Annex for double skin steel faced sandwich panels with a core made of mineral wool

- **Mineral wool sandwich panel 50mm thickness**
- **Mineral wool sandwich panel 200mm thickness**
- **1 kg steel sheet**
- **1 m³ mineral wool core**

to the

ENVIRONMENTAL PRODUCT DECLARATION
as per /ISO 14025/ and /EN 15804+A2/

Owner of the Declaration	European Association for Panels and Profiles e. V. (PPA-Europe)
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General information

This document is a public annex to the EPD with the declaration number: EPD-PPA-20240127-CBG1-EN. It contains the LCA results for additional thicknesses of mineral wool sandwich panels (50mm, 200mm).

The LCA data were based on production data from the year 2022.

Additionally, the annex provides separate results for 1 kg of steel sheet used for the panel faces and 1 m³ of mineral wool used for the core of the panel.

The annex includes the individual results for steel sheet(1 kg) and MW core (1 m³). The MW core declared in this annex includes transportation to production site, and production processes. The values for 1 kg of steel sheet and 1 m³ of MW core can be used to estimate the LCA results for products with different thicknesses.

The following formula describes how results for different thicknesses can be estimated:

$R_x = M_s * R_s + T_c * R_c$

R_x= Results for other/new sandwich panel

M_s= Mass of steel used in new sandwich panel

R_s= Results of 1kg steel

T_c = Thickness of new sandwich panel core (in m)

R_c= Results of 1m³ MW core

The formula shall be used for all indicators and for the following modules: A1-A3, A4, A5, C2, C3, C4 and D.

Additionally, installation and deconstruction impacts (for A5 and C1) are mentioned separately and declared per m² of product. The user can directly use these results without scaling. The impacts from installation (A5) shall be added with the scaled impacts from A5 in the mineral wool core results (EOL of packaging materials).

European Association for Panels and Profiles

General information on sandwich panels

This annex contains the LCA results of:

- Mineral wool sandwich panel 50mm thickness
- Mineral wool sandwich panel 200mm thickness
- 1 kg steel sheet
- 1 m³ mineral wool core

Technical data for sandwich panel MW 50

Technical specifications for sandwich panels with a core made of mineral wool are:

- EN 14509
- EN 13162

Constructional data

Name	Value	Unit
Density of the insulation	100-130	kg/m^3
Thickness of the element, when the outer layers are flat, this is the overall height of the element (D); on heavily profiled elements, this is the continuous core thickness without profile (dc)	50	mm
Thickness of the inner layer	0.5	mm
Weight	15	kg/m²
Thickness of the outer layer	0.6	mm

Composition of the sandwich panels

- Steel sheet 63%
- Core material 37%

Technical data for sandwich panel MW 200

Technical specifications for sandwich panels with a core made of mineral wool are:

- EN 14509
- EN 13162

Constructional data

Name	Value	Unit
Density of the insulation	100-130	kg/m^3
Thickness of the element, when the outer layers are flat, this is the overall height of the element (D); on heavily profiled elements, this is the continuous core thickness without profile (dc)	200	mm
Thickness of the inner layer	0.5	mm
Weight	33.82	kg/m²
Thickness of the outer layer	0.6	mm

Composition of the sandwich panels

- Steel sheet 29%
- Core material 71%

Technical data for 1m³ MW core

Thermal insulation core according to EN 13162:
The mineral wool thermal insulating core is bonded with an organic adhesive between the steel sheets.".

- Density:100-130 kg/m³

Technical data for 1kg steel sheet

Steel sheet according to EN 10346:
S280 GD to S350 GD with organic coating according to EN 10169.

