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The Norwegian EPD Foundation

ENVIRONMENTAL 'PRODUCT' DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:

Program operator:

Publisher:

Declaration number:

Registration number:

ECO Platform reference number:

Issue date:

Valid to:

Saint-Gobain Sweden AB, ISOVER

The Norwegian EPD Foundation

The Norwegian EPD Foundation

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ISOVER Skalmursskiva 32 and ISOVER Takstolsskiva 32

Saint-Gobain Sweden AB, ISOVER



General information

Product

ISOVER Skalmursskiva 32
ISOVER Takstolsskiva 32

Program operator

The Norwegian EPD Foundation
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Declaration number

POUØFI H E I I EP

ECO Platform reference number

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This declaration is based on Product Category Rules

CEN Standard EN 15804 serve as core PCR
The Product Category Rules, NPCR 12 rev.: Insulation materials, epd-norge.no, (2012) is used in addition to the core PCR.

Statement of liability

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Declared unit

1 m² with a thermal resistance of 1.0 K m²W⁻¹
With a thickness of 32 mm.

Functional unit

1 m² with a thermal resistance of 1.0 K m²W⁻¹ with a reference service life of 60 years.

Verification

Independent verification of calculation data and other environmental information and test of the computer program was carried out by Martin Erlandsson in accordance with ISO14025, 8.1.3 and 8.1.4 + EN 15804

Externally

IVL Swedish Environmental Research Institute
(Independent verifier approved by EPD Norway)

Owner of the declaration

Saint-Gobain Sweden AB, ISOVER
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Manufacturer

Saint-Gobain Sweden AB, ISOVER

Place of production

Billesholm, Sweden

Management system

SS-EN ISO 9001:2008
SS-EN ISO 14001:2004

Org. No

556241-2592

Issue date

~~EPD~~

Valid to

~~EPD~~

Year of study

2016

Comparability

EPD of construction products may not be comparable if they do not comply with EN15804 and seen in a building context.

The EPD has been worked out by

The EPD has been worked by the use of EPD tool, TEAM, version 5.2 by Saint-Gobain ISOVER TEAM by Sanna Lindholm
Company-specific data has been verified by Michaël Medard, Saint-Gobain Isover.

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product description

Product description and description of use:

This EPD describes the potential environmental impacts of 1 m² of glass wool insulation, ISOVER Skalmursskiva 32 and ISOVER Takstolsskiva 32, with a thermal resistance equal to 1 K·m²·W⁻¹.

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

ISOVER glass wool products are CE-marked according to the EN 13172 (2011) "Thermal Insulation Products – Evaluation of Conformity" and EN 13162 (2012) "Thermal insulation Products for Buildings. Factory made mineral wool (MW) Products. Specification".

The production site of Saint-Gobain Sweden AB, ISOVER in Billesholm, uses a small amount of natural and abundant raw materials (sand, soda, limestone, feldspar) and high share of recycled glass cullets (more than 50% post-consumer recycled content of the glass). This material is converted by using fusion and fiberizing techniques to produce glass wool. The products obtained come in the form of a "mineral wool mat" consisting of a soft, airy structure.

On Earth, naturally, the best insulator is dry immobile air at 10°C: its thermal conductivity factor, expressed in λ , is 0.025 W/(m·K) (watts per meter Kelvin degree). The thermal conductivity of mineral wool is close to immobile air as its lambda varies from 0.030 W/(m·K) for the most efficient to 0.040 W/(m·K).

With its entangled structure, glass wool is a porous material that traps the air, making it one of the best insulating materials. The porous and elastic structure of the wool also absorbs noise in the air and offers acoustic correction inside premises. Glass wool mainly containing incombustible materials does not react to fire.

Glass wool insulation is used in buildings as well as industrial facilities. It ensures a high level of comfort, minimizes carbon dioxide (CO₂) emissions by preventing heat losses through roofs, walls, floors, pipes and boilers. It reduces noise and protects homes and industrial facilities against fire.

Correctly installed glass wool products and solutions do not require maintenance and last throughout the lifetime of the building (which is set at 60 years as a default value in the model), or as long as the insulated building component is a part of the building.

