



**FRAMM**

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# ***ENVIRONMENTAL PRODUCT DECLARATION***

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

## ***HOLLOW CORE SLABS***

**We are Framm** – In Norwegian and Swedish, fram means movement, a continuous journey forward. We have come a long way from where we started under the name of Talot in 1990.

There have also been quieter periods in the development of the company, but in the last decade we have moved forward with ever bigger and bolder steps. The last of them – the acquisition of the competing AS Lasbet Tootmine in March 2020 – made us the largest manufacturer of concrete products in Estonia. This gives us the opportunity to turn another old and well-known maker into a modern and up-to-date direction.

Standing still does not fit our essence – we have knowingly invested in the development of our team, products, and manufacturing, and we have reached yet another significant milestone in our journey, where the change must also be projected outward.

#### **GREEN IMPACT**

We strive to take as little as possible from nature and at the same time giving more and more back. It starts with the day-to-day sorting of industrial and municipal waste, the use of materials and energy and the continuous pursuit of other circular economic objectives to reduce our impact on nature.

#### **COMMUNITY**

Our mission is to give a human face to this difficult and technical area and to be actively involved in the concrete field, both at the level of community and in the construction industry.

#### **DEDICATION**

We do our job with great dedication, and we make no allowances when it comes to our work. We always give our best to deliver products and meet customers wishes. We are demanding ourselves and we are continuously improving to offer only the best to our customers.



*“ Standing still does not fit our essence – we have knowingly invested in the development of our team, products, and manufacturing...”*



### **HOLLOW CORE SLABS**

Hollow core slabs are used in floors and roof ceilings, in some cases as walls and in wall-like structures. According to the provisions of the design documentations, we manufacture slabs with a thickness of 200, 220, 265, 320 and 400 mm. Standard width of slabs is 1.200 mm, lengths depend on the load bearing capacities and may reach up to 16 meters. Slabs can be cut narrower, and slab ends can be cut at an angle. The factory can manufacture slabs with required openings for feedthroughs for communications, chimney, etc. without compromising the load bearing capacity of the floor slab. Panel cavities can in some cases be used for supporting balcony mounts.

A photograph of a modern building with a hollow core slab courtyard. The building has a dark blue, vertically-slatted facade and numerous windows with bright yellow frames. The courtyard is paved with a reddish-brown material and features several circular green spaces with young trees. White circular lines are painted on the ground in the foreground. The text "HOLLOW CORE SLABS" is overlaid in large, white, bold, italicized capital letters.

# ***HOLLOW CORE SLABS***

# GENERAL INFORMATION

## MANUFACTURER INFORMATION

Manufacturer	AS Framm
Address	Vana-Narva mnt 8, Estonia
Contact details	framm@framm.ee
Website	framm.ee
Place(s) of production	Estonia

## The Building Information Foundation RTS sr

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



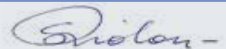
Jukka Seppänen  
RTS EPD Committee Secretary



Laura Apilo  
Managing Director

## EPD INFORMATION

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

EPD program operator	The Building Information Foundation RTS sr
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804 serves as the core PCR. In addition, the RTS PCR (English version, 26.8.2020 is used.
EPD author	Anette Iital, Mari Kirss Rangi Maja OU www.lcasupport.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025:2010: Internal certification <input checked="" type="checkbox"/> External verification
Verification date	10 <sup>th</sup> of March 2023
EPD verifier	Sigita Židonienė  Vesta Consulting UAB www.vestaconsulting.lt
Publication date	07.02.2024
Validity period	07.02.2029
EPD number	RTS_275_24



# PRODUCT INFORMATION

**PRODUCT NAME**

Hollow core slabs:

- HCE;
- HCS.

**PRODUCT DESCRIPTION AND APPLICATION**

Hollow core slabs in different height, produced using the slipformer (HCS) or extruder (HCE) method, which are intended to be used in floors, roofs, walls and similar applications.

**TECHNICAL SPECIFICATIONS**

Further information can be found at <https://framm.ee/>

**PHYSICAL PROPERTIES OF THE PRODUCT AND ADDITIONAL TECHNICAL INFORMATION**

Product properties and further information can be found on the manufacturer website <https://framm.ee/>

**PRODUCT STANDARDS**

EN 1168 Precast concrete products - Hollow core slabs.

**PRODUCT RAW MATERIAL MAIN COMPOSITION**

Materials	Amount (%)	
	HCE	HCS
Cement	17.1%	17.8%
Sand	33.9%	41.7%
Limestone	23.1%	32.5%
Granite	17.5%	-
Water	7.0%	6.5%
Prestressed steel	1.4%	1.5%
Total	100.0%	100.0%

**PRODUCT RAW MATERIAL MAIN COMPOSITION**

Raw material category	Amount, mass- %		Material origin	Recycled
	HCE	HCS		
Metals	1.5%	1.5%	Europe	87%
Minerals	91.5%	92.0%	Europe	
Water	7.0%	6.5%	Europe	
Fossil materials	-	-	N/A	
Bio-based materials	-	-	N/A	
Total	100.0%	100.0%		

**SUBSTANCES, REACH - VERY HIGH CONCERN**

The product does not contain any REACH SVHC substances in amounts greater than 0.1% (1000 ppm).

# PRODUCT LIFE-CYCLE

## MANUFACTURING AND PACKAGING (A1-A3)

Hollow core slabs have been grouped into 2 groups: HCE and HSC, each representing an average product, which based on the products' recipe and GWP values do not differ more than 10%.

