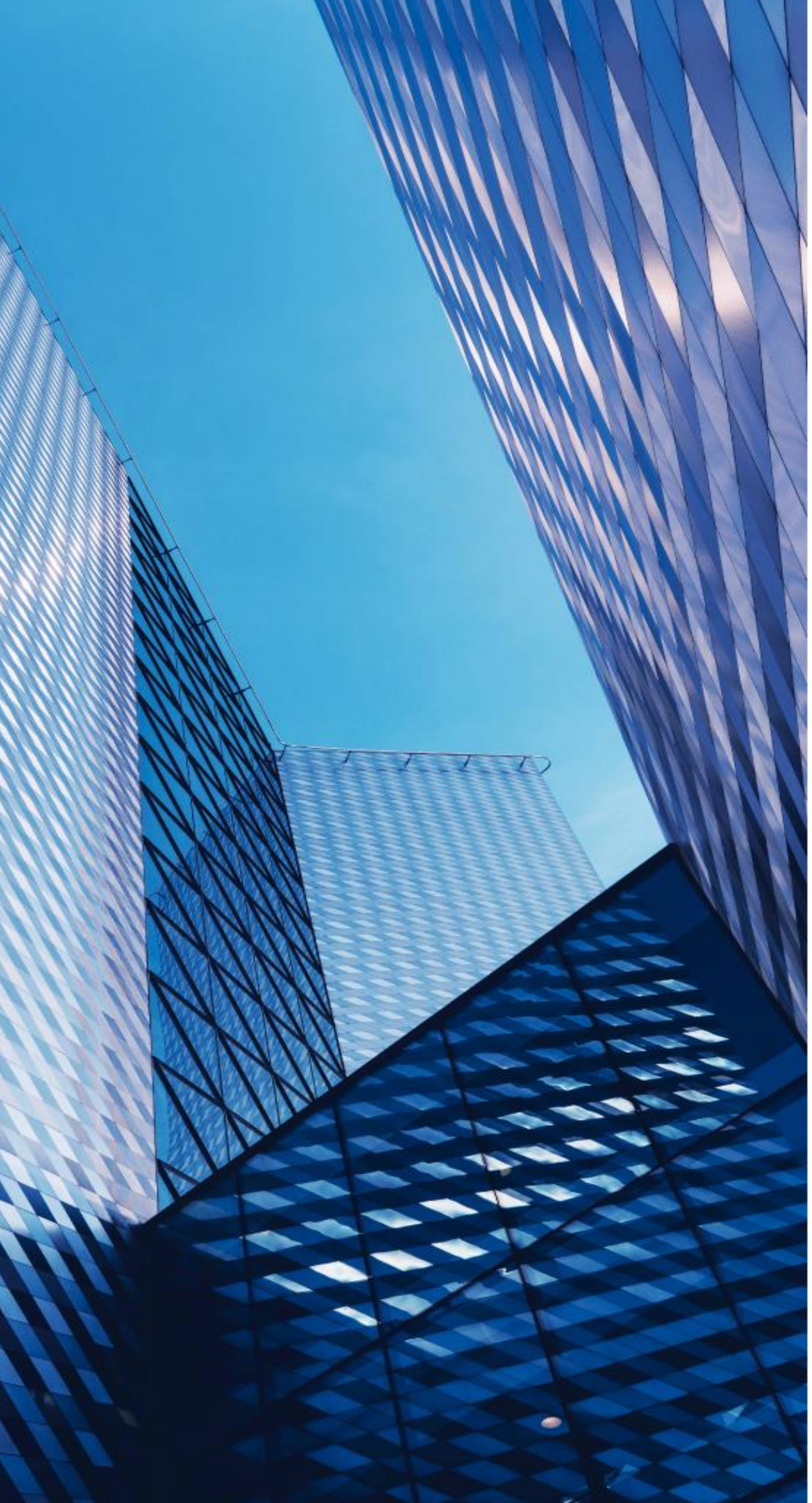
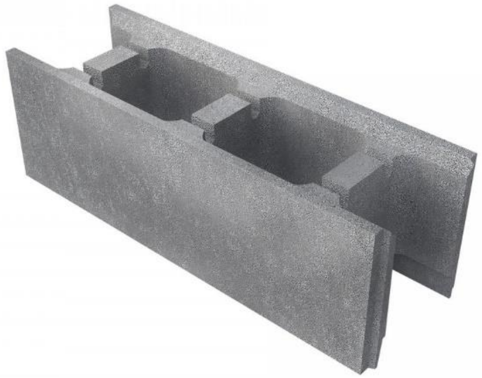