Technical data/physical characteristics:

The thermal resistance of the product: $1.00 \text{ K}\cdot\text{m}^2\cdot\text{W}^{-1}$
The thermal conductivity of the product: $0.032 \text{ W}/(\text{m}\cdot\text{K})$
Reaction to fire: Euroclass A1

Description of the main product components and or materials:

Main components

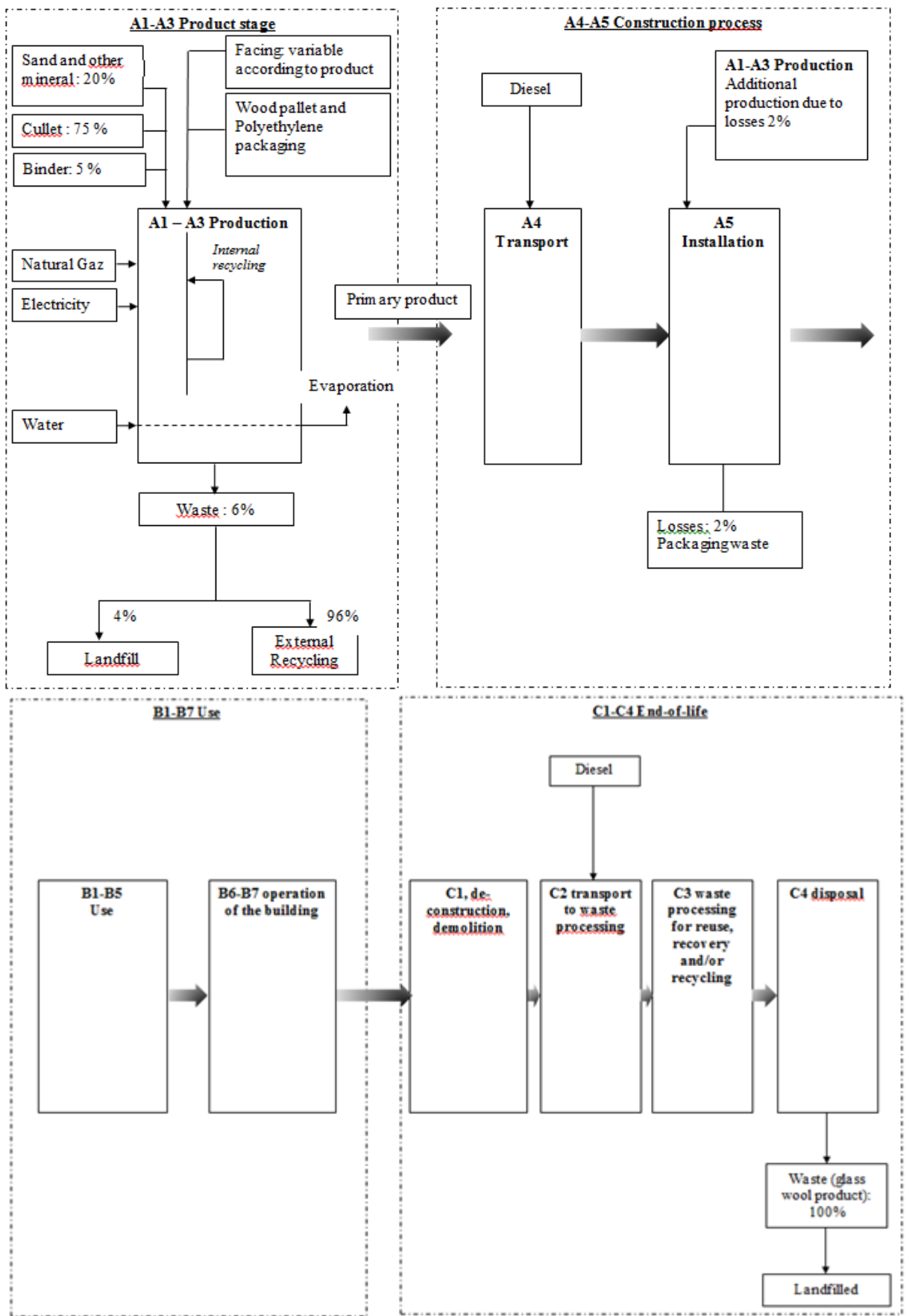
Glass wool 90-95 % (REACH registration number 01-2119472313-44-0041)
Binder 0-10%

