2,94E-1 | 1,73E-2 | 3E-2 | 3,41E-1 | 1,82E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,87E-3 | 1,05E-2 | 1,12E-2 | 2,08E-4 | -3,12E-2 |
| Eutrophication | kg $PO_4^{3}$e | 7,24E-2 | 3,41E-3 | 1,16E-2 | 8,74E-2 | 3,78E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 8,57E-4 | 2,18E-3 | 3,25E-3 | 4,03E-5 | -1,71E-2 |
| POCP (“smog”) | kg $C_2H_4$e | 1,07E-2 | 1,04E-3 | 1,2E-3 | 1,3E-2 | 1,18E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 5,01E-4 | 6,78E-4 | 8,43E-4 | 1,53E-5 | -2,74E-3 |
| ADP-elements | kg Sbe | 1,13E-3 | 1,88E-4 | 3,23E-5 | 1,35E-3 | 2,23E-4 | MND | MND | MND | MND | MND | MND | MND | MND | 5,03E-6 | 1,29E-4 | 4,65E-5 | 4,81E-7 | -8,04E-4 |
| ADP-fossil | MJ | 7,48E2 | 1,15E2 | 2,04E2 | 1,07E3 | 1,36E2 | MND | MND | MND | MND | MND | MND | MND | MND | 4,54E1 | 7,86E1 | 6,3E1 | 1,47E0 | -1,08E2 |

# ANNEX 2 : ENVIRONMENTAL IMPACTS – TRACI 2.1. / 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 | 1,02E2 | 7,49E0 | 6,86E0 | 1,17E2 | 8,83E0 | MND | MND | MND | MND | MND | MND | MND | MND | 3,26E0 | 5,09E0 | 4,52E0 | 5,14E-2 | -7,52E0 |
| Ozone Depletion | kg $CFC_{-11}$e | 5,22E-6 | 1,84E-6 | 1,65E-6 | 8,7E-6 | 2,17E-6 | MND | MND | MND | MND | MND | MND | MND | MND | 7,51E-7 | 1,25E-6 | 9,93E-7 | 2,29E-8 | -8,1E-7 |
| Acidification | kg $SO_2$e | 3,16E-1 | 2,9E-2 | 3,26E-2 | 3,78E-1 | 3,19E-2 | MND | MND | MND | MND | MND | MND | MND | MND | 3,16E-2 | 1,84E-2 | 4,43E-2 | 4,43E-4 | -4,21E-2 |
| Eutrophication | kg Ne | 2,59E-2 | 3,88E-3 | 3,86E-3 | 3,37E-2 | 4,51E-3 | MND | MND | MND | MND | MND | MND | MND | MND | 2,79E-3 | 2,6E-3 | 3,98E-3 | 5,31E-5 | -5,65E-3 |
| POCP (“smog”) | kg $O_3$e | 4,63E0 | 6,19E-1 | 5,37E-1 | 5,79E0 | 6,89E-1 | MND | MND | MND | MND | MND | MND | MND | MND | 9,69E-1 | 3,98E-1 | 1,25E0 | 1,09E-2 | -6,47E-1 |
| ADP-fossil | MJ | 5,29E1 | 1,65E1 | 6,59E0 | 7,59E1 | 1,94E1 | MND | MND | MND | MND | MND | MND | MND | MND | 6,71E0 | 1,12E1 | 8,87E0 | 2,13E-1 | -7,96E0 |