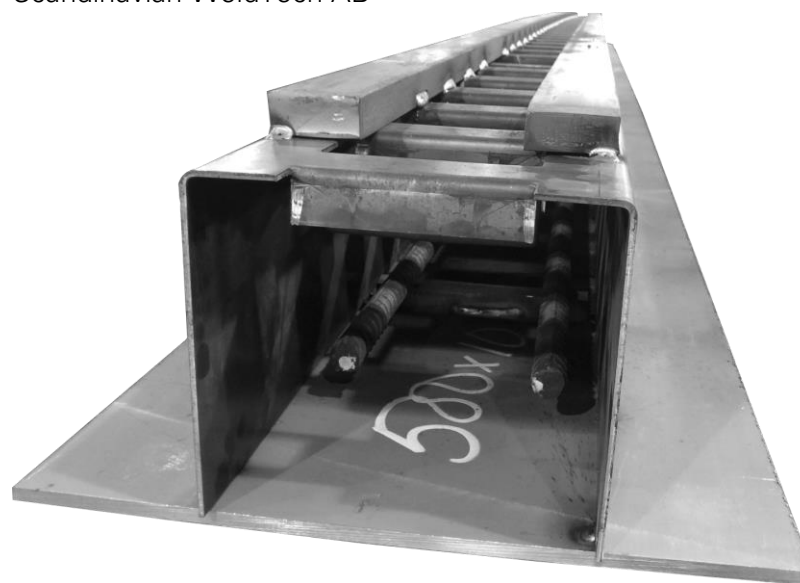


ENVIRONMENTAL PRODUCT DECLARATION

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

SWT-Beam
Scandinavian WeldTech AB



EPD HUB, HUB-0005

Publishing date 22 Mar. 2022, last updated date 22 Mar. 2022, valid until 22 Mar. 2027

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Scandinavian WeldTech AB
Address	Mästargatan 14, 781 71 Borlänge
Contact details	info@swt.eu
Website	www.swt.eu

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 and D
EPD author	Gabriel Sabau, Scandinavian WeldTech AB
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 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	SWT-Beam
Place of production	Borlänge, Sweden
Period for data	2020.12.01 - 2021.11.30
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	N/A

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 kg
Declared unit mass	1 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	1,84
GWP-total, A1-A3 (kgCO ₂ e)	1,90
Secondary material, inputs (%)	43,1
Secondary material, outputs (%)	95,5
Total energy use, A1-A3 (kWh)	6,57
Total water use, A1-A3 (m ³ e)	0,0155



PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Scandinavian WeldTech manufactures steel/concrete composite beams, columns and conventional steel products used for high-rise buildings.

PRODUCT DESCRIPTION

This EPD represents the SWT-composite beam produced at Scandinavian WeldTech AB in Borlänge, Sweden. The SWT-beam is a flexible solution tailored to customers' needs. It enables slender and light structural solutions that provide savings in terms of volume and costs. The composite action between steel and concrete allows for creative structures with large open spaces. The SWT-beam has been used in numerous construction projects in Scandinavia since the early 1990s.

The SWT-beam can be combined with various types of concrete slabs and wooden slabs. It can rest on steel, concrete and wooden columns, but is best combined with the SWT composite column to form a unified system.

SWT-beams consist of steel plates and bars welded together to form a hollow box-section, acting as a composite beam. The beam is then cast in concrete at the construction site. Typical weight of beams varies greatly between 50-500 kg/m, as each element is designed to specifically fit customer needs. This EPD is valid for an average SWT-beam project order with an average material composition (production based). The quantity of materials in the product are scaled based on the products geometry resulting in low variance of uncertainties.

The EPD calculations do not cover the concrete used on the construction site. The products are CE-marked under the harmonized standard EN 1090-1 and complies with EN 1090-2. The products design is done according to European standards EN 1990 to EN 1994 with applicable national adoptions. Detailed technical information is delivered to the client as project specific data. General information can be found on:

www.swt.eu.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	100	EU
Minerals	0	-
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	0.0015

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 kg
Mass per declared unit	1 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.

The steel plates are blasted using steel grit to obtain required surface conditions and are subsequently cut to dimensions. Hydraulic oils, water-oil emulsions and other lubrication oils are used during the process to reduce the wear of machines and to ensure stable cutting conditions. The steel components are welded together to obtain the final product. The

welding process consumables considered in the analysis consists of filler materials and gases used for shielding. Finished products are painted and transported to the requested construction sites. Electricity and fuels are consumed during the manufacturing process to operate machines and to transport the product. Electricity is also used for ventilation and heating of the workshop. The main source of heat is provided through district heating. The steel waste produced at the plant is directed into recycling. The material loss is also considered herein.