PARAMETER	VALUE
Quantity of mineral wool	896 g
Thickness of mineral wool	32 mm
Surfacing	No facing
Packaging for the transportation and distribution	Polyethylene 26.9 g Wood pallet 115 g
Product used for the Installation:	None

LCA calculation information

FUNCTIONAL UNIT	Providing a thermal insulation on 1 m^2 with a thermal resistance of equals $1 \text{ K}\cdot\text{m}^2\cdot\text{W}^{-1}$.
SYSTEM BOUNDARIES	Cradle to Gate with options: A1-3, A4-5, B1- 7, C1-4
REFERENCE SERVICE LIFE (RSL)	60 years
CUT-OFF RULES	See detailed explanation page 9
ALLOCATIONS	See detailed explanation page 9
ELECTRICITY USED FOR THE MANUFACTURING PROCESS	Sweden electricity mix from IEA (reference year 2014)
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Sweden 2016
GREENHOUSE GAS EMISSION FROM ELECTRICITY	Which equals $0.0056 \text{ kg CO}_2 \text{ eq /MJ}$

Flow diagram of the Life Cycle



System boundaries (X=included, MND=module not declared)																
Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	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	X	X	X	X	X	X	X	X	X	X	X	MND

Product stage, A1-A3

Description of the stage:

The product stage of the mineral wool products is subdivided into 3 modules A1, A2 and A3 respectively "Raw material supply", "transport" and "manufacturing".

The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15 804 standard. This rule is applied in this EPD.

A1, Raw material supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process.

Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. sand and borax for glass wool. Besides these raw materials, recycled material/glass cullet is also used as input.

About cullet: The main raw material for the production of glass insulation material is cullets or/and sand. Only specific cleaning activities and transport is included for the cullets – and thus not the impacts from the full life cycle of glass. The reason is that cullets are considered a waste product and not initially produced for the purpose of glass wool insulation production. The only activities included are:

- Magnetic separation of metallic piece
- Separation of other piece-crushing of glass (<20 mm)
- Separation of bottle cap crushing (<2 mm) sieving
- Transport