1. LCA: Calculation rules

Declared unit

Product name	Name	Value	Unit
MW 50	Declared unit	1	m^2
	Surface weight of the panel (total value)	15	kg/m²
MW 200	Declared unit	1	m^2
	Surface weight of the panel (total value)	33.82	kg/m²
Steel sheet	Declared unit	1	kg
MW Core	Declared unit	1	m³

2. LCA: Scenarios and additional technical information

Information on describing the biogenic carbon content at factory gate

Product name	Name	Value	Unit
MW 50	Biogenic carbon content in accompanying packaging	0.040	kg C
MW 200	Biogenic carbon content in accompanying packaging	0.147	kg C
1 m³ Core with aux.	Biogenic carbon content in accompanying packaging	1.290	kg C

The following technical information is a basis for the declared modules.

Transport to the building site (A4)

The transport to building site A4 is standardized and can be scaled up to building level. Hence, it is considered to be 100 km.

Name	Value	Unit
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

Installation (A5)

The following packaging material is considered in A1- A3: polystyrene, polyethylene foil, cardboard and wooden pallets.

A5 covers the treatment of packaging material at the point of installation. The installation is done by diesel driven machinery with consumption of 0,233kg/m² panel.

Installation into the building (A5)

Product name	Name	Value	Unit
MW 50	Output substances following waste treatment on site	0.159	kg
MW 200	Output substances following waste treatment on site	0.495	kg
1m³ Core with aux.	Output substances following waste treatment on site	4.152	kg

End of life (C1-C4)

Similar machine as for installation used for demolition or deconstruction with similar consumption.

Product name	Name	Value	Unit
MW 50	Collected separately waste type	13.84	kg
	Recycling	8.27	kg
	Energy recovery	-	kg
	Landfilling	5.57	kg
MW 200	Collected separately waste type	32.58	kg
	Recycling	8.72	kg
	Energy recovery	-	kg
	Landfilling	23.86	kg
1kg steel sheet	Collected separately waste type	1	kg
	Recycling	1	kg
	Energy recovery	-	kg
	Landfilling	-	kg
1m³ MW core with aux.	Collected separately waste type	100	kg
	Recycling	-	kg
	Energy recovery	-	kg
	Landfilling	100	kg

Reuse, recovery or recycling potential (D)

Resulting potential benefits and loads for the metal recycling are declared in module D.

3. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m² mineral wool sandwich panel 50mm thickness

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO2-Eq.]	3,25E+01	1,09E-01	1,05E-01	8,26E-01	5,43E-02	0,00E+00	8,98E-02	-1,58E+01
GWP-fossil	[kg CO2-Eq.]	3,21E+01	1,07E-01	7,23E-02	8,15E-01	5,36E-02	0,00E+00	8,98E-02	-1,58E+01
GWP-biogenic	[kg CO2-Eq.]	4,08E-01	3,17E-04	3,22E-02	3,21E-03	1,58E-04	0,00E+00	0,00E+00	3,06E-02
GWP-luluc	[kg CO2-Eq.]	1,23E-02	9,94E-04	1,48E-05	7,53E-03	4,97E-04	0,00E+00	2,79E-04	-6,52E-03
ODP	[kg CFC11-Eq.]	4,32E-11	1,40E-14	1,57E-13	1,06E-13	6,98E-15	0,00E+00	2,28E-13	4,62E-11
AP	[mol H+-Eq.]	1,14E-01	1,38E-04	1,03E-04	4,77E-03	6,89E-05	0,00E+00	6,37E-04	-3,55E-02
EP-freshwater	[kg P-Eq.]	3,05E-05	3,92E-07	5,25E-08	2,97E-06	1,96E-07	0,00E+00	1,81E-07	-1,16E-06
EP-marine	[kg N-Eq.]	1,96E-02	4,67E-05	3,20E-05	2,33E-03	2,33E-05	0,00E+00	1,65E-04	-8,52E-03
EP-terrestrial	[mol N-Eq.]	3,22E-01	5,62E-04	3,69E-04	2,58E-02	2,81E-04	0,00E+00	1,81E-03	-9,22E-02
POCP	[kg NMVOC-Eq.]	6,51E-02	1,19E-04	9,50E-05	6,19E-03	5,94E-05	0,00E+00	4,96E-04	-2,84E-02
ADPE	[kg Sb-Eq.]	5,91E-04	7,07E-09	1,69E-09	5,36E-08	3,53E-09	0,00E+00	4,14E-09	-1,64E-07
ADPF	[MJ]	3,46E+02	1,46E+00	4,98E-01	1,11E+01	7,31E-01	0,00E+00	1,20E+00	-1,17E+02
WDP	[m³ world-Eq deprived]	1,20E+00	1,30E-03	1,12E-02	9,83E-03	6,49E-04	0,00E+00	9,86E-03	-2,24E-01