Hollow core slabs are produced in two of the factories belonging to the company: Vana-Narva mnt 8 (in Maardu) and Punane tn 18 (in Tallinn). In the factories, several kinds of concrete elements are produced. The allocation is made in accordance with the provisions of EN 15804. Allocation is based on annual production data and rate for 2021. 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 products to the total annual production at the factories, the annual total raw materials, energy consumption, packaging materials and the generated waste per the declared product are allocated. Co-product allocation has not been used.

Hollow core slabs are either slipformed or extruded on 1.2 m wide and 80 m or 120 m long metal casting beds, depending on the production unit. First, the casting bed is cleaned and treated with form oil. The required number of steel prestressing strands are pulled over the bed in a predetermined formation and prestressed to the required tension. The slipformer or extruder machine forms the almost dry (zero-slump) concrete mix around the prestressed strands, forming one long hollow core slab. The slab is left to cure and harden until the concrete reaches the required release strength. The slab is cut into smaller slabs, according to the shop drawings.

Wooden spacers are used for packaging hollow core slabs.

Electricity used during manufacturing is electricity from the grid and green electricity (wind power from Sweden).

## MANUFACTURING ENERGY SCENARIO DOCUMENTATION

Object	GWP fossil	Data quality
Electricity: data quality and CO2 emission kg CO2 eq. / kWh	0.88 kg-CO2e/kWh	Market for electricity, high voltage (Reference product: electricity, high voltage), Estonia, Ecoinvent 3.8.
Electricity: data quality and CO2 emission kg CO2 eq. / kWh	0.016 kgCO2e/kWh	Electricity production, wind, 1-3MW turbine, onshore (Reference product: electricity, high voltage), Sweden, Ecoinvent 3.8.
Fuels (diesel): data quality and CO2 emission kg CO2 eq. / kWh	0.33 kg-CO2e/kWh	Diesel, burned in building machine (Reference product: diesel, burned in building machine), Global, Ecoinvent 3.8.
Heating fuels: data quality and CO2 emission kg CO2 eq. / kWh	0.12 kg-CO2e/kWh	Heat and power co-generation, diesel, 200kw electrical, scr-nox reduction (Reference product: heat, district or industrial, other than natural gas), Global, Ecoinvent 3.8.
Heating: data quality and CO2 emission kg CO2 eq. / kWh	0.26 kg-CO2e/kWh	Heat production, natural gas, at industrial furnace >100kw (Reference product: heat, district or industrial, natural gas), Global, Ecoinvent 3.8.



### 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 RTS PCR. Transportation from the manufacturing plants to the building site has been calculated using a most likely scenario – Helsinki (Finland). It is assumed that the distance is 20 km by lorry and 82 km by ferry. The distances are a mean average as the company uses several ports and production takes place in two factories. According to the manufacturer, transportation doesn't cause losses.

Vehicle capacity utilization volume factor is assumed to be 1.

### TRANSPORT SCENARIO DOCUMENTATION (A4)

Scenario parameter	Value
A4 specific transport CO <sub>2</sub> e emissions, kg CO <sub>2</sub> e / tkm (GWP-fossil)	0.12
A4 average transport distance, km	20+82 (lorry and ferry)
A4 Capacity utilization (including empty return) %	100
A4 mass of transported products (including packaging)	1 t (for all the products) + 0.0005 t (for packaging)
A4 Volume capacity utilization factor	=1

Optional module A5 is not declared.

### PRODUCT USE AND MAINTENANCE (B1-B7)

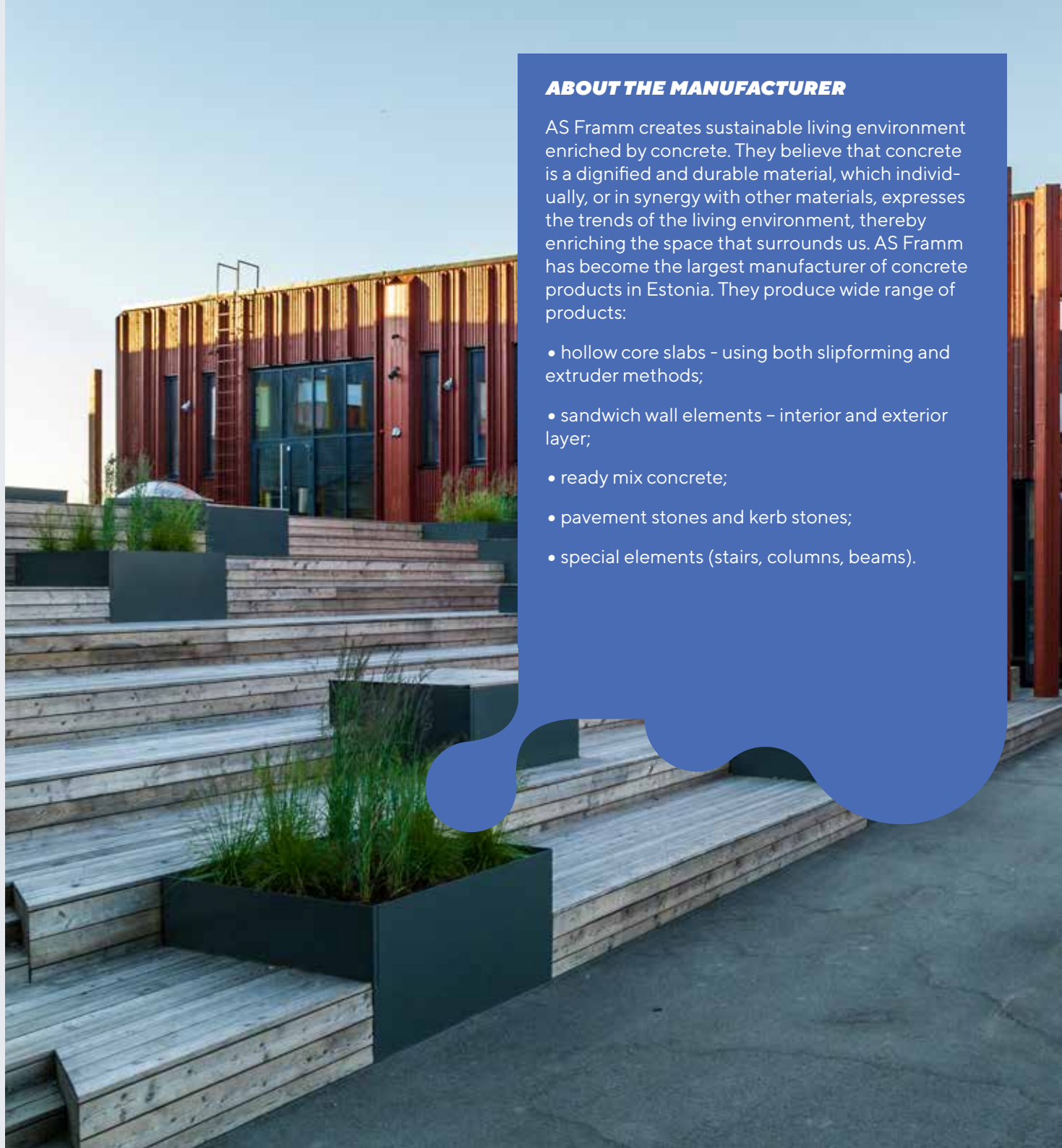
This EPD does not cover the use phase.