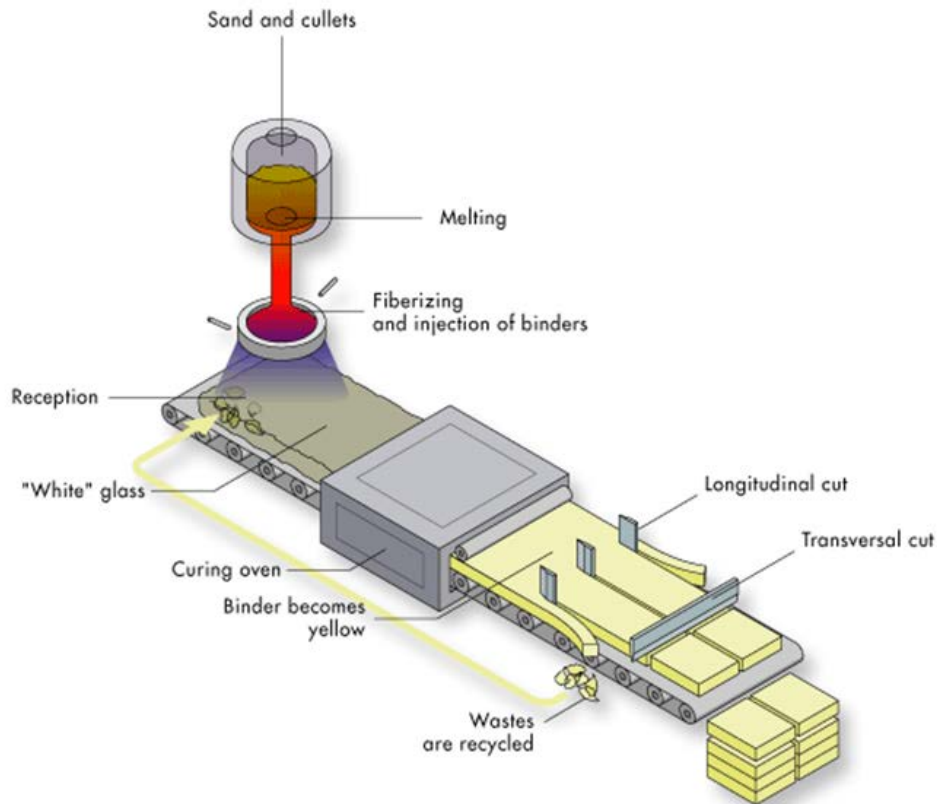
A2, transport to the manufacturer

The raw materials are transported to the manufacturing site. In our case, the modeling include: road and boat transportations (specific values) of each raw material.

A3, manufacturing

This module covers glass wool fabrication, including melting and fiberization (see process flow diagram). In addition, the production of packaging material is taking into account at this stage.

Glass wool production



Construction process stage, A4-A5

Description of the stage:

The construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

Description of scenarios and additional technical information:

A4, Transport to the building site:

- This module includes transport from the production gate to the building site. (Representative as average for the Swedish market).
- Transport is calculated on the basis of a scenario with the parameters described in the following table.

PARAMETER	VALUE
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km
Distance	500 km
Capacity utilisation (including empty returns)	95 % of the capacity in volume 50 % of empty returns
Bulk density of transported products	50-100 kg/m ³
Volume capacity utilisation factor	1 (by default)

A5, Installation in the building: This module includes

- Wastage of products: see following table 5 %. These losses are landfilled (landfill model for glass see chapter End of life),
- Additional production processes to compensate for the loss
- Processing of packaging wastes: they are 100 % collected and modeled as recovered matter.

PARAMETER	VALUE
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	5 %
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	Packaging wastes are 100 % collected and modeled as recovered matter Glass wool losses are landfilled

Use stage (excluding potential savings), B1-B7

Description of the stage: The use stage is divided into the following modules:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational energy use
- B7: Operational water use

Description of scenarios and additional technical information:

Once installation is complete, no actions or technical operations are required during the use stages until the end of life stage. Therefore glass wool insulation products have no impact (excluding potential energy savings) on this stage.

End-of-life stage C1-C4

Description of the stage:

The stage includes the different modules of end-of-life detailed below.

C1, de-construction, demolition

The de-construction and/or dismantling of insulation products take part of the demolition of the entire building and is assumed to be made manually. In our case, the environmental impact is assumed to be very small and can be neglected.

C2, transport to waste processing

Transport is included and calculated on the basis of a scenario with the parameters described in the End-of-life table.

C3, waste processing for reuse, recovery and/or recycling;

Today the product is considered to be landfilled without reuse, recovery or recycling.

C4, disposal;

The glass wool is assumed to be 100% landfilled.

Description of scenarios and additional technical information: See below

End-of-life:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	The entire insulation product (wool and surfacing) is collected with mixed construction waste
Recovery system specified by type	No re-use, recycling or energy recovery
Disposal specified by type	The entire insulation product (wool and surfacing) is landfilled
Assumptions for scenario development (e.g. transportation)	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km 25 km (default distance from the building site to landfill).

Reuse/recovery/recycling potential, D

Module D is not included in the EPD.

LCA results

LCA model, aggregation of data and potential environmental impact are calculated from the TEAM™ software 5.2. and CML impact method has been used, together with DEAM (2017) and Ecoinvent V3.3 (2016) databases to obtain the inventory of generic data. Biogenic carbon is not reported in the context of GWP.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant of Saint-Gobain Sweden A, ISOVER in Billesholm (Production data according 2016).

Resume of the LCA results detailed on the following tables.