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 transportation distance is defined according to the PCR. The distance of transportation from production plant to building site was calculated as a weighted average based on mass and distance transported over a period of 1 year. The transport is considered to be by lorry over a distance of 712 km. Vehicle capacity utilization volume factor is assumed to be 100 %. The utilization factor may vary but it was considered that the variation will not have a significant impact on the result. Empty returns are not considered because the transportation company used the return trips to facilitate other customers. Transportation does not cause losses as product are properly packaged.

Density of the product is 7850 kg/m³, however bulk density varies depending on product type and thickness. Therefore, the average loss due to the openings both in the product itself and between the nested products is assumed as 10%; accordingly, bulk density is calculated as an approximate 7000 kg/m³.

It was assumed that 10kWh are required to install 1 tonne of product on-site. The installation should be planned accordingly to minimize empty

runs and idle engine times. The lifting device should be positioned to ensure shortest path(s) between storage and installation points taking also into account the lifting capacity.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase.

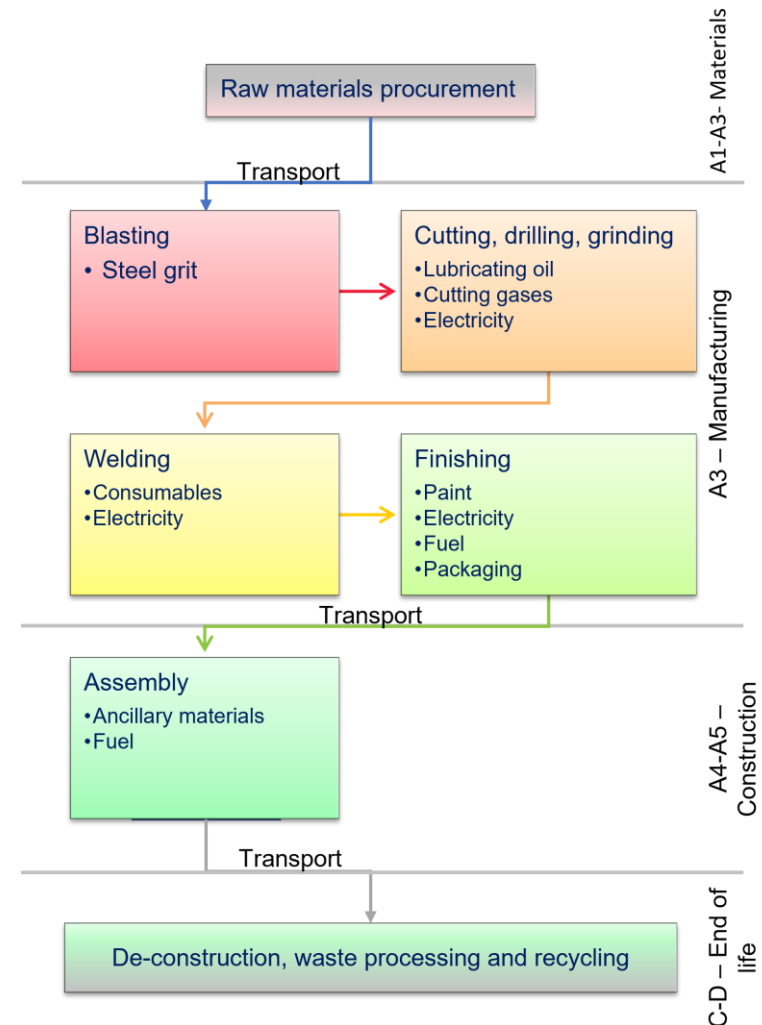
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

Demolition is assumed to take 0,01 kWh/kg of product. The source of energy is diesel fuel used by construction machines (C1). It is assumed that 100% of the waste is collected and transported to the waste treatment centre. Distance for transportation to treatment is assumed as 50 km and the transportation method is assumed to be lorry (C2). Approximately 95% of steel is assumed to be recycled based on World Steel Association, 2020 (C3). It is assumed that the rest 5 % of steel is taken to landfill for final disposal (C4). Due to the recycling process the end-of-life product is converted into a recycled steel (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 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.

The report excluded non-biogenic constituents under 0,1% of product mass. These include some ancillary materials which are all present in the product only in very small amounts and have no serious impact on the emissions of the product, such as priming paint and lubrication oil that represent less than 0,1% of product weight, cutting oils that are fully recycled and fuels that amount to less than 0,1% of total energy consumption. The use phase is not covered, assuming there are no use emissions or replacements. All industrial processes from raw material acquisition and pre-processing, production, product distribution and installation, and end-of-life management are included.