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m² mineral wool sandwich panel 50mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	3,56E+01	1,06E-01	1,74E+00	8,06E-01	5,32E-02	0,00E+00	1,95E-01	1,94E+01
PERM	[MJ]	1,66E+00	0,00E+00	-1,66E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	3,72E+01	1,06E-01	8,05E-02	8,06E-01	5,32E-02	0,00E+00	1,95E-01	1,94E+01
PENRE	[MJ]	3,33E+02	1,47E+00	3,28E+00	1,11E+01	7,34E-01	1,18E+01	1,20E+00	-1,18E+02
PENRM	[MJ]	1,46E+01	0,00E+00	-2,78E+00	0,00E+00	0,00E+00	-1,18E+01	0,00E+00	0,00E+00
PENRT	[MJ]	3,47E+02	1,47E+00	4,99E-01	1,11E+01	7,34E-01	0,00E+00	1,20E+00	-1,18E+02
SM	[kg]	1,64E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	5,17E-02	1,17E-04	3,05E-04	8,83E-04	5,83E-05	0,00E+00	3,02E-04	-1,01E-02

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² mineral wool sandwich panel 50mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1,50E-02	4,54E-12	-1,50E-02	3,44E-11	2,27E-12	0,00E+00	2,60E-11	-3,43E-10
NHWD	[kg]	3,53E+00	2,24E-04	1,24E-01	1,70E-03	1,12E-04	0,00E+00	5,98E+00	1,80E-01
RWD	[kg]	6,26E-03	2,75E-06	8,18E-06	2,08E-05	1,37E-06	0,00E+00	1,36E-05	2,04E-03
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	-1,42E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,27E+00	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00	7,74E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	1,82E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² mineral wool sandwich panel 50mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	1,23E-06	1,01E-09	1,23E-09	9,51E-08	5,04E-10	0,00E+00	7,83E-09	-5,19E-07
IRP	[kBq U235-Eq.]	8,30E-01	4,10E-04	8,57E-04	3,10E-03	2,05E-04	0,00E+00	1,58E-03	2,24E-01
ETP-fw	[CTUe]	9,40E+01	1,04E+00	1,80E-01	7,87E+00	5,19E-01	0,00E+00	6,52E-01	-2,02E+01
HTP-c	[CTUh]	3,99E-08	2,13E-11	2,67E-11	1,61E-10	1,06E-11	0,00E+00	1,00E-10	-2,43E-08
HTP-nc	[CTUh]	5,08E-07	1,13E-09	7,92E-10	1,06E-08	5,66E-10	0,00E+00	1,10E-08	-9,34E-08
SQP	[-]	8,36E+01	6,11E-01	6,77E-02	4,63E+00	3,05E-01	0,00E+00	2,90E-01	1,10E+01

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m² mineral wool sandwich panel 200mm thickness

