ENVIRONMENTAL PRODUCT DECLARATION

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

GLASS FIBRE REINFORCED CONCRETE

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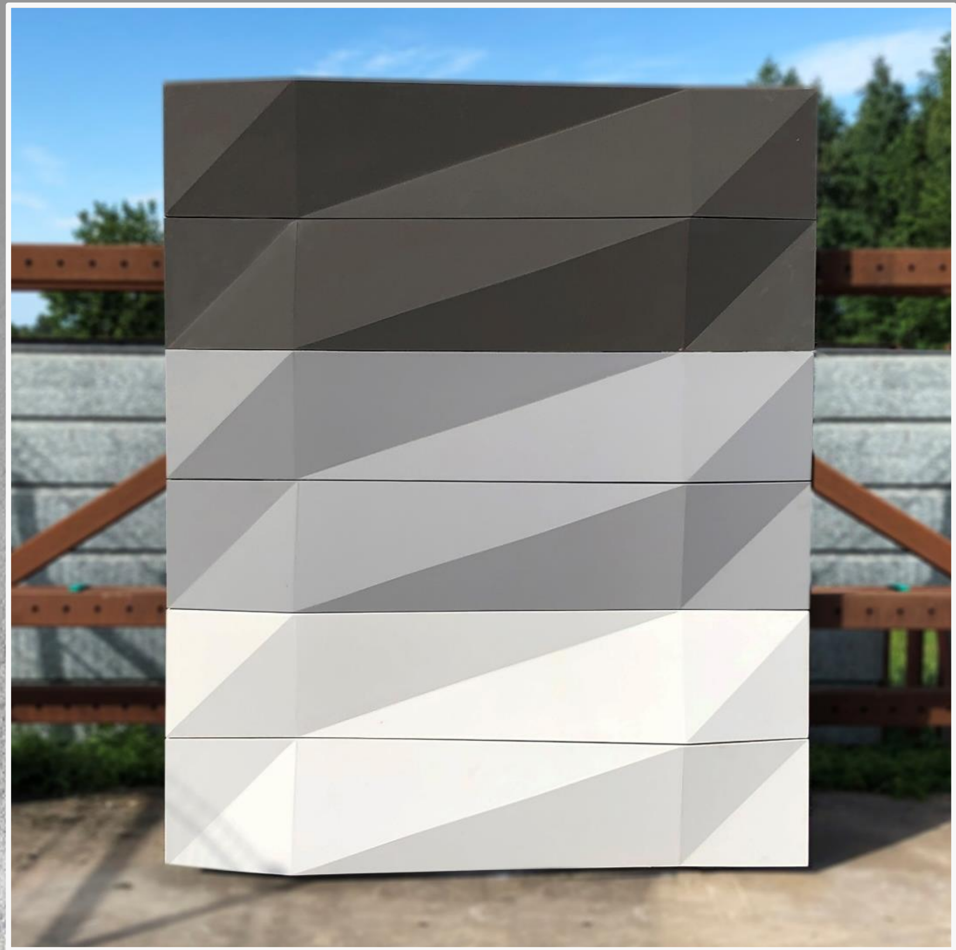

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Dzelzsbetons MB (DzMB)
Address	Cukura street 34, Liepaja, Latvia, LV-3414
Contact details	mbbetons@mbbetons.lv
Website	https://www.mbbetons.lv/en

PRODUCT IDENTIFICATION

Product name	Precast glass fibre reinforced concrete
Place(s) of production	Latvia, Liepaja

EPD INFORMATION

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.

EPD program operator	The Building Information Foundation RTS sr / Building Information Ltd Malminkatu 16 A, 00100 Helsinki, Finland http://cer.rts.fi
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	CEN standard 15804+A2 serves as the core PCR, RTS PCR (Finnish version, 1.6.2020)
EPD author	AS UPB, Dzintaru street 17, Liepaja, Latvia
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
Verification date	24.2.2021
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
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PRODUCT INFORMATION

PRODUCT DESCRIPTION

Precast glass fibre reinforced concrete.

PRODUCT APPLICATION

Precast glass fibre reinforced concrete is used for exterior façade panel elements, concrete cladding, for building construction. The increased building speed and minimised health and safety risks at the building site are just a few of the benefits of using precast concrete products when compared to in-situ construction methods.