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

### ABOUT THE MANUFACTURER

AS Framm creates sustainable living environment enriched by concrete. They believe that concrete is a dignified and durable material, which individually, or in synergy with other materials, expresses the trends of the living environment, thereby enriching the space that surrounds us. AS Framm has become the largest manufacturer of concrete products in Estonia. They produce wide range of products:

- hollow core slabs – using both slipforming and extruder methods;
- sandwich wall elements – interior and exterior layer;
- ready mix concrete;
- pavement stones and kerb stones;
- special elements (stairs, columns, beams).





### 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). Energy consumption of a demolition process is on the average 10 kWh/m<sup>2</sup> (Bozdağ, Ö & Seçer, M., 2007). Basing on a Level(s) project, an average mass of a reinforced concrete building is about 1000 kg/m<sup>2</sup>. Therefore, energy consumption demolition is 10 kWh/1000 kg = 0,01 kWh/kg. The source of energy is diesel fuel used by work machines.

All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill (C2). Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is lorry which is the most common.

100% of steel and 92% concrete is recycled (C3) and the remaining is sent to local landfill for disposal (C4). Steel will be melted and concrete crushed.

Due to the recycling potential of reinforcement steel and concrete, the end-of-life product is converted into recycled raw materials (D). Steel can be re-used and crushed concrete used as road filling.



### END OF LIFE SCENARIO DOCUMENTATION

Scenario parameter	HCE	HCS
Collection process – kg collected separately	1000.00	1000.00
Collection process – kg collected with mixed waste	0	0
Recovery process – kg for re-use	0	0
Recovery process – kg for recycling	921.14	921.17
Recovery process – kg for energy recovery	0	0
Disposal (total) – kg for final deposition	78.86	78.83
Scenario assumptions e.g. transportation	End-of-life product is transported 50 km with an average lorry	

### LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2021
Declared unit	1 tonne
Mass per declared unit	1000 kg

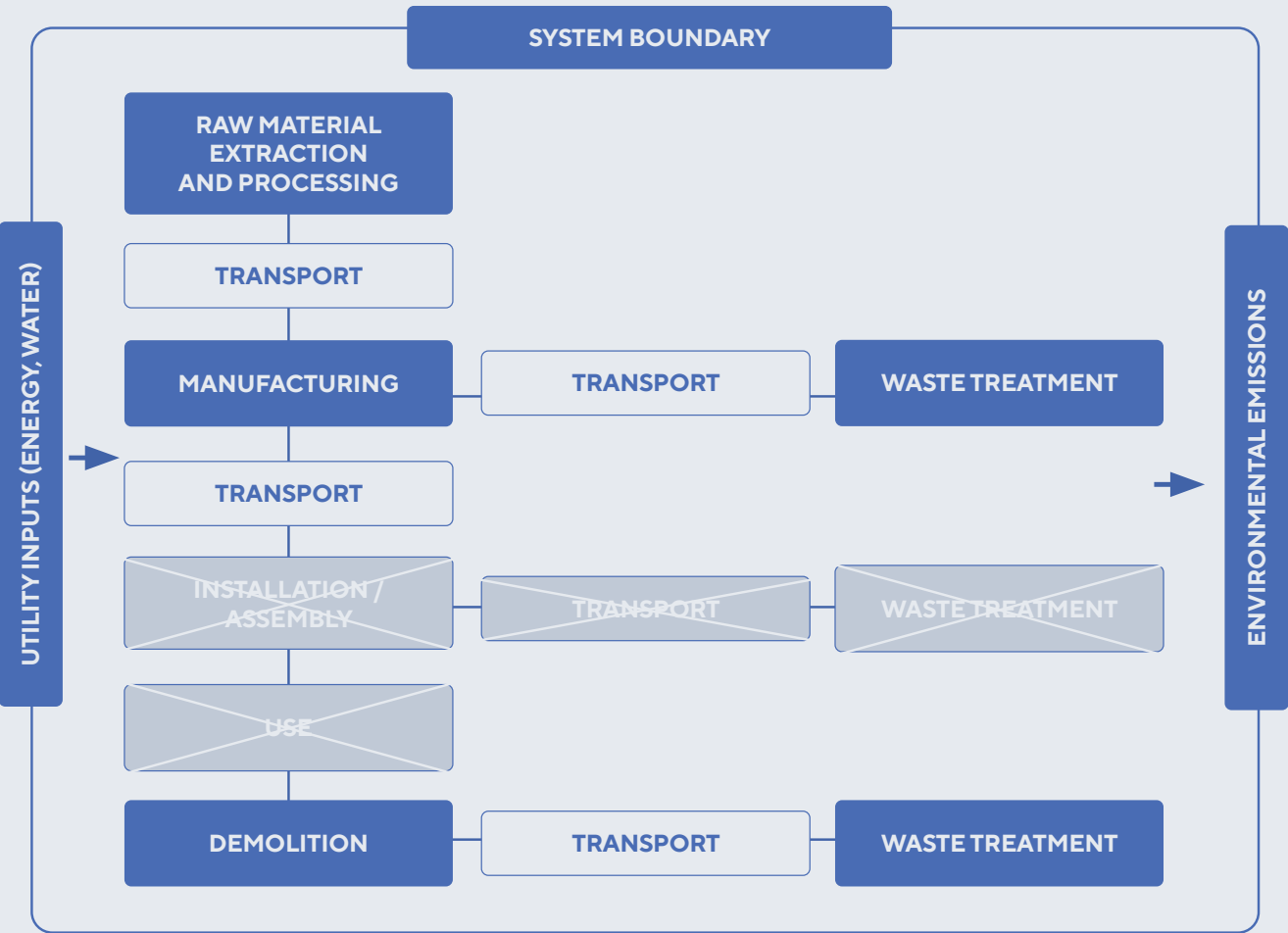
The source of LCA data is Ecoinvent 3.8 or specific EPDs. The tools used were One Click LCA and Open LCA.

**BIOGENIC CARBON CONTENT AT GATE**

The packaging of hollow core slabs contains biogenic carbon. The products do not contain biogenic carbon.

	HCE	HCS
Biogenic carbon content in product	0 kg	0 kg
Biogenic carbon content in packaging	0.23 kg	0.24 kg

Note. 1 kg biogenic carbon is equivalent to 44/12 kg of biogenic CO2 and biogenic carbon has been calculated based on EN 16449.



**SYSTEM BOUNDARY**

The scope of the EPD is cradle to gate with option A4, modules C1–C4 and module D.



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		Modules not declared							x	x	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

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The module A5 has not been calculated nor included in the LCA calculations. 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.

Cut-off has not been applied.





# ENVIRONMENTAL IMPACT DATA

## HCE

### CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2. PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP – total	kg CO <sub>2</sub> e	1.59E+2	2.63E+1	1.15E+1	1.97E+2	1.24E+1	3.30E+0	8.50E+0	4.47E+0	4.16E-1	-9.22E+0
GWP – fossil	kg CO <sub>2</sub> e	1.59E+2	2.63E+1	1.15E+1	1.97E+2	1.24E+1	3.30E+0	8.50E+0	4.47E+0	4.16E-1	-9.21E+0
GWP – biogenic	kg CO <sub>2</sub> e	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
GWP – LULUC	kg CO <sub>2</sub> e	5.12E-2	1.18E-2	3.03E-3	6.60E-2	7.20E-3	3.30E-4	3.25E-3	4.44E-4	3.94E-4	-9.21E-3
Ozone depletion pot.	kg CFC <sub>11</sub> e	3.99E-6	5.73E-6	2.06E-6	1.18E-5	2.56E-6	7.10E-7	1.90E-6	9.51E-7	1.66E-7	-6.46E-7
Acidification potential	mol H <sup>+</sup> e	4.84E-1	2.89E-1	6.03E-2	8.34E-1	3.09E-1	3.40E-2	3.35E-2	4.67E-2	3.94E-3	-5.51E-2
EP-fresh-water	kg Pe	5.55E-3	1.61E-4	8.65E-5	5.80E-3	5.35E-5	1.10E-5	6.00E-5	1.45E-5	4.34E-6	-4.23E-4
EP-marine	kg Ne	1.48E-1	7.61E-2	1.64E-2	2.40E-1	7.78E-2	1.50E-2	1.00E-2	2.00E-2	1.34E-3	-1.00E-2
EP-terrestrial	mol Ne	1.74E+0	8.42E-1	1.77E-1	2.76E+0	8.64E-1	1.70E-1	1.10E-1	2.23E-1	1.50E-2	-1.54E-1
POCP (“smog”)	kg NMVOCe	4.65E-1	2.32E-1	5.17E-2	7.48E-1	2.27E-1	4.60E-2	3.40E-2	6.22E-2	4.34E-3	-4.46E-2
ADP-minerals & metals	kg Sbe	2.92E-4	7.72E-5	1.47E-5	3.84E-4	2.33E-5	1.70E-6	2.95E-5	2.23E-6	9.46E-7	-1.26E-4
ADP-fossil resources	MJ	5.51E+2	3.70E+2	1.80E+2	1.10E+3	1.63E+2	4.45E+1	1.24E+2	6.01E+1	1.14E+1	-1.20E+2
Water use	m <sup>3</sup> e depr.	9.83E+3	1.51E+0	7.53E-1	9.83E+3	5.32E-1	1.20E-1	5.50E-1	1.66E-1	3.63E-2	-1.33E+1

GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential.  
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.

## USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Renew. PER as energy	MJ	8.95E+1	4.61E+0	4.21E+1	1.36E+2	1.42E+0	2.50E-1	1.75E+0	3.44E-1	9.86E-2	-1.16E+1
Renew. PER as material	MJ	0.00E+0	0.00E+0	3.15E+0	3.15E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renew. PER	MJ	8.95E+1	4.61E+0	4.53E+1	1.39E+2	1.42E+0	2.50E-1	1.75E+0	3.44E-1	9.86E-2	-1.16E+1
Non-re. PER as energy	MJ	7.64E+2	3.70E+2	1.19E+2	1.25E+3	1.63E+2	4.45E+1	1.24E+2	6.01E+1	1.14E+1	-1.20E+2
Non-re. PER as material	MJ	0.00E+0	0.00E+0	6.04E+1	6.04E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-re. PER	MJ	7.64E+2	3.70E+2	1.80E+2	1.31E+3	1.63E+2	4.45E+1	1.24E+2	6.01E+1	1.14E+1	-1.20E+2
Secondary materials	kg	1.75E+1	1.30E-1	3.62E-2	1.76E+1	6.33E-2	1.70E-2	4.15E-2	2.33E-2	2.37E-3	4.04E+0
Renew. secondary fuels	MJ	1.35E+2	1.16E-3	1.63E-4	1.35E+2	3.13E-4	5.70E-5	4.55E-4	7.67E-5	6.23E-5	-1.13E-3
Non-ren. secondary fuels	MJ	4.32E+2	0.00E+0	0.00E+0	4.32E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	m³	1.07E+0	4.11E-2	6.78E-2	1.17E+0	1.29E-2	2.70E-3	1.55E-2	3.66E-3	1.26E-2	-3.82E-1

PER = Primary energy Resources

## END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	8.19E+0	4.27E-1	1.81E-1	8.80E+0	1.95E-1	6.00E-2	1.40E-1	8.01E-2	0.00E+0	-1.72E+0
Non-hazardous waste	kg	5.05E+1	6.55E+0	2.57E+0	5.96E+1	2.13E+0	4.20E-1	2.45E+0	5.66E-1	7.89E+1	-2.13E+1
Radioactive waste	kg	1.74E-3	2.56E-3	6.57E-4	4.96E-3	1.14E-3	3.10E-4	8.50E-4	4.23E-4	0.00E+0	-5.10E-4





## END OF LIFE – OUTPUT FLOWS

### Impact

category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	kg	2.63E-2	0.00E+0	0.00E+0	2.63E-2	0.00E+0	0.00E+0	0.00E+0	9.21E+2	0.00E+0	0.00E+0
Materials for energy rec	kg	4.60E-2	0.00E+0	0.00E+0	4.60E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported energy	MJ	3.25E-2	0.00E+0	0.00E+0	3.25E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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

### Impact

category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP – total	kg CO <sub>2</sub> e	1.59E-1	2.63E-2	1.15E-2	1.97E-1	1.24E-2	3.30E-3	8.50E-3	4.47E-3	4.16E-4	-9.22E-3
ADP-minerals & metals	kg Sbe	2.92E-7	7.72E-8	1.47E-8	3.84E-7	2.33E-8	1.70E-9	2.95E-8	2.23E-9	9.46E-10	-1.26E-7
ADP-fossil	MJ	5.51E-1	3.70E-1	1.80E-1	1.10E+0	1.63E-1	4.45E-2	1.24E-1	6.01E-2	1.14E-2	-1.20E-1
Water use	m <sup>3</sup> e depr.	9.83E+0	1.51E-3	7.53E-4	9.83E+0	5.32E-4	1.20E-4	5.50E-4	1.66E-4	3.63E-5	-1.33E-2
Secondary materials	kg	1.75E-2	1.30E-4	3.62E-5	1.76E-2	6.33E-5	1.70E-5	4.15E-5	2.33E-5	2.37E-6	4.04E-3
Biog. C in product	kg C	N/A	N/A	0.00E+0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Biog. C in packaging	kg C	N/A	N/A	1.06E-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A

## ENVIRONMENTAL IMPACTS – EN 15804+A1. CML / ISO 21930

### Impact

category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Pot.	kg CO <sub>2</sub> e	1.60E+2	2.52E+1	1.12E+1	1.97E+2	1.22E+1	3.30E+0	8.00E+0	4.41E+0	4.07E-1	-8.88E+0
Ozone depletion Pot.	kg CFC <sub>311</sub> e	3.48E-6	4.50E-6	1.72E-6	9.71E-6	1.99E-6	5.60E-7	1.50E-6	7.55E-7	1.34E-7	-5.72E-7
Acidification	kg SO <sub>2</sub> e	1.77E-1	2.31E-1	4.84E-2	4.56E-1	2.48E-1	2.50E-2	2.60E-2	3.33E-2	2.92E-3	-4.30E-2
Eutrophication	kg PO <sub>4</sub> <sup>3</sup> e	2.66E-1	3.28E-2	8.80E-3	3.07E-1	2.86E-2	5.70E-3	6.00E-3	7.67E-3	6.39E-4	-1.99E-2
POCP (“smog”)	kg C <sub>2</sub> H <sub>4</sub> e	5.06E-2	6.73E-3	1.87E-3	5.92E-2	6.41E-3	5.40E-4	1.05E-3	7.22E-4	1.26E-4	-3.91E-3
ADP-elements	kg Sbe	3.02E-4	7.55E-5	1.45E-5	3.92E-4	2.23E-5	1.70E-6	2.90E-5	2.23E-6	9.46E-7	-1.26E-4
ADP-fossil	MJ	7.37E+2	3.70E+2	1.79E+2	1.29E+3	1.63E+2	4.45E+1	1.24E+2	6.01E+1	1.14E+1	-1.20E+2