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	5,53E+01	2,43E-01	1,28E+00	0,00E+00	8,26E-01	1,22E-01	0,00E+00	3,54E-01
GWP-fossil	[kg CO_2-Eq.]	5,35E+01	2,40E-01	1,03E+00	0,00E+00	8,15E-01	1,20E-01	0,00E+00	3,65E-01
GWP-biogenic	[kg CO_2-Eq.]	1,76E+00	7,10E-04	2,41E-01	0,00E+00	3,21E-03	3,55E-04	0,00E+00	-1,21E-02
GWP-luluc	[kg CO_2-Eq.]	1,98E-02	2,23E-03	7,53E-03	0,00E+00	7,53E-03	1,11E-03	0,00E+00	1,13E-03
ODP	[kg CFC11-Eq.]	9,52E-11	3,13E-14	2,86E-13	0,00E+00	1,06E-13	1,56E-14	0,00E+00	9,27E-13
AP	[mol H⁺-Eq.]	2,96E-01	3,09E-04	5,02E-03	0,00E+00	4,77E-03	1,54E-04	0,00E+00	2,58E-03
EP-freshwater	[kg P-Eq.]	5,22E-05	8,79E-07	3,03E-06	0,00E+00	2,97E-06	4,39E-07	0,00E+00	7,34E-07
EP-marine	[kg N-Eq.]	3,57E-02	1,05E-04	2,42E-03	0,00E+00	2,33E-03	5,23E-05	0,00E+00	6,68E-04
EP-terrestrial	[mol N-Eq.]	8,63E-01	1,26E-03	2,70E-02	0,00E+00	2,58E-02	6,29E-04	0,00E+00	7,35E-03
POCP	[kg NMVOC-Eq.]	1,20E-01	2,66E-04	6,44E-03	0,00E+00	6,19E-03	1,33E-04	0,00E+00	2,01E-03
ADPE	[kg Sb-Eq.]	6,25E-04	1,58E-08	5,39E-08	0,00E+00	5,36E-08	7,92E-09	0,00E+00	1,68E-08
ADPF	[MJ]	6,01E+02	3,27E+00	1,13E+01	0,00E+00	1,11E+01	1,64E+00	0,00E+00	4,85E+00
WDP	[m³ world-Eq deprived]	2,56E+00	2,90E-03	8,73E-02	0,00E+00	9,83E-03	1,45E-03	0,00E+00	4,00E-02

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m² mineral wool sandwich panel 200mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	7,62E+01	2,38E-01	7,19E+00	0,00E+00	8,06E-01	1,19E-01	0,00E+00	7,91E-01
PERM	[MJ]	6,30E+00	0,00E+00	-6,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	8,25E+01	2,38E-01	8,90E-01	0,00E+00	8,06E-01	1,19E-01	0,00E+00	7,91E-01
PENRE	[MJ]	5,83E+02	3,29E+00	1,76E+01	0,00E+00	1,11E+01	1,64E+00	0,00E+00	4,86E+00
PENRM	[MJ]	1,98E+01	0,00E+00	-6,19E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	6,03E+02	3,29E+00	1,14E+01	0,00E+00	1,11E+01	1,64E+00	0,00E+00	4,86E+00
SM	[kg]	1,74E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	1,01E-01	2,61E-04	2,70E-03	0,00E+00	8,83E-04	1,31E-04	0,00E+00	1,23E-03

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² mineral wool sandwich panel 200mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	7,96E-06	1,02E-11	3,71E-11	0,00E+00	3,44E-11	5,09E-12	0,00E+00	1,06E-10
NHWD	[kg]	1,22E+01	5,01E-04	3,11E-02	0,00E+00	1,70E-03	2,51E-04	0,00E+00	2,43E+01
RWD	[kg]	1,49E-02	6,15E-06	2,96E-05	0,00E+00	2,08E-05	3,08E-06	0,00E+00	5,54E-05
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	4,37E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,72E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00	5,73E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	1,35E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² mineral wool sandwich panel 200mm thickness

