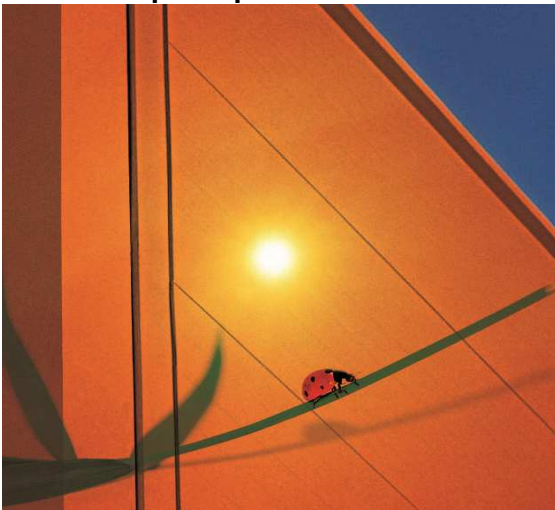




**Paroc fire proof panel AST S 150 mm**



**NEPD nr: 182E**

Approved according to ISO 14025, § 8.1.4

Approved 17.01.2011

Valid until 17.01.2016

*Svein Fossdal*

**Verification**

Independent verification of data and other environmental information has been carried out by Jarle Svnæs, in accordance with ISO14025, § 8.1.3.

*Jarle Svnæs*

**The declaration has been prepared by:**

Kjersti Folvik, SINTEF Byggforsk

*Kjersti Folvik*

**PCR**

NPCR010 Building boards [3]

**About EPD**

EPD from other program operators than The Norwegian EPD Foundation may not be comparable.

**Manufacturer information**

Organization	Paroc Panel System Oy Ab		
Address	FI-21600 Pargas	Tlf	e-mail
Contact person	Dick Karlsson. Development Director	+358468768000	<a href="mailto:dick.karlsson@paroc.com">dick.karlsson@paroc.com</a>
Organisation no.	FI19183492		
ISO 14001/EMAS:	No		

**Product information**

Scope of assessment	cradle to grave
Functional unit (FU)	1m <sup>2</sup> sandwich panel, type AST S with a thickness of 150 mm, installed and maintained, with an expected average service life of 60 years.
Expected service life	All figures in this document refer to 1 functional unit (FU)
Year of study	60 years
Production area	2010, with data collection representing 2008
Expected market area	Finland
Product description	Scandinavia and central and eastern Europe

Paroc fire proof panels is a family of stone wool sandwich panels intended to be used as partitions, ceilings and external wall structures in industrial, commercial, residential, official and office buildings, hospitals, chill stores, clean rooms and in the food industry. The surfaces of the panels are normally coated (SP or PVDF) steel sheets and the core is stone wool (50 - 300 mm) in which the fibers are oriented perpendicularly to the faces. The surfaces are smooth or slightly profiled. The panels can be fastened on a structural frame or on secondary purlins.

**Environmental indicators**

Energy consumption	351 MJ
Global warming	20,5 kg CO <sub>2</sub> -ekv.
Ozone layer depletion potential	3,52E-06 kg R11 eq.
Acidification potential	0,107 kg SO <sub>2</sub> eq.
Eutrophication potential	0,015 kg PO <sub>4</sub> eq.
Photochemical ozone creation potential	0,023 kg C <sub>2</sub> H <sub>4</sub> eq.
Amount of recycled materials	58,8 %
Indoor classification	M1

a	b	
	AST T/AST S	AST F/AST E
237,44	832,07	1174,69
17,269	25,242	35,636
3,50E-06	1,35E-07	1,90E-07
0,0708	0,2715	0,3833
0,0083	0,0492	0,0695
0,0218	0,0089	0,0126

Conversion formula: **a + b \* thickness [m]** for other wool types and thicknesses. The factors a and b are given in the table above.  
NB! The error margin of conversion is ± 10 % (- for 300mm, + for 50m)

**Product specification**

Tabell 1

Composition of final product		Input i LCA*		Weight final product	
Stone wool	kg	12,8	56,6 %	Specific data	12,8 56,6 %
Steel	kg	9,1	40,6 %	Specific data	9,1 40,6 %
Glue	kg	0,6	2,8 %	Generic data	0,6 2,8 %
SUM	kg	22,5	100 %		22,5 100 %