ENVIRONMENTAL PRODUCT DECLARATION

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

MH200 Concrete block, uninsulated
Lammin Betoni Oy



EPD HUB, HUB-0012
Publishing date 29 Mar. 2022, last updated date 29 Mar. 2022, valid until 29 Mar. 2027

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Lammin Betoni Oy
Address	Paarmamäentie 8, 16900 Lammi, Finland
Contact details	info@lammi.fi
Website	www.lammi.fi

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) EN 16757 Product Category Rules for concrete and concrete elements
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 and D
EPD author	Vahanen Environment Oy Riikka Anttonen, Laura Sariola
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	Elma Avdyli, EPD Hub

The manufacturer has 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	MH200 Concrete block, uninsulated
Place of production	Finland
Period for data	2020

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m^2
Declared unit mass (kg)	172,8
GWP-fossil, A1-A3 (kgCO2e)	25,5
GWP-total, A1-A3 (kgCO2e)	19,2
GWP-total, A1-A3 (kgCO2e) per kg of product	0,111
Secondary material, inputs (%)	0,0171
Secondary material, outputs (%)	80,0
Total energy use, A1-A3 (kWh)	59,2
Total water use, A1-A3 (m3e)	0,352

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Lammin Betoni is a family-owned concrete construction company founded in 1956. Product innovations have shaped the industry over the decades and made Lammi a pioneer in concrete construction. Today, Lammi is a viable market leader in the industry, producing top-quality block and foundation products to create ambitious and individual concrete houses. The company has production facilities in Lammi, Vantaa, and Dabrowa Gornicza, Poland. Lammi's customers are both construction professionals and private customers in the market for single-family houses.

PRODUCT DESCRIPTION

Uninsulated concrete blocks are suitable construction materials for all construction phases and are available in various sizes. The reference product is an uninsulated 200 mm thick concrete block (MH200) that weighs 21 kg and is made of pure concrete by vibratory compression. The product is used e.g. for load-bearing and non-load-bearing wall structures, plinths, retaining walls and swimming pools. The product is especially suitable for construction in cramped spaces like elevator shafts and renovation sites.

The width of the concrete blocks varies depending on the intended use. Values can be converted per declared unit (m2) for other block thicknesses (150, 250, 300 mm) using the following conversion factors:

Product	Weight, kg/m2	Conversion factor
MH150	163	0,94
MH200	173	1,00
MH250	196	1,13
MH300	236	1,37

The main raw materials for uninsulated concrete blocks are portland cement, water and aggregates such as sand and gravel. Other raw materials account for less than 1 %.

Emission values for reinforcement steel and cast concrete are given as additional information (APPENDIX 1).

Further information available at www.lammi.fi

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	-	-
Minerals	100	-
Fossil materials	-	-
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product’s biogenic carbon content at the factory gate.

Biogenic carbon content in the product, kg C	-
Biogenic carbon content in packaging, kg C	1,8

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	m2
Mass per declared unit, kg	172,8
Functional unit	-
Reference service life, years	100

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 waste handling 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.

The product is made of aggregate (sand and gravel), cement and water. Other raw materials account for less than 1 %. Blocks are made of earth-moist concrete. The raw materials are manufactured in Finland and Latvia (A1). Raw material losses during production are assessed as insignificant (<0,01%).