TECHNICAL SPECIFICATIONS

For glass fibre reinforced concrete products, the modulus of rupture is at least 18 MPa, but higher modulus can be achieved if required.

The concrete is reinforced by using glass fibres with a typical fibre length from 25 to 31 mm. For specific project it is possible to tailor the fibre properties as required.

PRODUCT STANDARDS

Product is produced in accordance with EN 206, EN 13369 standards.

The quality of the products is ensured by taking regular quality control measures including, but not limited to the testing of raw materials, inspection of the manufacturing equipment and thorough inspection of the final product.

PHYSICAL PROPERTIES OF THE PRODUCT

Physical properties of the product are dependent on the exact project structural and architectural requirements. The product is available in various shapes and sizes.

ADDITIONAL TECHNICAL INFORMATION

Further information can be found at https://www.mbbetons.lv/en.

PRODUCT RAW MATERIAL COMPOSITION

Material	Quantity, mass [%]	Usability			Origin of the raw materials
		Renewable	Non-renewable	Recycled	
Sand	39.3		X		EU
Cement	39.2		X		EU
Water	11		X		EU
Glass fibre	4.8		X		EU
Chemical additives	5.7		X		EU

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, wt%	Material origin
Metals	0	N/A
Minerals	83.3	EU
Water	11.0	EU
Fossil materials	0	N/A
Bio-based materials	0	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

MANUFACTURING AND PACKAGING (A1-A3)

GRC panel production starts by manufacturing the required moulds. This includes sawing as well as assembly and painting of the formwork. Concrete mixture with added glass fibres is then sprayed on the surface of the formwork. Glass fibres are cut and added to the concrete during the spraying process. The concrete is then covered and cured. After curing the element is demoulded and any post-treatment is then done. After post-treatment element is stored and eventually shipped to the construction site.

TRANSPORT AND INSTALLATION (A4-A5)

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

Scenario A5 is modelled as installation of a typical concrete product in a building. Fossil fuel for building machinery and auxiliary materials are included.

PRODUCT USE AND MAINTENANCE (B1-B7)

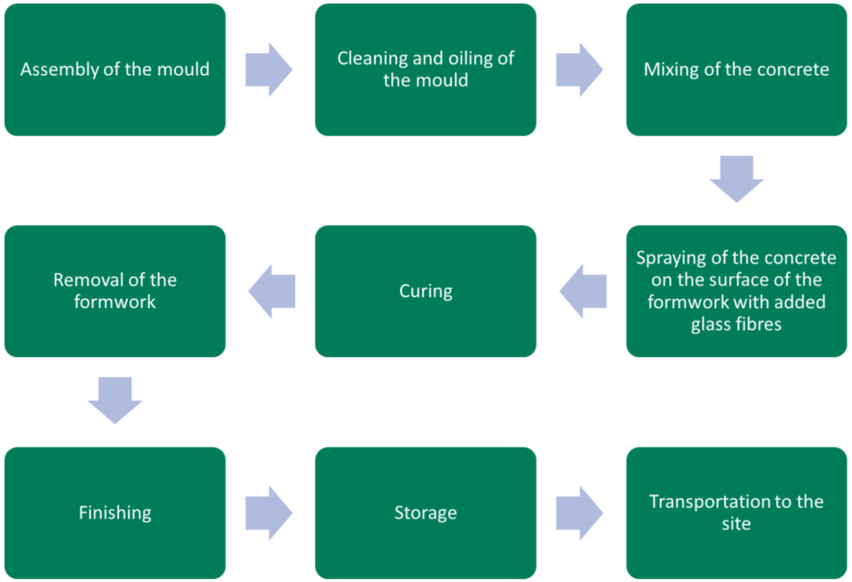
This EPD does not cover use phase. Air, soil and water impacts during the use phase have not been studied.

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 (C1). All of the end-of-life product is assumed to be sent to the closest facilities (C2).

100% of glass fibre, 92% concrete is recycled (C3) and the remaining is sent to a local landfill for disposal (C4). Due to the recycling potential of reinforcement steel and concrete, the end-of-life product is converted into recycled raw materials (D).

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	Manufacturer data for the calendar year 2019 is used.

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 tonne
Mass per declared unit	1000 kg

BIOGENIC CARBON CONTENT

Neither the product itself nor the packaging contains biogenic carbon, so the biogenic carbon content at the factory gate is 0 kg.