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	2,63E-06	2,26E-09	9,65E-08	0,00E+00	9,51E-08	1,13E-09	0,00E+00	3,18E-08
IRP	[kBq U235-Eq.]	2,21E+00	9,17E-04	4,04E-03	0,00E+00	3,10E-03	4,59E-04	0,00E+00	6,40E-03
ETP-fw	[CTUe]	1,91E+02	2,33E+00	7,96E+00	0,00E+00	7,87E+00	1,16E+00	0,00E+00	2,65E+00
HTP-c	[CTUh]	7,80E-08	4,76E-11	1,71E-10	0,00E+00	1,61E-10	2,38E-11	0,00E+00	4,07E-10
HTP-nc	[CTUh]	1,12E-06	2,53E-09	1,20E-08	0,00E+00	1,06E-08	1,27E-09	0,00E+00	4,48E-08
SQP	[-]	2,56E+02	1,37E+00	4,71E+00	0,00E+00	4,63E+00	6,84E-01	0,00E+00	1,18E+00

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg steel sheet

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	2,63E+00	7,25E-03			3,62E-03	0,00E+00	0,00E+00	-2,03E+00
GWP-fossil	[kg CO_2-Eq.]	2,63E+00	7,16E-03			3,58E-03	0,00E+00	0,00E+00	-2,03E+00
GWP-biogenic	[kg CO_2-Eq.]	1,49E-03	2,12E-05			1,06E-05	0,00E+00	0,00E+00	4,37E-03
GWP-luluc	[kg CO_2-Eq.]	1,07E-03	6,64E-05			3,32E-05	0,00E+00	0,00E+00	-9,59E-04
ODP	[kg CFC11-Eq.]	1,92E-12	9,32E-16			4,66E-16	0,00E+00	0,00E+00	6,85E-12
AP	[mol H^+-Eq.]	6,26E-03	9,20E-06			4,60E-06	0,00E+00	0,00E+00	-4,60E-03
EP-freshwater	[kg P-Eq.]	2,06E-06	2,62E-08			1,31E-08	0,00E+00	0,00E+00	-1,16E-07
EP-marine	[kg N-Eq.]	1,53E-03	3,12E-06			1,56E-06	0,00E+00	0,00E+00	-1,15E-03
EP-terrestrial	[mol N-Eq.]	1,66E-02	3,75E-05			1,88E-05	0,00E+00	0,00E+00	-1,26E-02
POCP	[kg NMVOC-Eq.]	4,88E-03	7,93E-06			3,96E-06	0,00E+00	0,00E+00	-3,73E-03
ADPE	[kg Sb-Eq.]	6,49E-05	4,72E-10			2,36E-10	0,00E+00	0,00E+00	7,29E-07
ADPF	[MJ]	2,44E+01	9,76E-02			4,88E-02	0,00E+00	0,00E+00	-1,45E+01
WDP	[m^3 world-Eq deprived]	7,93E-02	8,66E-05			4,33E-05	0,00E+00	0,00E+00	2,30E-02

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg steel sheet

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	1,96E+00	7,10E-03			3,55E-03	0,00E+00	0,00E+00	2,70E+00
PERM	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	1,96E+00	7,10E-03			3,55E-03	0,00E+00	0,00E+00	2,70E+00
PENRE	[MJ]	2,45E+01	9,80E-02			4,90E-02	0,00E+00	0,00E+00	-1,47E+01
PENRM	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	2,45E+01	9,80E-02			4,90E-02	0,00E+00	0,00E+00	-1,47E+01
SM	[kg]	1,81E-01	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m^3]	2,96E-03	7,78E-06			3,89E-06	0,00E+00	0,00E+00	-2,18E-04

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg steel sheet

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	8,26E-07	3,03E-13			1,52E-13	0,00E+00	0,00E+00	-2,23E-11
NHWD	[kg]	1,18E-01	1,49E-05			7,47E-06	0,00E+00	0,00E+00	-1,55E-02
RWD	[kg]	2,48E-04	1,83E-07			9,17E-08	0,00E+00	0,00E+00	3,06E-04
CRU	[kg]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	2,23E-01	0,00E+00			0,00E+00	1,00E+00	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg steel sheet