Domestic raw materials are transported by a truck. The cement from Latvia is transported by trucks and container ships. For raw material transports (A2) an occupancy rate of 100% is assumed for sea freight and 50% for road transport. Road transports are assumed to be covered by > 32 t truck.

In the manufacturing process, the aggregate is delivered to the silos from which it is dispensed on a conveyor and weighed using a balance. Cement is added and the material is mixed dry. After this water and additives (superplasticizer) are added and the mass is mixed wet. The mass is then filled into block moulds and vibrated to the shape and density. After this, blocks are transported on a conveyor belt to the dryer where the product acquires its final shape and density. Dried blocks are packed in plastic on wooden pallets after which they are stored ready for transport. The quality of the production process and materials is constantly monitored.

Manufacturing requires energy for electricity and heating of production facilities (A3). Steel moulds, machinery and equipment are counted as capital goods and are not taken into consideration in the calculation. Waste generated at the production facility is recycled. According to the estimate by the manufacturer, 15% of the wooden pallets are reused.

TRANSPORT AND INSTALLATION (A4-A5)

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

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

Product is transported to the construction site with a > 32 t lorry. The average distance from the production facility to the construction site in the Uusimaa region is assumed to be 140 km. Possibly empty return trips are taken into consideration by using an occupancy rate of 50%. Transportation losses are assessed as insignificant.

At the site, the concrete blocks are stacked, and the structure is reinforced with reinforcing steel. Thermal insulation joints are sealed. After stacking the structure, the cavities are filled with cast concrete. The amount of loss in installation is estimated to be negligible (<0,1%). The products are stacked manually and the energy consumption of moving them from the truck platform to the site is assumed to be so low that it has not been considered. As the location of construction sites varies, the transportation to treatment – scenario for installation waste (wooden pallets and plastics) is based on the information provided for the production waste. (A5)

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)

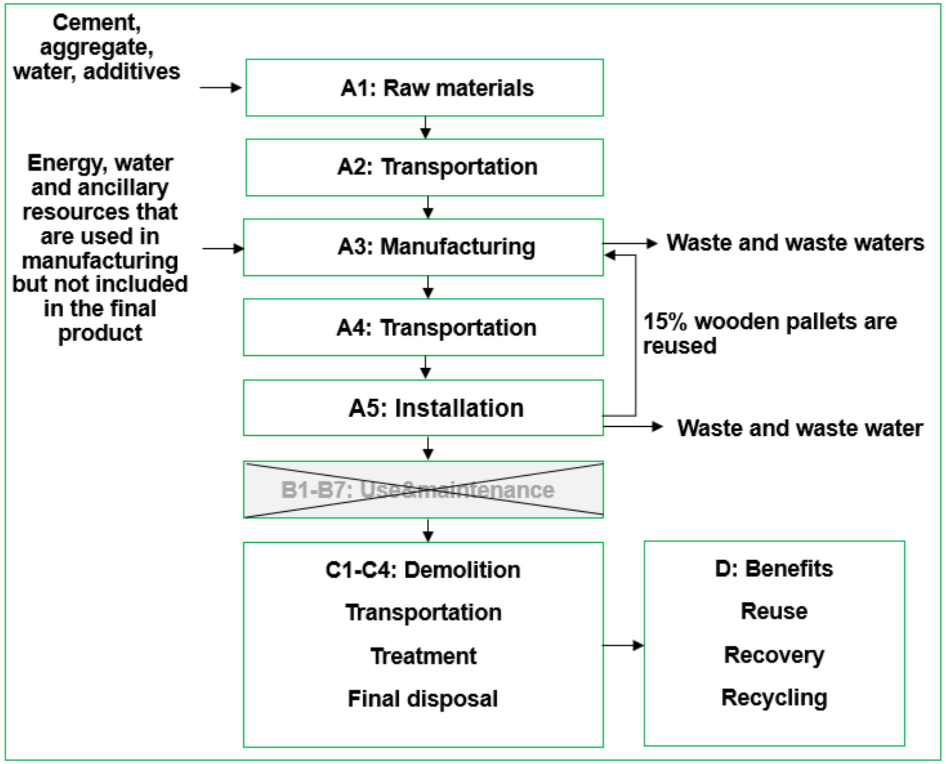
At the end of the life cycle, the structure is dismantled. According to the assumption, 80% of the waste is recycled and 20% is disposed to landfills. This waste handling scenario used in modules C, and the associated effect in module D, is a conservative assumption based on Finland's current practice and the concrete recycling rate assessment by the Finnish Environment Institute (Sederholm, 2019).