# HCS

## CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2. PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP – total	kg CO <sub>2</sub> e	1.56E+2	2.43E+1	1.15E+1	1.92E+2	1.24E+1	3.30E+0	8.50E+0	4.49E+0	4.16E-1	-9.21E+0
GWP – fossil	kg CO <sub>2</sub> e	1.56E+2	2.43E+1	1.15E+1	1.92E+2	1.24E+1	3.30E+0	8.50E+0	4.49E+0	4.15E-1	-9.20E+0
GWP – biogenic	kg CO <sub>2</sub> e	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
GWP – LULUC	kg CO <sub>2</sub> e	4.98E-2	1.01E-2	3.04E-3	6.29E-2	7.20E-3	3.30E-4	3.25E-3	4.46E-4	3.94E-4	-9.21E-3
Ozone depletion pot.	kg CFC <sub>11</sub> e	4.11E-6	5.37E-6	2.06E-6	1.15E-5	2.56E-6	7.10E-7	1.90E-6	9.56E-7	1.66E-7	-6.46E-7
Acidification potential	mol H <sup>+</sup> e	4.90E-1	1.79E-1	6.03E-2	7.30E-1	3.09E-1	3.40E-2	3.35E-2	4.69E-2	3.94E-3	-5.51E-2
EP-fresh-water	kg Pe	2.33E-3	1.61E-4	8.66E-5	2.57E-3	5.35E-5	1.10E-5	6.00E-5	1.46E-5	4.34E-6	-4.23E-4
EP-marine	kg Ne	1.79E-1	4.89E-2	1.64E-2	2.44E-1	7.78E-2	1.50E-2	1.00E-2	2.01E-2	1.34E-3	-9.99E-3
EP-terrestrial	mol Ne	1.90E+0	5.41E-1	1.77E-1	2.61E+0	8.64E-1	1.70E-1	1.10E-1	2.24E-1	1.50E-2	-1.54E-1
POCP (“smog”)	kg NMVOCe	4.97E-1	1.54E-1	5.17E-2	7.03E-1	2.27E-1	4.60E-2	3.40E-2	6.25E-2	4.34E-3	-4.46E-2
ADP-minerals & metals	kg Sbe	3.20E-4	7.80E-5	1.47E-5	4.13E-4	2.33E-5	1.70E-6	2.95E-5	2.24E-6	9.46E-7	-1.26E-4
ADP-fossil resources	MJ	6.02E+2	3.47E+2	1.80E+2	1.13E+3	1.63E+2	4.45E+1	1.24E+2	6.04E+1	1.14E+1	-1.20E+2
Water use	m <sup>3</sup> e depr.	1.25E+4	1.49E+0	7.53E-1	1.25E+4	5.32E-1	1.20E-1	5.50E-1	1.66E-1	3.63E-2	-1.33E+1

GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential.

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.





## USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Renew. PER as energy	MJ	8.07E+1	4.64E+0	4.24E+1	1.28E+2	1.42E+0	2.50E-1	1.75E+0	3.46E-1	9.85E-2	-1.16E+1
Renew. PER as material	MJ	0.00E+0	0.00E+0	3.31E+0	3.31E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renew. PER	MJ	8.07E+1	4.64E+0	4.57E+1	1.31E+2	1.42E+0	2.50E-1	1.75E+0	3.46E-1	9.85E-2	-1.16E+1
Non-re. PER as energy	MJ	6.06E+2	3.47E+2	1.19E+2	1.07E+3	1.63E+2	4.45E+1	1.24E+2	6.04E+1	1.14E+1	-1.20E+2
Non-re. PER as material	MJ	0.00E+0	0.00E+0	6.04E+1	6.04E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-re. PER	MJ	6.06E+2	3.47E+2	1.80E+2	1.13E+3	1.63E+2	4.45E+1	1.24E+2	6.04E+1	1.14E+1	-1.20E+2
Secondary materials	kg	1.31E+1	1.20E-1	3.62E-2	1.33E+1	6.33E-2	1.70E-2	4.15E-2	2.34E-2	2.36E-3	1.67E+1
Renew. secondary fuels	MJ	8.91E+1	1.19E-3	1.63E-4	8.91E+1	3.13E-4	5.70E-5	4.55E-4	7.71E-5	6.23E-5	-1.13E-3
Non-ren. secondary fuels	MJ	4.35E+2	0.00E+0	0.00E+0	4.35E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	m³	7.70E-1	4.12E-2	6.78E-2	8.79E-1	1.29E-2	2.70E-3	1.55E-2	3.68E-3	1.26E-2	-3.81E-1

PER = Primary energy resources

## END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	8.28E+0	3.97E-1	1.81E-1	8.86E+0	1.95E-1	6.00E-2	1.40E-1	8.05E-2	0.00E+0	-1.72E+0
Non-hazardous waste	kg	4.85E+1	6.54E+0	2.57E+0	5.76E+1	2.13E+0	4.20E-1	2.45E+0	5.69E-1	7.88E+1	-2.13E+1
Radioactive waste	kg	1.90E-3	2.40E-3	6.57E-4	4.95E-3	1.14E-3	3.10E-4	8.50E-4	4.25E-4	0.00E+0	-5.10E-4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	kg	1.95E-2	0.00E+0	0.00E+0	1.95E-2	0.00E+0	0.00E+0	0.00E+0	9.21E+2	0.00E+0	0.00E+0
Materials for energy rec	kg	5.87E-2	0.00E+0	0.00E+0	5.87E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported energy	MJ	4.16E-2	0.00E+0	0.00E+0	4.16E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