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

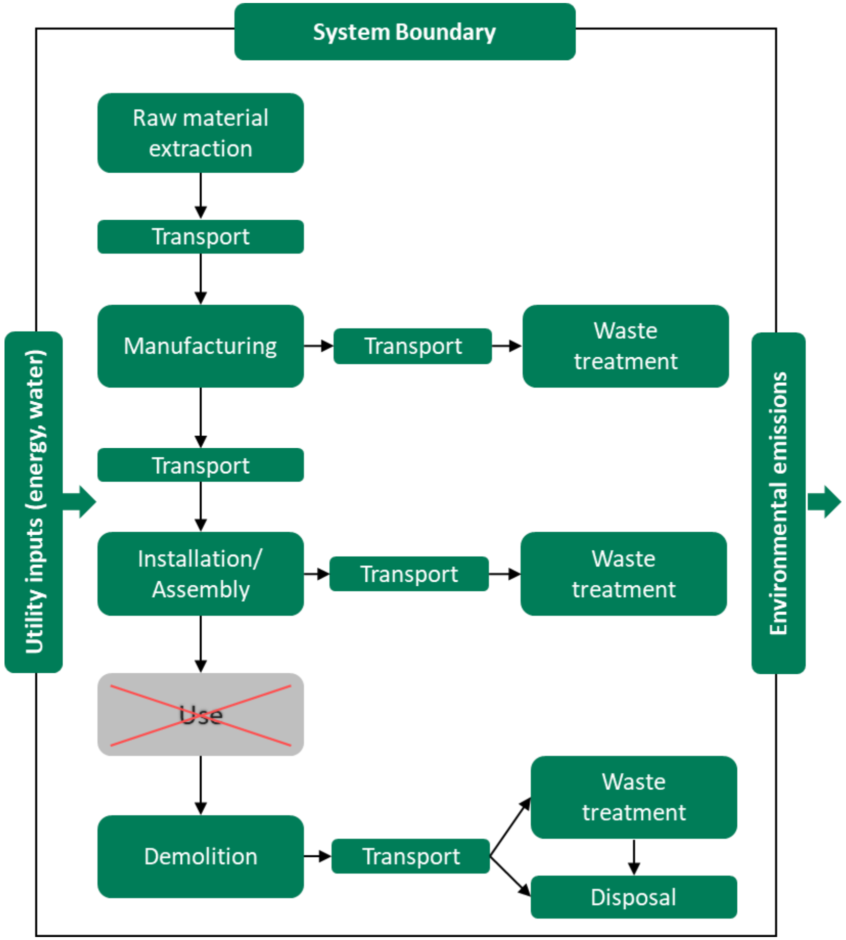
SYSTEM BOUNDARY

This EPD covers cradle to gate with modules C1-C4 and module D; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport), A5 (Installation) 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	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	MNR	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

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and RTS 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 which data are available for are 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. Packaging does not include any biogenic carbon as product is only packaged using reusable tie down straps.

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.

The modules B1-B7 have not been calculated nor included in the LCA calculations as that is not mandatory for this LCA report.

The benefits of recovering glass fibre are not calculated in D module as the amount of recovered material is negligible.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

The allocation is made in accordance with the provisions of EN 15804. Allocation is based on the annual production rate. Heat, electricity and other energy use in production, are calculated as a weighted average per produced tonne of all products using yearly production data and rate for 2019.

Carbonation is not taken into account in the calculations. Carbonation is a natural process occurring when carbon dioxide is emitted during cement production is rebound to the concrete during the use and end of life stages of a building.

As the raw material use for each of the products produced in the factory is recorded to a high standard of accuracy and precision, the raw material data for each of the products produced is processed. From the data, the most likely product size, thickness and reinforcement amount is chosen and thus it is assumed to be the most representative product of the annually produced products of the same kind. Since the production and transportation processes are similar for all of the products produced in the factory, the energy consumption is allocated according to the annual production of the declared unit to the total annual production at the factory. The data on generated waste is also recorded separately for each of the products as accurately as possible. Thus, the generated waste is allocated per declared unit. The output is fixed to 1000 kg and the corresponding amount of product is used in 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 A1: Raw material composition is an average value calculated using total annual material consumption for the product by mass within the studied year 2019.

Module A4: Transportation from the manufacturing plants to the building site has been calculated using a most likely scenario for the export of the declared unit of one tonne to each of the market countries separately - Sweden, Norway, Denmark, United Kingdom.