Cut-off criteria

The cut-off criterion used in Saint-Gobain EPD will be the mass criterion with the following details:

- Taking into account all input and output flows in a unit process i.e. taking into account the value of all flows in the unit process and the corresponding LCI whenever available
- No simplification of the LCI by additional exclusions of material flows

Data collected at the manufacturing site was used. The inventory process in this LCA includes all data related to raw material, packaging material and consumable items, and the associated transport to the manufacturing site. Process energy and water use, direct production waste and emissions to air and water are included. Scenarios have been developed to account for downstream processes such as demolition and waste treatment in accordance with the requirements of EN 15804:2012+A1:2013

All inputs and outputs to the manufacturing plants have been included and made transparent. All assumptions regarding the materials and water balances have also been included.

All hazardous and toxic materials and substances are considered in the inventory even though they are below the cut off criteria

There are excluded processes in the inventory:

- Flows related to human activities such as employee transport and administration activity.

Allocation

Allocation criteria are based on mass.

The allocation of all the air emissions, wastes and energy usage are based on mass (kg). The reason we can use a mass basis is because we use the exact same manufacturing process shown for every product. We only produce glass mineral wool in the Billesholm site using the same process and therefore all the factors can be allocated by a mass basis. The amount of binder varies for different products and is accounted for as well as if different surface layers are used.







A mass balance was conducted for the 2016 production year to ensure that we haven't excluded any materials, emissions and hence potential environmental impacts. Regarding the mass balance, all the raw materials and corresponding production goods and wastes generated were taken into account.

Influence of particular thicknesses









All the results in the table of this EPD refer to an ISOVER Skalmursskiva 32 and ISOVER Takstolsskiva 32 with a 32 mm of thickness for a functional unit of 1 m² with a thermal resistance equals to 1 K·m²·W⁻¹.

Other Environmental impact indicator result based on the same requirements can be provided for other R-values (other thicknesses) for ISOVER Skalmursskiva 32 and ISOVER Takstolsskiva 32 after request.




ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
 Global Warming Potential (GWP) - <i>kg CO2 equiv/FU</i>	7.1E-01	8.1E-02	4.0E-02	0	0	0	0	0	0	0	0	5.8E-03	0	4.8E-03	MND
The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.															
 Ozone Depletion (ODP) <i>kg CFC 11 equiv/FU</i>	4.7E-08	5.9E-08	5.5E-09	0	0	0	0	0	0	0	0	4.2E-09	0	1.6E-09	MND
Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
 Acidification potential (AP) <i>kg SO2 equiv/FU</i>	5.6E-03	3.7E-04	3.0E-04	0	0	0	0	0	0	0	0	2.7E-05	0	3.6E-05	MND
Acid depositions have negative impacts on natural ecosystems and the man-made environment incl, buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.															
 Eutrophication potential (EP) <i>kg (PO4)3- equiv/FU</i>	6.9E-04	8.8E-05	3.9E-05	0	0	0	0	0	0	0	0	6.3E-06	0	6.5E-06	MND
Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.															
 Photochemical ozone creation (POPC) <i>kg Ethene equiv/FU</i>	6.3E-04	5.8E-05	3.5E-05	0	0	0	0	0	0	0	0	4.2E-06	0	1.0E-05	MND
Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.															
 Abiotic depletion potential for non-fossil resources (ADP-elements) - <i>kg Sb equiv/FU</i>	8.4E-07	2.2E-11	4.2E-08	0	0	0	0	0	0	0	0	1.6E-12	0	4.2E-09	MND
 Abiotic depletion potential for fossil resources (ADP-fossil fuels) - <i>MJ/FU</i>	1.4E+01	1.0E+00	7.6E-01	0	0	0	0	0	0	0	0	7.5E-02	0	1.4E-01	MND
Consumption of non-renewable resources, thereby lowering their availability for future generations.															