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	8,78E-08	6,73E-11			3,36E-11	0,00E+00	0,00E+00	-6,75E-08
IRP	[kBq U235-Eq.]	2,38E-02	2,73E-05			1,37E-05	0,00E+00	0,00E+00	2,71E-02
ETP-fw	[CTUe]	4,69E+00	6,93E-02			3,47E-02	0,00E+00	0,00E+00	-2,81E+00
HTP-c	[CTUh]	3,10E-09	1,42E-12			7,09E-13	0,00E+00	0,00E+00	-3,47E-09
HTP-nc	[CTUh]	3,29E-08	7,55E-11			3,78E-11	0,00E+00	0,00E+00	-9,73E-09
SQP	[-]	2,05E+00	4,08E-02			2,04E-02	0,00E+00	0,00E+00	1,59E+00

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m³ mineral wool core with auxiliary processes

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	1,57E+02	8,28E-01	3,63E+00		4,14E-01	0,00E+00	1,72E+00	-1,27E+00
GWP-fossil	[kg CO_2-Eq.]	1,51E+02	8,18E-01	1,74E+00		4,09E-01	0,00E+00	1,72E+00	-1,26E+00
GWP-biogenic	[kg CO_2-Eq.]	6,80E+00	2,42E-03	1,89E+00		1,21E-03	0,00E+00	0,00E+00	-1,61E-03
GWP-luluc	[kg CO_2-Eq.]	5,09E-02	7,58E-03	-3,40E-05		3,79E-03	0,00E+00	5,33E-03	-7,27E-05
ODP	[kg CFC11-Eq.]	4,51E-10	1,06E-13	1,43E-12		5,32E-14	0,00E+00	4,36E-12	-5,28E-12
AP	[mol H^+-Eq.]	1,16E+00	1,05E-03	1,98E-03		5,25E-04	0,00E+00	1,22E-02	-1,24E-03
EP-freshwater	[kg P-Eq.]	1,87E-04	2,99E-06	4,09E-07		1,50E-06	0,00E+00	3,45E-06	-5,75E-07
EP-marine	[kg N-Eq.]	1,06E-01	3,56E-04	7,63E-04		1,78E-04	0,00E+00	3,14E-03	-4,16E-04
EP-terrestrial	[mol N-Eq.]	3,48E+00	4,28E-03	9,65E-03		2,14E-03	0,00E+00	3,46E-02	-4,49E-03
POCP	[kg NMVOC-Eq.]	3,77E-01	9,05E-04	1,97E-03		4,52E-04	0,00E+00	9,48E-03	-1,19E-03
ADPE	[kg Sb-Eq.]	6,59E-06	5,39E-08	2,37E-09		2,69E-08	0,00E+00	7,91E-08	-3,36E-08
ADPF	[MJ]	2,10E+03	1,11E+01	1,98E+00		5,57E+00	0,00E+00	2,28E+01	-2,37E+01
WDP	[m³ world-Eq deprived]	9,48E+00	9,88E-03	6,17E-01		4,94E-03	0,00E+00	1,88E-01	-4,56E-02

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m³ mineral wool core with auxiliary processes

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	3,20E+02	8,11E-01	5,31E+01		4,05E-01	0,00E+00	3,72E+00	-1,64E+00
PERM	[MJ]	5,24E+01	0,00E+00	-5,24E+01		0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	3,72E+02	8,11E-01	6,69E-01		4,05E-01	0,00E+00	3,72E+00	-1,64E+00
PENRE	[MJ]	1,93E+03	1,12E+01	4,61E+01		5,59E+00	0,00E+00	2,29E+01	-2,37E+01
PENRM	[MJ]	1,65E+02	0,00E+00	-4,41E+01		0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	2,10E+03	1,12E+01	1,97E+00		5,59E+00	0,00E+00	2,29E+01	-2,37E+01
SM	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	4,18E-01	8,88E-04	1,45E-02		4,44E-04	0,00E+00	5,77E-03	-2,73E-03

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTMWT FLOWS according to EN 15804+A2: 1m³ mineral wool core with auxiliary processes