The average distance of transportation from production plant to building sites in Sweden, Norway, Denmark and UK and the fill rate to be 100%:

For transportation to building sites in Sweden it is assumed that 335 km of the total distance are covered by a lorry and it is assumed that 275 km of the total distance are covered by a ferry.

For transportation to building sites in Norway it is assumed that 655 km of the total distance are covered by a lorry and it is assumed that 275 km of the total distance are covered by a ferry.

For transportation to building sites in Denmark it is assumed that 310 km of the total distance are covered by a lorry and it is assumed that 400 km of the total distance are covered by a ferry.

For transportation to building sites in the United Kingdom it is assumed that 710 km of the total distance are covered by a lorry and it is assumed that 1300 km of the total distance are covered by a ferry.

Transportation does not cause losses as products are packaged properly. Packaging does not include wooden pallets. Bulk density varies depending on product type and thickness. Also, volume capacity utilisation factor is assumed to be 1 for the nested packaged products.

Module A5: Assembly/Installation is modelled as installation of a typical concrete product in a building. Fossil fuel for building machinery and auxiliary materials are included.

It is assumed that the waste is insignificant during the assembly process. The assembly process is also assumed to be similar across all of the market countries. The energy required for the installation process as well as the auxiliary materials are taken as the industry average values for the precast element assembly process.

Module C1: Energy consumption of a demolition process is on the average 10 kWh/m2 (Bozdağ, Ö & Seçer, M. 2007). Basing on a Level(s) project, an average mass of a reinforced concrete building is about 1000 kg/m2. Therefore, energy consumption demolition is 10 kWh/1000 kg = 0,01 kWh/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 50 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 the role of transportation emission in total results is small, the variation in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that a return trip is used by the transportation company to serve the needs of other clients.

Module C3: It is assumed that 92% of the concrete waste, 100% of glass fibre waste is recycled. This assumption is based on information from a study by T. Ideon and M. Osjamets (2010) and by Zainab Z.Ismail Enas A.AL-Hashmi (2009). It is assumed that the end of life scenario is similar across all of the target market countries.

Module C4: The remaining waste materials are assumed to be sent to the landfill.

Module D: The recycled end-of-life product is assumed to be converted into a raw material after recycling.