The production of capital equipment, construction activities, infrastructure, maintenance and operation of capital equipment, personnel-related activities and water use related to company management and sales activities are excluded from the analysis.

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.

In this study allocation could not be avoided for raw materials, packaging, ancillary material, energy consumption and waste production as the information was only measured on factory or production process level. The inputs were allocated to studied product based on annual production mass. The values for 1 kilogram of SWT-beam are calculated by considering the total product weight per annual production. In the factory, several kinds of steel products 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, packaging materials and the generated waste per the declared product are allocated. Subsequently, the product output fixed to 1 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.

Allocation used in environmental data sources is aligned with the above.

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 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 ₂ e	1,78E0	1,68E-2	1,09E-1	1,9E0	9,01E-2	2,95E-2	MND	MND	MND	MND	MND	MND	MND	3,3E-3	1,08E-2	2,22E-2	2,65E-4	-1E0
GWP – fossil	kg CO ₂ e	1,78E0	1,68E-2	4,81E-2	1,84E0	9,09E-2	2,32E-2	MND	MND	MND	MND	MND	MND	MND	3,3E-3	1,08E-2	2,36E-2	2,65E-4	-1,01E0
GWP – biogenic	kg CO ₂ e	-2,28E-3	1,07E-5	6,04E-2	5,82E-2	5,57E-5	6,31E-3	MND	MND	MND	MND	MND	MND	MND	9,17E-7	5,35E-6	-1,35E-3	5,25E-7	1,04E-2
GWP – LULUC	kg CO ₂ e	7,46E-4	5,71E-6	8,21E-5	8,34E-4	3,21E-5	1,36E-5	MND	MND	MND	MND	MND	MND	MND	2,79E-7	4,7E-6	2,67E-5	7,86E-8	1,92E-5
Ozone depletion pot.	kg CFC-11e	1,04E-7	3,87E-9	3,38E-9	1,11E-7	2,08E-8	2,18E-9	MND	MND	MND	MND	MND	MND	MND	7,12E-10	2,39E-9	3,38E-9	1,09E-10	-2,72E-8
Acidification potential	mol H ⁺ e	7,66E-3	6,95E-5	6,46E-4	8,38E-3	3,75E-4	1,31E-4	MND	MND	MND	MND	MND	MND	MND	3,45E-5	4,33E-5	2,86E-4	2,51E-6	-3,9E-3
EP-freshwater ³⁾	kg Pe	8,51E-5	1,43E-7	3,85E-6	8,91E-5	7,85E-7	1,24E-6	MND	MND	MND	MND	MND	MND	MND	1,33E-8	1,04E-7	1,63E-6	3,2E-9	-4,06E-5
EP-marine	kg Ne	1,5E-3	2,07E-5	4,88E-5	1,57E-3	1,11E-4	3,47E-5	MND	MND	MND	MND	MND	MND	MND	1,52E-5	1,24E-5	6,3E-5	8,65E-7	-7,68E-4
EP-terrestrial	mol Ne	1,66E-2	2,28E-4	2,14E-3	1,9E-2	1,23E-3	3,76E-4	MND	MND	MND	MND	MND	MND	MND	1,67E-4	1,37E-4	7,31E-4	9,53E-6	-8,13E-3
POCP (“smog”)	kg NMVOCe	8,61E-3	7,21E-5	1,37E-4	8,82E-3	3,85E-4	1,28E-4	MND	MND	MND	MND	MND	MND	MND	4,59E-5	4,22E-5	2E-4	2,77E-6	-5,3E-3
ADP-minerals & metals	kg Sbe	8,78E-6	3,87E-7	2,68E-7	9,43E-6	2,27E-6	4,67E-7	MND	MND	MND	MND	MND	MND	MND	5,03E-9	3,88E-7	1,3E-6	2,42E-9	-1,01E-6
ADP-fossil resources	MJ	1,92E1	2,57E-1	7,65E-1	2,03E1	1,39E0	2,85E-1	MND	MND	MND	MND	MND	MND	MND	4,54E-2	1,61E-1	3,26E-1	7,4E-3	-7,5E0
Water use ²⁾	m ³ e depr.	6,88E-1	9,25E-4	5,02E-2	7,39E-1	4,93E-3	7,89E-3	MND	MND	MND	MND	MND	MND	MND	8,46E-5	5,71E-4	4,63E-3	3,42E-4	-1,44E-1