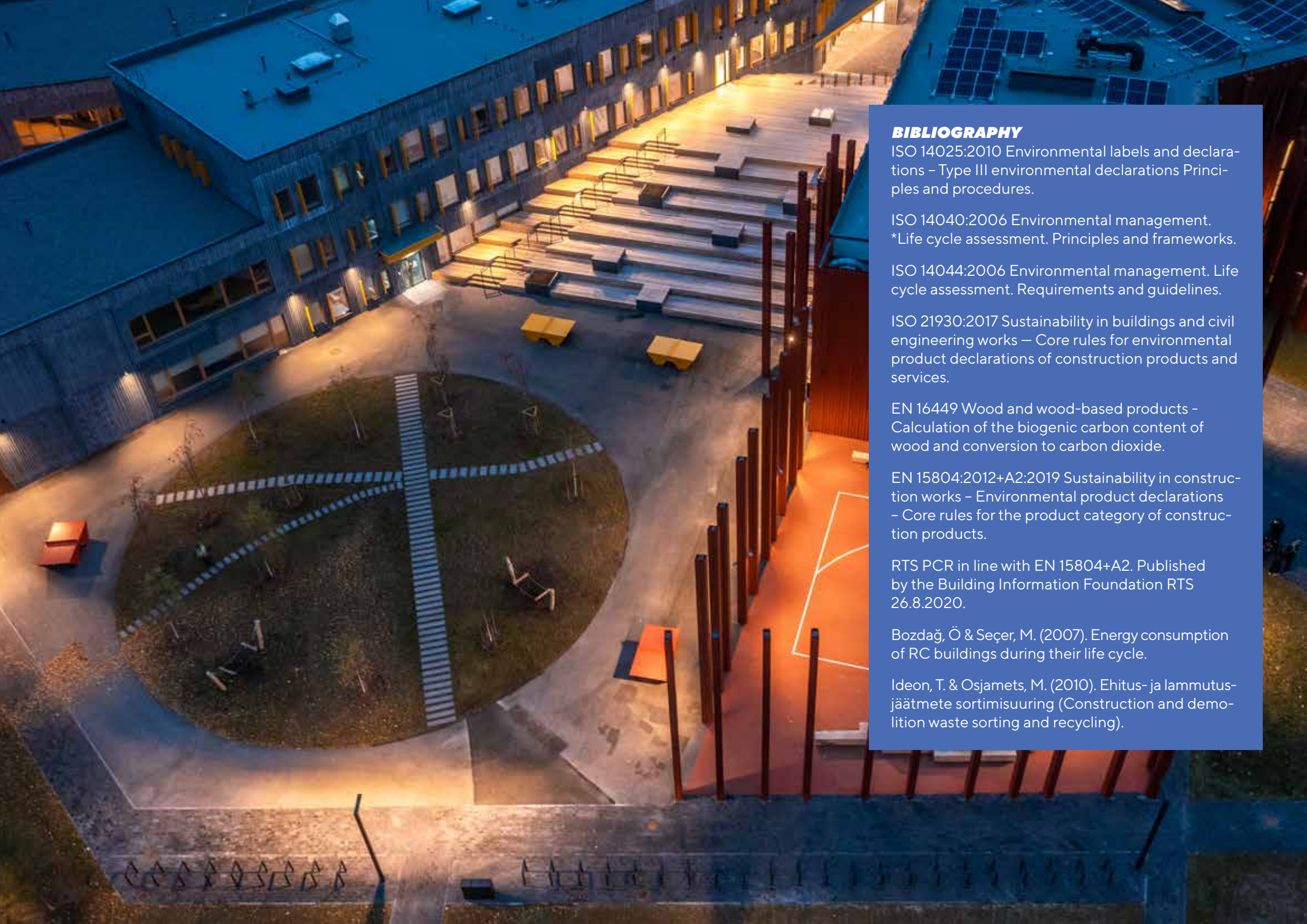
KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP – total	kg CO <sub>2</sub> e	1.56E-1	2.43E-2	1.15E-2	1.92E-1	1.24E-2	3.30E-3	8.50E-3	4.49E-3	4.16E-4	-9.21E-3
ADP-minerals & metals	kg Sbe	3.20E-7	7.80E-8	1.47E-8	4.13E-7	2.33E-8	1.70E-9	2.95E-8	2.24E-9	9.46E-10	-1.26E-7
ADP-fossil	MJ	6.02E-1	3.47E-1	1.80E-1	1.13E+0	1.63E-1	4.45E-2	1.24E-1	6.04E-2	1.14E-2	-1.20E-1
Water use	m <sup>3</sup> e depr.	1.25E+1	1.49E-3	7.53E-4	1.25E+1	5.32E-4	1.20E-4	5.50E-4	1.66E-4	3.63E-5	-1.33E-2
Secondary materials	kg	1.31E-2	1.20E-4	3.62E-5	1.33E-2	6.33E-5	1.70E-5	4.15E-5	2.34E-5	2.36E-6	1.67E-2
Biog. C in product	kg C	N/A	N/A	0.00E+0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Biog. C in packaging	kg C	N/A	N/A	1.12E-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ENVIRONMENTAL IMPACTS – EN 15804+A1. CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Pot.	kg CO <sub>2</sub> e	1.57E+2	2.30E+1	1.12E+1	1.92E+2	1.22E+1	3.30E+0	8.00E+0	4.43E+0	4.07E-1	-8.88E+0
Ozone depletion Pot.	kg CFC <sub>11</sub> e	3.54E-6	4.23E-6	1.72E-6	9.49E-6	1.99E-6	5.60E-7	1.50E-6	7.59E-7	1.34E-7	-5.72E-7
Acidification	kg SO <sub>2</sub> e	1.28E-1	1.42E-1	4.84E-2	3.18E-1	2.48E-1	2.50E-2	2.60E-2	3.35E-2	2.92E-3	-4.30E-2
Eutrophication	kg PO <sub>4</sub> <sup>3</sup> e	3.00E-1	2.36E-2	8.80E-3	3.32E-1	2.86E-2	5.70E-3	6.00E-3	7.71E-3	6.38E-4	-1.99E-2
POCP (“smog”)	kg C <sub>2</sub> H <sub>4</sub> e	5.67E-2	4.57E-3	1.88E-3	6.32E-2	6.41E-3	5.40E-4	1.05E-3	7.26E-4	1.26E-4	-3.90E-3
ADP-elements	kg Sbe	3.17E-4	7.65E-5	1.45E-5	4.08E-4	2.23E-5	1.70E-6	2.90E-5	2.24E-6	9.46E-7	-1.26E-4
ADP-fossil	MJ	6.02E+2	3.47E+2	1.79E+2	1.13E+3	1.63E+2	4.45E+1	1.24E+2	6.04E+1	1.14E+1	-1.20E+2