ENVIRONMENTAL IMPACT DATA

NOTE : ENVIRONMENTAL IMPACTS - EN 15804+A1, CML / ISO 21930 AND ENVIRONMENTAL IMPACTS – TRACI 2.1./ ISO 21930 ARE PRESENTED IN ANNEX.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Climate change – total	kg CO2e	5,21E2	5,13E1	4,77E0	5,77E2	3,6E1	6,51E1	3,63E1	9,09E1	3,82E0	MND	3,28E0	6,35E0	3,83E0	3,8E−1	−6,98E0
Climate change – fossil	kg CO2e	5,16E2	5,1E1	3,88E0	5,71E2	3,57E1	6,45E1	3,6E1	9,01E1	3,82E0	MND	3,27E0	6,32E0	3,82E0	3,77E−1	−6,94E0
Climate change – biogenic	kg CO2e	4,89E0	2,44E−1	8,93E−1	6,03E0	1,61E−1	3,02E−1	1,56E−1	3,77E−1	6,47E−3	MND	5,54E−3	3,76E−2	6,47E−3	2,39E−3	−2,78E−2
Climate change – LULUC	kg CO2e	1,72E−1	1,67E−2	4,44E−4	1,89E−1	1,16E−2	2,03E−2	1,2E−2	3,09E−2	3,25E−4	MND	2,79E−4	2,25E−3	3,25E−4	1,14E−4	−9,01E−3
Ozone depletion	kg CFC11e	1,69E−5	1,2E−5	5,96E−7	2,95E−5	8,32E−6	1,52E−5	8,31E−6	2,07E−5	8,31E−7	MND	7,12E−7	1,46E−6	8,31E−7	1,58E−7	−6,31E−7
Acidification	mol H+e	2,04E0	1,93E−1	4,47E−3	2,24E0	1,95E−1	2,63E−1	2,46E−1	7,35E−1	6,57E−3	MND	5,64E−3	1,49E−2	6,58E−3	1,81E−3	−3,19E−2
Eutrophication, aquatic freshwater	kg PO4e	1,72E−1	3,6E−3	1,15E−4	1,76E−1	2,45E−3	4,52E−3	2,41E−3	5,91E−3	1,4E−4	MND	1,2E−4	4,85E−4	1,4E−4	3,98E−5	−4,16E−3
Eutrophication, aquatic marine	kg Ne	3,46E−1	3,46E−2	1,5E−3	3,82E−1	4,81E−2	5,79E−2	6,46E−2	2,01E−1	8,84E−4	MND	7,58E−4	2,09E−3	8,85E−4	3,55E−4	−4,74E−3
Eutrophication, terrestrial	mol Ne	3,5E0	3,77E−1	1,32E−2	3,9E0	5,27E−1	6,31E−1	7,08E−1	2,2E0	9,46E−3	MND	8,11E−3	2,22E−2	9,47E−3	3,86E−3	−5,74E−2
Photochemical ozone formation	kg NMVOCe	9,96E−1	1,5E−1	4,88E−3	1,15E0	1,68E−1	2,26E−1	2,12E−1	6,36E−1	9,41E−3	MND	8,07E−3	1,15E−2	9,42E−3	1,58E−3	−1,54E−2
Abiotic depletion, minerals & metals	kg Sbe	2,25E−2	8,56E−4	5,34E−6	2,34E−2	7,42E−4	1,24E−3	8,05E−4	2,15E−3	5,87E−6	MND	5,03E−6	1,59E−4	5,88E−6	3,51E−6	−7,66E−4
Abiotic depletion of fossil resources	MJ	5,51E3	7,85E2	7,2E1	6,36E3	5,4E2	9,87E2	5,37E2	1,33E3	5,23E1	MND	4,48E1	9,61E1	5,23E1	1,07E1	−9,8E1
Water use	m3e depr.	1,46E4	1,11E3	2,69E4	4,26E4	7,42E2	1,39E3	7,19E2	1,73E3	2,95E1	MND	2,53E1	1,5E2	2,96E1	9,49E0	−4,23E2

EN 15804+A2 disclaimer for Abiotic depletion and Water use indicators and all 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. Eutrophication aquatic freshwater is reported as *kg PO_4 eq,* although the reference given (“EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe”) uses the unit *kg P eq.*

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Particulate matter	Incidence	9,57E−6	4,29E−6	1,77E−7	1,4E−5	2,77E−6	5,27E−6	2,64E−6	6,24E−6	9,86E−7	MND	8,45E−7	4,66E−7	4,66E−6	6,64E−8	−4,92E−7
Ionizing radiation, human health	kBq U235e	2,67E1	4,02E0	7,14E−2	3,08E1	2,74E0	5,04E0	2,71E0	6,66E0	2,4E−1	MND	2,06E−1	5,02E−1	2,41E−1	4,8E−2	−1,47E0
Eco-toxicity (freshwater)	CTUe	7,3E1	3,24E1	9,36E−2	1,06E2	2,08E1	3,99E1	1,97E1	4,63E1	2,89E−1	MND	2,48E−1	3,52E0	2,9E−1	6,67E−2	−8,77E−1
Human toxicity, cancer effects	CTUh	1,81E−7	1,53E−8	6,81E−10	1,97E−7	1,09E−8	1,91E−8	1,14E−8	2,93E−8	1,02E−9	MND	8,77E−10	1,98E−9	1,02E−9	1,49E−10	−5,61E−9
Human toxicity, non-cancer effects	CTUh	2,18E−5	9,41E−7	1,87E−8	2,28E−5	6,43E−7	1,19E−6	6,32E−7	1,55E−6	2,15E−8	MND	1,85E−8	1,25E−7	2,16E−8	5,65E−9	−3,19E−7
Land use related impacts/soil quality	-	5,14E2	1,12E3	8,09E−1	1,63E3	6,97E2	1,36E3	6,46E2	1,48E3	8,19E−1	MND	7,02E−1	1,05E2	8,2E−1	7,42E0	−6,87E1