The impacts cover dismantling of the building, disassembling of parts and the use of energy for on-site transport. The calculation assumes the use of diesel-powered work machines. The energy consumption (0.107 MJ / kg) for the demolition phase (C1) has been based on VTT's estimate of the demolition energy of a concrete building. The estimate is declared in the background report on the environmental impact of building materials (Rakennusmateriaalien ympäristövaikutukset –Taustaraportti, VTT, 2013).

The dismantled waste material is transported to the closest facility for recycling or final disposal (C2). The assumption for an average distance and transport method is estimated to be 20 km by 16-32 t truck with an occupancy rate of 50%.

At the treatment plant, the recoverable waste is separated for recycling and directed to further use (C3). Non-recoverable waste is disposed of in landfills (C4). Recoverable concrete waste can be used to replace virgin gravel in soil construction. (D).

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 materials and energy consumption. All inputs and outputs of the unit processes, for which data is available, 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.

The production and maintenance of capital equipment, construction activities and infrastructure as well as activities related to sales or personnel (commuting etc.) are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. In this study, as per the reference standard, 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.

Data on energy, packaging and waste related to production has been delivered per total output. Allocation of these flows per studied product is based on annual production. Data on raw material consumption is product-specific, so no allocation was required concerning it.

Allocation used in environmental data sources is aligned with the above. Module-specific estimations and assumptions are presented in the module descriptions.

AVERAGES AND VARIABILITY

This EPD is product and factory specific and does not contain average calculations.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using a One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent 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	kg CO_2e	2,09E1	2,13E0	-3,81E0	1,92E1	4,41E0	1,02E1	MND	MND	MND	MND	MND	MND	MND	1,69E0	1,15E0	7,75E-1	1,83E-1	1,91E-1
GWP – fossil	kg CO_2e	2,06E1	2,13E0	2,78E0	2,55E1	4,45E0	2,83E-1	MND	MND	MND	MND	MND	MND	MND	1,69E0	1,15E0	7,74E-1	1,82E-1	1,95E-1
GWP – biogenic	kg CO_2e	3,31E-1	1,44E-3	-6,61E0	-6,28E0	3,23E-3	9,97E0	MND	MND	MND	MND	MND	MND	MND	4,71E-4	6,15E-4	2,15E-4	3,61E-4	-2,45E-3
GWP – LULUC	kg CO_2e	3,93E-3	6,83E-4	1,45E-2	1,91E-2	1,34E-3	1,2E-5	MND	MND	MND	MND	MND	MND	MND	1,43E-4	4,09E-4	6,54E-5	5,41E-5	-6,08E-4
Ozone depletion pot.	kg CFC_{-11}e	7,12E-7	4,97E-7	4,48E-7	1,66E-6	1,05E-6	5,85E-9	MND	MND	MND	MND	MND	MND	MND	3,66E-7	2,62E-7	1,67E-7	7,5E-8	1,09E-7
Acidification potential	mol H^+e	5,14E-2	1,2E-2	1,37E-2	7,72E-2	1,87E-2	4,78E-4	MND	MND	MND	MND	MND	MND	MND	1,77E-2	4,71E-3	8,1E-3	1,73E-3	3,91E-3
EP-freshwater[3)]	kg Pe	2,61E-4	1,69E-5	1,16E-4	3,94E-4	3,62E-5	6,04E-7	MND	MND	MND	MND	MND	MND	MND	6,85E-6	9,64E-6	3,13E-6	2,2E-6	-1,87E-5
EP-marine	kg Ne	1,34E-2	3,43E-3	2,85E-3	1,96E-2	5,64E-3	2,18E-4	MND	MND	MND	MND	MND	MND	MND	7,82E-3	1,4E-3	3,58E-3	5,95E-4	2,38E-3
EP-terrestrial	mol Ne	1,57E-1	3,8E-2	3,29E-2	2,28E-1	6,23E-2	2,31E-3	MND	MND	MND	MND	MND	MND	MND	8,58E-2	1,54E-2	3,92E-2	6,56E-3	2,53E-2
POCP (“smog”)	kg NMVOCe	3,98E-2	1,16E-2	1,2E-2	6,34E-2	2E-2	5,77E-4	MND	MND	MND	MND	MND	MND	MND	2,36E-2	4,73E-3	1,08E-2	1,91E-3	6,94E-3
ADP-minerals & metals	kg Sbe	1,12E-4	3,53E-5	2,62E-5	1,74E-4	7,6E-5	8,34E-7	MND	MND	MND	MND	MND	MND	MND	2,59E-6	3,12E-5	1,18E-6	1,66E-6	-2,76E-5
ADP-fossil resources	MJ	8,6E1	3,28E1	6,73E1	1,86E2	6,93E1	5,09E-1	MND	MND	MND	MND	MND	MND	MND	2,33E1	1,74E1	1,07E1	5,09E0	3,43E0
Water use[2)]	m^3e depr.	1,03E1	1,2E-1	8,21E-1	1,13E1	2,58E-1	-1,39E-2	MND	MND	MND	MND	MND	MND	MND	4,35E-2	5,59E-2	1,99E-2	2,36E-1	-8,51E0