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	7,61E-07	3,46E-11	2,10E-11		1,73E-11	0,00E+00	4,97E-10	-2,79E-09
NHWD	[kg]	5,69E+01	1,71E-03	2,34E-01		8,53E-04	0,00E+00	1,14E+02	-5,80E-03
RWD	[kg]	7,31E-02	2,09E-05	6,99E-05		1,05E-05	0,00E+00	2,61E-04	-1,83E-03
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00	4,56E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	1,07E+01		0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m³ mineral wool core with auxiliary processes

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	8,88E-06	7,68E-09	1,14E-08		3,84E-09	0,00E+00	1,50E-07	-1,11E-08
IRP	[kBq U235-Eq.]	1,14E+01	3,12E-03	7,47E-03		1,56E-03	0,00E+00	3,01E-02	-2,75E-01
ETP-fw	[CTUe]	8,40E+02	7,91E+00	7,27E-01		3,96E+00	0,00E+00	1,25E+01	-3,48E+00
HTP-c	[CTUh]	2,40E-07	1,62E-10	8,26E-11		8,10E-11	0,00E+00	1,92E-09	-1,52E-10
HTP-nc	[CTUh]	4,10E-06	8,62E-09	1,13E-08		4,31E-09	0,00E+00	2,11E-07	-7,02E-09
SQP	[-]	1,46E+03	4,66E+00	6,65E-01		2,33E+00	0,00E+00	5,55E+00	-1,62E+00

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1m² mineral wool sandwich panel: Additional results from installation and deconstruction

Core Indicator	Unit	A5	C1
GWP-total	[kg CO_2-Eq.]	8,26E-01	8,26E-01
GWP-fossil	[kg CO_2-Eq.]	8,15E-01	8,15E-01
GWP-biogenic	[kg CO_2-Eq.]	3,21E-03	3,21E-03
GWP-luluc	[kg CO_2-Eq.]	7,53E-03	7,53E-03
ODP	[kg CFC11-Eq.]	1,06E-13	1,06E-13
AP	[mol H^+-Eq.]	4,77E-03	4,77E-03
EP-freshwater	[kg P-Eq.]	2,97E-06	2,97E-06
EP-marine	[kg N-Eq.]	2,33E-03	2,33E-03
EP-terrestrial	[mol N-Eq.]	2,58E-02	2,58E-02
POCP	[kg NMVOC-Eq.]	6,19E-03	6,19E-03
ADPE	[kg Sb-Eq.]	5,36E-08	5,36E-08
ADPF	[MJ]	1,11E+01	1,11E+01
WDP	[m^3 world-Eq deprived]	9,83E-03	9,83E-03

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1m² mineral wool sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
PERE	[MJ]	8,06E-01	8,06E-01
PERM	[MJ]	0,00E+00	0,00E+00
PERT	[MJ]	8,06E-01	8,06E-01
PENRE	[MJ]	1,11E+01	1,11E+01
PENRM	[MJ]	0,00E+00	0,00E+00
PENRT	[MJ]	1,11E+01	1,11E+01
SM	[kg]	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00
FW	[m^3]	8,83E-04	8,83E-04

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² mineral wool sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
HWD	[kg]	3,44E-11	3,44E-11
NHWD	[kg]	1,70E-03	1,70E-03
RWD	[kg]	2,08E-05	2,08E-05
CRU	[kg]	0,00E+00	0,00E+00
MFR	[kg]	0,00E+00	0,00E+00
MER	[kg]	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² mineral wool sandwich panel: Additional results from installation and deconstruction

Indicator	Unit	A5	C1
PM	[Disease Incidence]	9,51E-08	9,51E-08
IRP	[kBq U235-Eq.]	3,10E-03	3,10E-03
ETP-fw	[CTUe]	7,87E+00	7,87E+00
HTP-c	[CTUh]	1,61E-10	1,61E-10
HTP-nc	[CTUh]	1,06E-08	1,06E-08
SQP	[-]	4,63E+00	4,63E+00

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.
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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential. deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.