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 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Renewable PER used as energy	MJ	0E0	9,82E0	5,46E1	6,44E1	6,56E0	1,23E1	6,39E0	1,55E1	MND	MND	0E0	1,38E0	0E0	0E0	−8,49E0
Renewable PER used as materials	MJ	1,91E2	0E0	1,13E1	2,02E2	0E0	0E0	0E0	0E0	2,86E−1	MND	2,45E−1	0E0	2,87E−1	8,69E−2	0E0
Total use of renewable PER	MJ	1,91E2	9,82E0	6,59E1	2,66E2	6,56E0	1,23E1	6,39E0	1,55E1	2,86E−1	MND	2,45E−1	1,38E0	2,87E−1	8,69E−2	−8,49E0
Non-renew. PER used as energy	MJ	0E0	7,99E2	6,87E1	8,68E2	5,49E2	1E3	5,46E2	1,35E3	MND	MND	0E0	9,81E1	0E0	0E0	−1,2E2
Non-renew. PER used as materials	MJ	5,96E3	0E0	3,87E0	5,96E3	0E0	0E0	0E0	0E0	5,26E1	MND	4,51E1	0E0	5,27E1	1,08E1	0E0
Total use of non-renewable PER	MJ	5,96E3	7,99E2	7,26E1	6,83E3	5,49E2	1E3	5,46E2	1,35E3	5,26E1	MND	4,51E1	9,81E1	5,27E1	1,08E1	−1,2E2
Use of secondary materials	kg	1,12E0	2,79E−1	1,15E−2	1,41E0	1,96E−1	3,52E−1	1,98E−1	5E−1	2,6E−2	MND	2,23E−2	3,89E−2	2,6E−2	2,91E−3	−1,57E−1
Use of renewable secondary fuels	MJ	1,12E1	3,41E−1	1,66E−2	1,16E1	2,2E−1	4,19E−1	2,1E−1	4,96E−1	7,04E−3	MND	6,04E−3	4,91E−2	7,05E−3	2,02E−3	0E0
Use of non-renew. secondary fuels	MJ	3,11E0	1,21E0	4,15E−2	4,36E0	8,2E−1	1,49E0	8,23E−1	2,05E0	1,04E−1	MND	8,88E−2	1,72E−1	1,04E−1	1,03E−2	0E0
Use of net fresh water	m3	5,75E1	1,22E1	1,94E−1	6,99E1	8,3E0	1,54E1	8,14E0	1,99E1	4,29E−1	MND	3,67E−1	1,4E0	4,29E−1	1,55E−1	−9,91E−1

PER abbreviation stands for primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1 - B7	C1	C2	C3	C4	D
Hazardous waste	Kg	2,15E1	7,81E−1	3,87E−2	2,23E1	5,55E−1	9,94E−1	5,64E−1	1,42E0	5,7E−2	MND	4,88E−2	1,01E−1	5,7E−2	1,01E−2	−5,19E−1
Non-hazardous waste	Kg	8,46E2	8,23E1	6,85E−1	9,29E2	5,23E1	1,01E2	4,91E1	1,14E2	6,09E−1	MND	5,22E−1	8,41E0	6,09E−1	7,32E1	−2,12E1
Radioactive waste	Kg	9,26E−3	5,48E−3	7,26E−5	1,48E−2	3,77E−3	6,89E−3	3,75E−3	9,29E−3	3,71E−4	MND	3,18E−4	6,68E−4	3,71E−4	7,13E−5	−4,58E−4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1- B7	C1	C2	C3	C4	D
Components for reuse	Kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	Kg	6,71E−1	2,48E−1	1,09E−2	9,29E−1	1,79E−1	3,14E−1	1,86E−1	4,78E−1	2,55E−2	MND	2,19E−2	3,27E−2	2,55E−2	2,73E−3	0E0
Materials for energy recovery	Kg	1,2E−1	3,75E−3	1,7E−4	1,24E−1	2,42E−3	4,61E−3	2,31E−3	5,47E−3	7,91E−5	MND	6,78E−5	5,43E−4	7,92E−5	2,21E−5	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	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 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Climate change – total	kg CO2e	5,21E−1	5,15E−2	3,97E−3	5,76E−1	3,59E−2	6,49E−2	3,61E−2	9,05E−2	3,85E−3	MND	3,3E−3	6,37E−3	3,85E−3	3,85E−4	−6,98E−3
Abiotic depletion, minerals & metals	kg Sbe	2,25E−5	8,56E−7	5,34E−9	2,34E−5	7,42E−7	1,24E−6	8,05E−7	2,15E−6	5,87E−9	MND	5,03E−9	1,59E−7	5,88E−9	3,51E−9	−7,66E−7
Abiotic depletion of fossil resources	MJ	5,51E0	7,85E−1	7,2E−2	6,36E0	5,4E−1	9,87E−1	5,37E−1	1,33E0	5,23E−2	MND	4,48E−2	9,61E−2	5,23E−2	1,07E−2	−9,8E−2
Water use	m3e depr.	5,75E−2	1,22E−2	1,94E−4	6,99E−2	8,3E−3	1,54E−2	8,14E−3	1,99E−2	4,29E−4	MND	3,67E−4	1,4E−3	4,29E−4	1,55E−4	−9,91E−4
Use of secondary materials	kg	1,12E−3	2,79E−4	1,15E−5	1,41E−3	1,96E−4	3,52E−4	1,98E−4	5E−4	2,6E−5	MND	2,23E−5	3,89E−5	2,6E−5	2,91E−6	−1,57E−4
Biogenic carbon content in product	kg C	N/A	N/A	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
Biogenic carbon content in packaging	kg C	N/A	N/A	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