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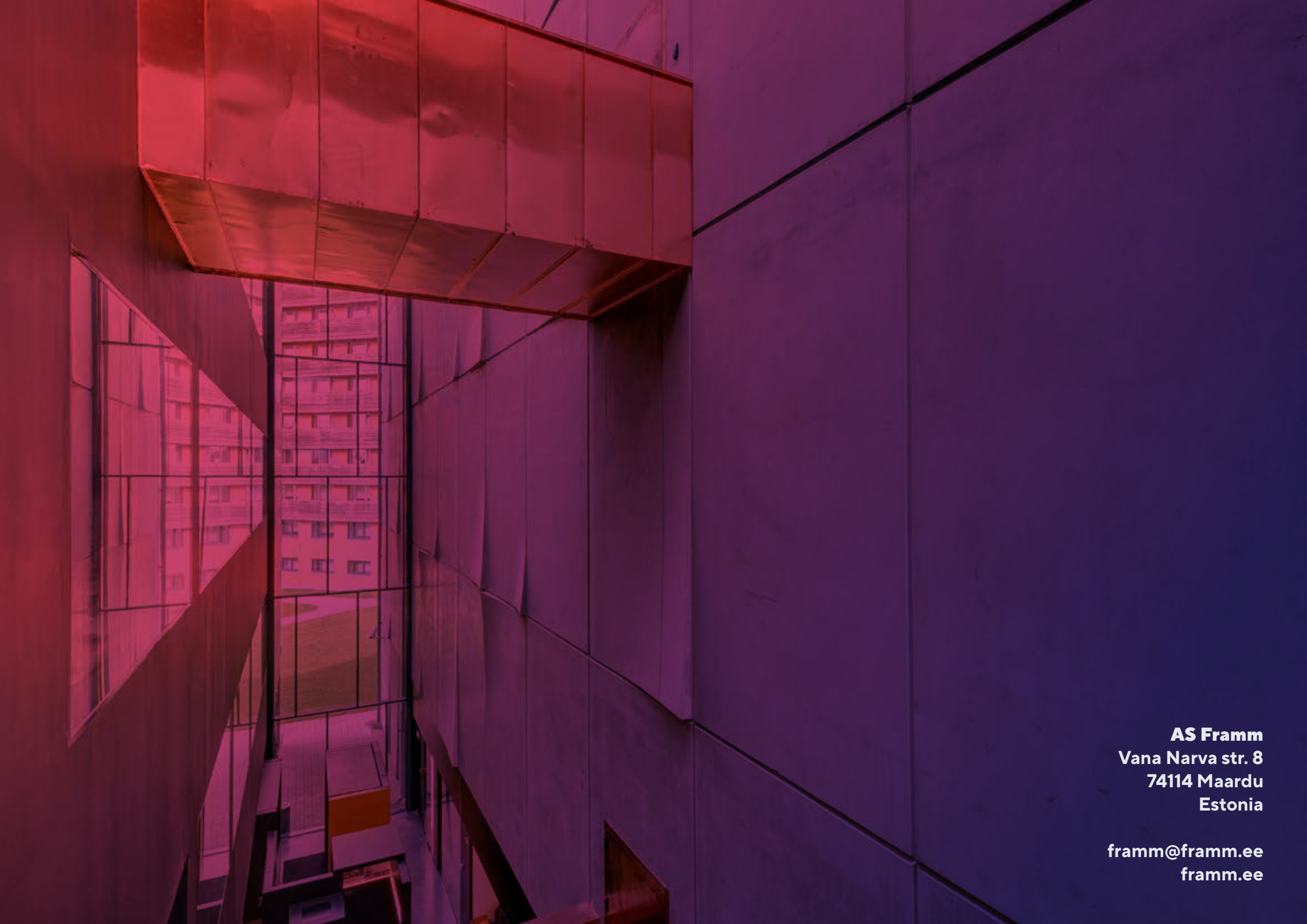
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