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 PO4e.

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	5,5E0	4,05E-1	2,64E1	3,23E1	8,72E-1	1,08E-2	MND	MND	MND	MND	MND	MND	MND	1,26E-1	2,45E-1	5,77E-2	4,12E-2	-4,44E-1
Renew. PER as material	MJ	0E0	0E0	6,58E1	6,58E1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	5,5E0	4,05E-1	9,22E1	9,81E1	8,72E-1	1,08E-2	MND	MND	MND	MND	MND	MND	MND	1,26E-1	2,45E-1	5,77E-2	4,12E-2	-4,44E-1
Non-re. PER as energy	MJ	8,56E1	3,28E1	6,25E1	1,81E2	6,93E1	5,09E-1	MND	MND	MND	MND	MND	MND	MND	2,33E1	1,74E1	1,07E1	5,09E0	3,43E0
Non-re. PER as material	MJ	4,68E-1	0E0	4,78E0	5,25E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	8,6E1	3,28E1	6,73E1	1,86E2	6,93E1	5,09E-1	MND	MND	MND	MND	MND	MND	MND	2,33E1	1,74E1	1,07E1	5,09E0	3,43E0
Secondary materials	kg	2,8E-2	0E0	1,6E-3	2,96E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	3,29E-1	6,68E-3	1,64E-2	3,52E-1	1,44E-2	1,01E-3	MND	MND	MND	MND	MND	MND	MND	2,06E-3	2,97E-3	9,41E-4	5,57E-3	-1,94E-1

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	3,54E-1	3,22E-2	1,61E-1	5,47E-1	6,73E-2	1,6E-2	MND	MND	MND	MND	MND	MND	MND	2,51E-2	1,76E-2	0E0	4,75E-3	-2,91E-2
Non-hazardous waste	kg	1,13E1	3,4E0	4,15E0	1,89E1	7,45E0	2,4E0	MND	MND	MND	MND	MND	MND	MND	2,68E-1	1,21E0	0E0	3,46E1	-8,77E-1
Radioactive waste	kg	4,27E-4	2,26E-4	4,51E-4	1,1E-3	4,75E-4	1,94E-6	MND	MND	MND	MND	MND	MND	MND	1,63E-4	1,19E-4	0E0	3,37E-5	4,39E-5