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality (DzMB)	Electricity production, hydro, run-of-river (Reference product: electricity, high voltage) Ecoinvent v3.6, Latvia, year: 2020
Electricity CO2e / kWh	0.004
District heating data source and quality (DzMB)	Heat and power co-generation, natural gas, combined cycle power plant, 400mw electrical (Reference product: heat, district or industrial, natural gas), Ecoinvent v3.6, Latvia, year: 2020
District heating CO2e / kWh	0.0964

Transport scenario documentation

Scenario parameter, Sweden	Value
A4 Truck >32 metric ton Euro 5, kgCO2e / tonkm	0.0909
A4 Ferry, kgCO2e / tonkm	0.0203
A4 average transport distance, Truck, km, Sweden	335
A4 average transport distance, Ferry, km, Sweden	275
Scenario parameter, United Kingdom	**Value**
A4 Truck >32 metric ton Euro 5, kgCO2e / tonkm	0.0909
A4 Ferry, kgCO2e / tonkm	0.0203
A4 average transport distance, Truck, km, UK	710
A4 average transport distance, Ferry, km, UK	1300
Scenario parameter, Denmark	**Value**
A4 Truck >32 metric ton Euro 5, kgCO2e / tonkm	0.0909
A4 Ferry, kgCO2e / tonkm	0.0203
A4 average transport distance, Truck, km, Denmark	310
A4 average transport distance, Ferry, km, Denmark	400
Scenario parameter, Norway	**Value**
A4 Truck >32 metric ton Euro 5, kgCO2e / tonkm	0.0909
A4 Ferry, kgCO2e / tonkm	0.0203
A4 average transport distance, Truck, km, Norway	655
A4 average transport distance, Ferry, km, Norway	275

End of life scenario documentation

Scenario parameter	Value
Collection process – kg collected separately	1000
Collection process – kg collected with mixed waste	0
Recovery process – kg for re-use	0
Recovery process – kg for recycling	927
Recovery process – kg for energy recovery	0
Disposal (total) – kg for final deposition	73
Scenario assumptions e.g. transportation	End-of-life product is transported 50 km with an average lorry.

BIBLIOGRAPHY

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

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

Ecoinvent database v3.6 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.

Bozdağ, Ö. & Seçer, M. (2007). Energy consumption of demolition process is on the average

Ideon, T. & Osjamets, M. (2010). Ehitus- ja lammutusjäätmete sortimisuuring (Construction and demolition waste sorting and recycling)

Zainab Z.Ismail Enas A.AL-Hashmi (2009) Recycling of waste glass as a partial replacement for fine aggregate in concrete. https://www.sciencedirect.com/science/article/abs/pii/S0956053X0800281X#bib24

ABOUT THE MANUFACTURER

Prefabricated concrete production units of MB Betons group are based in Liepaja and Daugavpils. MB Betons group offers a full nomenclature of precast concrete and concrete in compliance with all European standards for the construction of buildings and infrastructure. MB Betons group is characterized by quality, flexibility and experience, as well as a high level of service and wide range of products. Advantages of prefabricated concrete include high strength, fire resistance, low costs and longevity and significantly reduced health and safety risks at the construction site. Furthermore, precast concrete can be easily used for the production of products of various shapes and configurations.