RESOURCE USE

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
 Use of renewable primary energy excluding renewable primary energy resources used as raw materials - MJ/FU	2.1E+00	5.1E-04	2.1E-01	0	0	0	0	0	0	0	0	3.6E-05	0	3.5E-03	MND
 Use of renewable primary energy used as raw materials MJ/FU	2.1E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) MJ/FU	4.2E+00	5.1E-04	2.1E-01	0	0	0	0	0	0	0	0	3.6E-05	0	3.5E-03	MND
 Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - MJ/FU	2.0E+01	1.0E+00	1.1E+00	0	0	0	0	0	0	0	0	7.5E-02	0	1.4E-01	MND
 Use of non-renewable primary energy used as raw materials MJ/FU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - MJ/FU	2.0E+01	1.0E+00	1.1E+00	0	0	0	0	0	0	0	0	7.5E-02	0	1.4E-01	MND
 Use of secondary material kg/FU	4.8E-01	0	2.4E-02	0	0	0	0	0	0	0	0	0	0	0	MND
 Use of renewable secondary fuels- MJ/FU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
 Use of non-renewable secondary fuels - MJ/FU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
 Use of net fresh water - m3/FU	1.44E-02	9.96E-05	7.32E-04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.14E-06	0.0	1.49E-04	MND

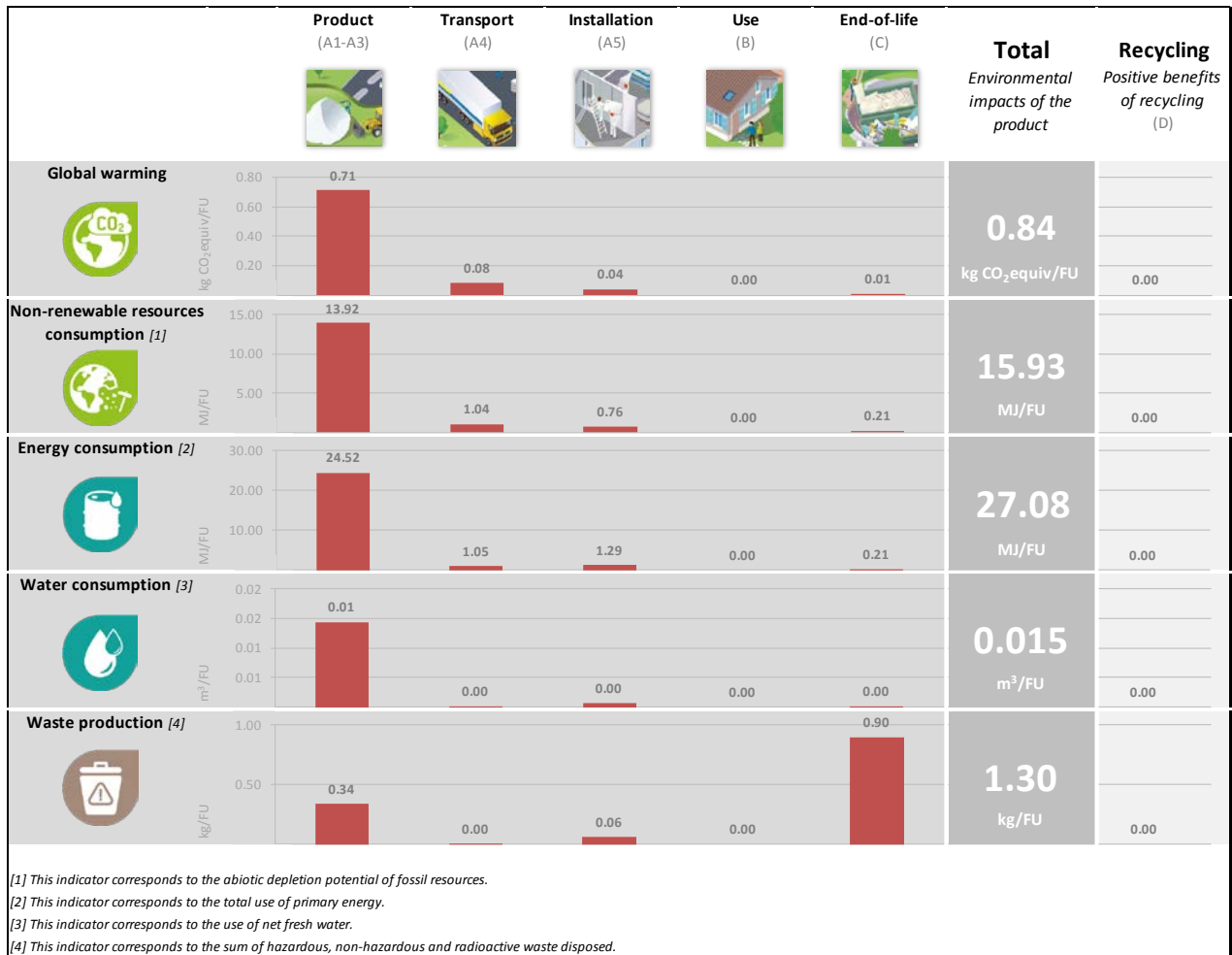
WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
 Hazardous waste disposed <i>kg/FU</i>	3.7E-02	3.2E-05	1.9E-03	0	0	0	0	0	0	0	0	2.3E-06	0	7.0E-05	MND
 Non-hazardous waste disposed <i>kg/FU</i>	3.0E-01	8.6E-05	6.0E-02	0	0	0	0	0	0	0	0	6.2E-06	0	9.0E-01	MND
 Radioactive waste disposed <i>kg/FU</i>	6.1E-05	1.7E-05	4.0E-06	0	0	0	0	0	0	0	0	1.2E-06	0	9.1E-07	MND

OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
 Components for re-use <i>kg/FU</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
 Materials for recycling <i>kg/FU</i>	2.6E-01	0	1.6E-01	0	0	0	0	0	0	0	0	0	0	0	MND
 Materials for energy recovery <i>kg/FU</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
 Exported energy <i>MJ/FU</i>	6.9E-07	0	3.5E-08	0	0	0	0	0	0	0	0	0	0	0	MND

LCA interpretation



Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

Electricity use in production is based on consumption figures for 2014 in Sweden according to IEA 2016 figures.

Emission data is taken from the module in TEAM/DEAM database “_401 Electricity (Sweden, 2014)”.

Data source	Amount	Unit
TEAM/DEAM_401 Electricity (Sweden, 2014)”.	20,29 gram	CO2-eqv/kWh

Indoor environment




The EPD does not give any information on release of regulated dangerous substances to indoor air because the national regulation in Sweden does not require any verification and declaration of release of regulated dangerous substances today.

Dangerous substances

The product contains no substances given from the REACH Candidate list (of 07.07.2017) (REACH registration number 01-2119472313-44-0041)

Bibliography

- *Product-Category Rules. NPCR 12 rev. Insulation materials, epd-norge.no, (2012)*
- *Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)*
- Environmental management - Life cycle assessment – Requirements and guidelines (ISO 14044:2006)
- *Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products (EN 15804:2012)*
- *Sustainability in building construction - Environmental declaration of building products (ISO 21930:2007)*
- LCA report Saint-Gobain ISOVER May 2017 (revised den 5 October 2017)
- Ecoinvent database V3.3 (2016) information about validation, calculation, and update are available via the various reports:
 - o ecoinvent 2.2 translated reports_06_Energy Systems.zip 23 MB 08.08.2016
 - o ecoinvent 3 report_Crop Production.zip 2.2 MB 08.08.2016
 - o ecoinvent 3 report_Refrigerated Transport.pdf 845.2 KB 08.08.2016
 - o ecoinvent 3 report_selected chapters_Energy.zip 293 KB 08.08.2016
 - o ecoinvent 3 report_Transport Default Model_Global.pdf 464.9 KB 08.08.2016
 - o ecoinvent 3 report_Transport Default Model_Switzerland.zip 636.5 KB 08.08.2016
 - o ecoinvent 3.3 open access datasets_PDF documentation.zip
- All these report are available at: <https://v33.ecoquery.ecoinvent.org/File/Reports>
- Ecobilan DEAM database, information about validation, calculation, and update are available via the report:
 - o DEAM™ User's Manual Version 2017 DEAMSTK 5.2.4
This user manual is only available with the license of the tool.
- SS-EN 13172:2012 Thermal Insulation Products – Evaluation of conformity
- SS-EN 13162:2012 Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification

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