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 experience 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	1,18E0	3,55E-3	2,15E0	3,33E0	1,97E-2	2,66E-2	MND	MND	MND	MND	MND	MND	MND	2,45E-4	2,74E-3	5,12E-2	5,98E-5	9,15E-2
Renew. PER as material	MJ	1,22E-4	0E0	4,87E-2	4,89E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	1,18E0	3,55E-3	2,2E0	3,38E0	1,97E-2	2,66E-2	MND	MND	MND	MND	MND	MND	MND	2,45E-4	2,74E-3	5,12E-2	5,98E-5	9,15E-2
Non-re. PER as energy	MJ	1,93E1	2,57E-1	7,46E-1	2,03E1	1,39E0	2,85E-1	MND	MND	MND	MND	MND	MND	MND	4,54E-2	1,61E-1	3,26E-1	7,4E-3	-7,5E0
Non-re. PER as material	MJ	2,71E-3	0E0	1,95E-2	2,22E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	1,93E1	2,57E-1	7,65E-1	2,03E1	1,39E0	2,85E-1	MND	MND	MND	MND	MND	MND	MND	4,54E-2	1,61E-1	3,26E-1	7,4E-3	-7,5E0
Secondary materials	kg	4,31E-1	0E0	2,38E-4	4,31E-1	0E0	1,31E-3	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	4,73E-1
Renew. secondary fuels	MJ	9,05E-4	0E0	0E0	9,05E-4	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	4,04E-2	0E0	0E0	4,04E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m³	1,52E-2	5E-5	2,48E-4	1,55E-2	2,63E-4	2,01E-4	MND	MND	MND	MND	MND	MND	MND	4,01E-6	2,8E-5	1,33E-4	8,09E-6	-6,71E-3

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	3,11E-1	2,63E-4	3,01E-3	3,14E-1	1,44E-3	5,51E-3	MND	MND	MND	MND	MND	MND	MND	4,88E-5	1,89E-4	0E0	6,9E-6	-1,21E-1
Non-hazardous waste	kg	3,24E0	2,36E-2	1,77E-1	3,44E0	1,2E-1	6E-2	MND	MND	MND	MND	MND	MND	MND	5,22E-4	1,05E-2	0E0	5,02E-2	-1,37E0
Radioactive waste	kg	5,88E-5	1,76E-6	4,66E-6	6,52E-5	9,49E-6	1,13E-6	MND	MND	MND	MND	MND	MND	MND	3,18E-7	1,09E-6	0E0	4,89E-8	5,24E-6

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	1,25E-4	0E0	4E-2	4,01E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	9,55E-1	0E0	0E0
Materials for energy rec	kg	1,43E-4	0E0	0E0	1,43E-4	0E0	3E-3	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 ₂ e	1,7E0	1,66E-2	5,41E-2	1,77E0	9,01E-2	2,27E-2	MND	MND	MND	MND	MND	MND	MND	3,27E-3	1,07E-2	2,32E-2	2,6E-4	-9,64E-1
Ozone depletion Pot.	kg CFC ₁₁ e	9,04E-8	3,08E-9	3,79E-9	9,72E-8	1,66E-8	1,9E-9	MND	MND	MND	MND	MND	MND	MND	5,63E-10	1,9E-9	2,87E-9	8,64E-11	-2,41E-8
Acidification	kg SO ₂ e	5,73E-3	3,42E-5	4,26E-4	6,19E-3	1,85E-4	8,21E-5	MND	MND	MND	MND	MND	MND	MND	4,87E-6	2,23E-5	1,77E-4	1,05E-6	-3,06E-3
Eutrophication	kg PO ₄ ³ e	3,31E-3	7,07E-6	1,68E-4	3,49E-3	3,85E-5	5,13E-5	MND	MND	MND	MND	MND	MND	MND	8,57E-7	4,9E-6	7,25E-5	2,03E-7	-1,69E-3
POCP ("smog")	kg C ₂ H ₄ e	1,1E-3	2,2E-6	2,03E-5	1,12E-3	1,2E-5	9,71E-6	MND	MND	MND	MND	MND	MND	MND	5,01E-7	1,46E-6	8,32E-6	7,68E-8	-7,92E-4
ADP-elements	kg Sbe	8,78E-6	3,87E-7	2,68E-7	9,43E-6	2,27E-6	4,67E-7	MND	MND	MND	MND	MND	MND	MND	5,03E-9	3,88E-7	1,3E-6	2,42E-9	-1,01E-6
ADP-fossil	MJ	1,92E1	2,57E-1	7,65E-1	2,03E1	1,39E0	2,85E-1	MND	MND	MND	MND	MND	MND	MND	4,54E-2	1,61E-1	3,26E-1	7,4E-3	-7,5E0



VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

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

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

Why does verification transparency matter? Read more online

This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the 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 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.

Elma Avdyli, approved verifier by EPD Hub, 22.03.2022