Quality and Environment Management system of the company is certified according to the requirements of the international standards ISO 9001 and ISO 14001. HSE processes are managed according to the requirements of the international standard ISO 45001.

EPD AUTHOR AND CONTRIBUTORS

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EPD author	AS UPB, Dzintaru street 17, Liepaja, Latvia
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
EPD program operator	The Building Information Foundation RTS
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

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

Impact category	Unit	A1	A2	A3	A1-A3	A4-SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Global warming potential	kg CO2e	5,21E2	5,15E1	3,97E0	5,76E2	3,6E1	6,51E1	3,63E1	9,09E1	3,85E0	MND	3,3E0	6,37E0	3,85E0	3,85E−1	−6,79E0
Depletion of stratospheric ozone	kg CFC11e	1,58E−5	9,55E−6	4,5E−7	2,58E−5	6,63E−6	1,21E−5	6,63E−6	1,65E−5	6,58E−7	MND	5,64E−7	1,16E−6	6,58E−7	1,25E−7	−5,74E−7
Acidification	kg SO2e	1,79E0	1,62E−1	3,67E−3	1,95E0	1,58E−1	2,17E−1	1,96E−1	5,83E−1	5,68E−3	MND	4,87E−3	1,3E−2	5,68E−3	1,52E−3	−2,79E−2
Eutrophication	kg PO4 3e	6,54E−1	2,68E−2	9,82E−4	6,82E−1	2,66E−2	3,85E−2	3,2E−2	9,3E−2	1E−3	MND	8,57E−4	2,7E−3	1E−3	2,94E−4	−1,5E−2
Photochemical ozone formation	kg C2H4e	7,16E−2	8,01E−3	3,18E−4	7,99E−2	6,57E−3	1,03E−2	7,48E−3	2,08E−2	5,85E−4	MND	5,01E−4	8,39E−4	5,85E−4	1,12E−4	−2,28E−3
Abiotic depletion of non-fossil res.	kg Sbe	2,25E−2	8,56E−4	5,34E−6	2,34E−2	7,42E−4	1,24E−3	8,05E−4	2,15E−3	5,87E−6	MND	5,03E−6	1,59E−4	5,88E−6	3,51E−6	−7,66E−4
Abiotic depletion of fossil resources	MJ	5,51E3	7,85E2	7,2E1	6,36E3	5,4E2	9,87E2	5,37E2	1,33E3	5,23E1	MND	4,48E1	9,61E1	5,23E1	1,07E1	−9,8E1

ANNEX : ENVIRONMENTAL IMPACTS - TRACI 2.1. / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4 - SWE	A4-NOR	A4-DK	A4-UK	A5	B1-B7	C1	C2	C3	C4	D
Global warming potential	kg CO2e	5,16E2	5,1E1	3,89E0	5,71E2	3,56E1	6,44E1	3,59E1	8,98E1	3,8E0	MND	3,26E0	6,3E0	3,8E0	3,75E−1	−6,75E0
Ozone depletion	kg CFC11e	2E−5	1,27E−5	6,22E−7	3,33E−5	8,81E−6	1,61E−5	8,81E−6	2,19E−5	8,77E−7	MND	7,51E−7	1,55E−6	8,77E−7	1,67E−7	−7,62E−7
Acidification	kg SO2e	1,7E0	1,6E−1	3,92E−3	1,86E0	1,66E−1	2,22E−1	2,1E−1	6,31E−1	5,34E−3	MND	4,58E−3	1,22E−2	5,35E−3	1,52E−3	−2,63E−2
Eutrophication	kg Ne	1,35E0	4,78E−2	1,59E−3	1,4E0	3,57E−2	6,2E−2	3,74E−2	9,73E−2	2,33E−3	MND	1,99E−3	5,97E−3	2,33E−3	5,61E−4	−3,26E−2
Photochemical Smog Formation	kg O3e	1,93E1	2,14E0	7,58E−2	2,16E1	3,02E0	3,61E0	4,07E0	1,27E1	5,39E−2	MND	4,62E−2	1,25E−1	5,39E−2	2,2E−2	−2,36E−1
Depletion of non-renewable energy	MJ	2,71E2	1,14E2	1,05E1	3,95E2	7,83E1	1,43E2	7,8E1	1,93E2	7,82E0	MND	6,71E0	1,39E1	7,83E0	1,56E0	−7,48E0

MND -abbreviation stands for module not declared