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	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	0E0	0E0	1,24E-1	1,24E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	1,38E2	0E0	0E0
Materials for energy rec	kg	0E0	0E0	1,9E-1	1,9E-1	0E0	4,8E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

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_2e	2,04E1	2,11E0	2,72E0	2,53E1	4,41E0	2,82E-1	MND	MND	MND	MND	MND	MND	MND	1,68E0	1,14E0	7,69E-1	1,79E-1	2,04E-1
Ozone depletion Pot.	kg $CFC_{-11}e$	6,09E-7	3,95E-7	4,35E-7	1,44E-6	8,32E-7	4,94E-9	MND	MND	MND	MND	MND	MND	MND	2,9E-7	2,08E-7	1,32E-7	5,95E-8	8,39E-8
Acidification	kg SO_2e	3,8E-2	6,96E-3	1,08E-2	5,57E-2	9,06E-3	3,24E-4	MND	MND	MND	MND	MND	MND	MND	2,5E-3	2,31E-3	1,14E-3	7,21E-4	-9,62E-4
Eutrophication	kg PO_4^3e	1,16E-2	1,15E-3	3,64E-3	1,64E-2	1,83E-3	3,24E-4	MND	MND	MND	MND	MND	MND	MND	4,41E-4	4,75E-4	2,01E-4	1,39E-4	-5,86E-4
POCP (“smog”)	kg C_2H_4e	1,48E-3	3,35E-4	8,22E-4	2,64E-3	5,74E-4	7,78E-6	MND	MND	MND	MND	MND	MND	MND	2,57E-4	1,52E-4	1,18E-4	5,29E-5	-7,94E-5
ADP-elements	kg Sbe	1,12E-4	3,53E-5	2,62E-5	1,74E-4	7,6E-5	8,34E-7	MND	MND	MND	MND	MND	MND	MND	2,59E-6	3,12E-5	1,18E-6	1,66E-6	-2,76E-5
ADP-fossil	MJ	8,6E1	3,28E1	6,73E1	1,86E2	6,93E1	5,09E-1	MND	MND	MND	MND	MND	MND	MND	2,33E1	1,74E1	1,07E1	5,09E0	3,43E0

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 the 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 the One Click LCA EPD generator, which has been verified and approved by the ED 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 a present concerning 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 the development of the declaration and have no conflicts of interest regarding this verification.

Elma Avdyli, approved verifier by EPD Hub, 29.03.2022

EPD Hub

VERIFIED ISO 14025

APPENDIX 1:

Emission value in modules A1-A3

The GWP total value of the uninsulated concrete block MH200 is 18,3 kg CO2 eq / m^2 and 91,5 kg CO2 eq / m^3 for modules A1-A3.

Cast concrete and reinforcing steel

On-site, the blocks are cast using cast concrete. The strength class C25/30 is used for interior walls and C30/37 for exterior walls. The average need for reinforcement steel and cast concrete for m^2 and m^3 of uninsulated concrete blocks (200 mm), and the corresponding average greenhouse gas emissions (based on CO2data.fi), are as follows:

Cast concrete	115 l/m^2 604 l/m^3
Cast concrete, GHG –emissions (interior) Cast concrete, GHG –emissions (exterior)	32 kg CO2 eq. /m^2 171 kg CO2 eq. /m^3 38 kg CO2 eq. /m^2 199 kg CO2 eq. /m^3
Reinforcement steel	4 kg/m^2 21 kg/m^3
Reinforcement steel, GHG-emissions	2,7 kg CO2 eq. /m^2 16,1 kg CO2 eq. /m^3

Carbonation of concrete

The CO2 uptake in kg per m2	0,4

The carbonation of the product has been assessed based on the assumption that the structure will be outdoor and sheltered from the rain. Service life is assumed to be 100 years. The maximum theoretical uptake for Portland cement is 0,49 kg CO2/kg cement.