## Resource consumption

### Material resources

Table 2

Material resources	Raw materia	Production	Building site	Use stage	Demolition	Transport	Total
<b>New, renewable resources</b>							
Water (fresh) [kg]	kg	102,108	2,699	0,435	55,884	0,435	161,638
Air [kg]	kg	1,789	2,924	0,771	0,079	0,771	6,400
Other [kg]	kg	0,184	0,001	0,005	0,551	0,005	0,747
<b>New, non-renewable resources</b>							
Inert rock [kg]	kg	17,247	0,295	0,237	0,006	0,237	18,052
Crude oil [kg]	kg	4,518	0,390	0,003	0,068	0,003	5,236
Natural gas [kg]	kg	0,526	0,098	0,009	0,069	0,009	0,725
Zinc [kg]	kg	0,549	0,091	8,93E-07	1,08E-04	8,93E-07	0,641
Limestone [kg]	kg	0,565	0,013	0,003	0,021	0,003	0,606
Sodium chloride (rock salt) [kg]	kg	0,378	0,073	6,70E-06	0,037	6,70E-06	0,487
Hard coal [kg]	kg	0,153	0,029	0,020	0,055	0,020	0,278
Soil [kg]	kg	0,125	0,013	0,001	1,50E-05	0,001	0,141
Lignite [kg]	kg	0,025	0,023	0,003	0,058	0,003	0,112
Peat [kg]	kg	0,004	6,97E-05	0,009	1,01E-04	0,009	0,022
Iron [kg]	kg	0,002	4,33E-04	5,06E-05	0,013	5,06E-05	0,016
Clay [kg]	kg	0,002	6,42E-04	5,38E-05	0,011	5,38E-05	0,015
Quartz sand [kg]	kg	0,007	1,59E-04	1,28E-05	1,30E-07	1,28E-05	0,008
Other (ore without minerals and heavy spar) [kg]	kg	0,006	9,88E-04	1,72E-04	4,59E-06	1,72E-04	0,007
Heavy spar [kg]	kg	0,001	9,99E-04	5,22E-05	5,32E-07	5,22E-05	0,003
Potassium chloride [kg]	kg	0,002	6,76E-09	4,77E-10	4,86E-12	4,77E-10	0,002
Gypsum [kg]	kg	0,001	2,08E-04	3,24E-05	5,58E-07	3,24E-05	0,002
Sulphur [kg]	kg	0,001	6,90E-05	1,24E-10	1,54E-06	1,24E-10	0,001
Nickel [kg]	kg	5,53E-06	9,89E-07	1,02E-07	6,68E-04	1,02E-07	6,75E-04
Phosphorus [kg]	kg	1,76E-04	5,70E-09	5,74E-10	3,39E-04	5,74E-10	5,15E-04
Unspecified [kg]	kg	0,825	0,114	0,010	0,138	0,010	1,097
<b>Feedstock energy, renewable resources [MJ]</b>							
<b>Feedstock energy, non-renewable resources [MJ]</b>							48,67

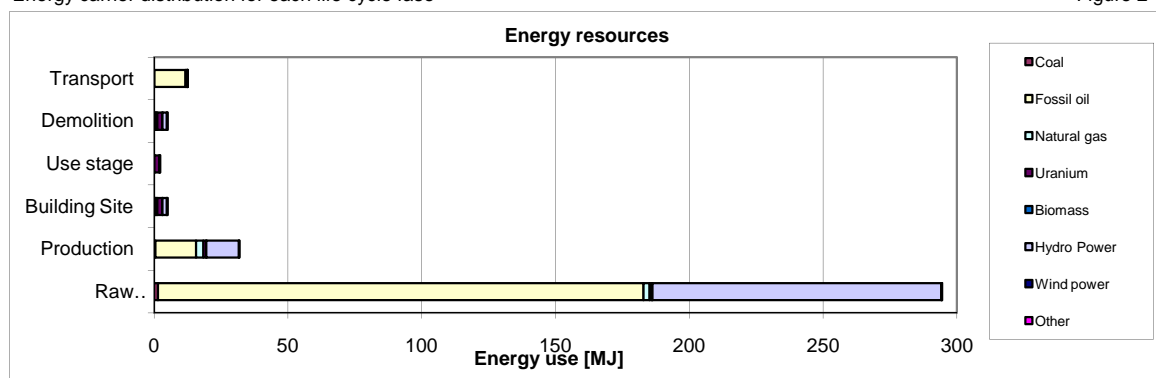
### Land use and water resources

Land use has not been quantified. Water consumption is included in Table 2.

### Energy resources

Energy carrier distribution for each life cycle fase

Figure 2



Energy consumption specified for the different energy carrier and life cycle stages

Table 3

	Unit	Raw materia	Production	Building Site	Use stage	Demolition	Transport	Total
<b>Fossil energy</b>								
Coal	MJ	1,354	0,426	0,558	0,057	0,558	0,043	2,995
Fossil oil	MJ	181,536	15,236	0,147	0,015	0,147	11,611	208,692
Natural gas	MJ	2,248	2,703	0,452	0,046	0,452	0,664	6,563
Uranium	MJ	0,819	1,069	1,962	1,782	1,962	0,062	7,656
<b>Renewable energy</b>								
Biomass	MJ	0,266	0,041	3,94E-05	6,62E-06	3,94E-05	3,07E-06	0,307
Hydro Power	MJ	108,000	12,202	1,588	0,162	1,588	0,014	123,554
Wind power	MJ	0,021	0,020	0,086	0,009	0,086	0,001	0,223
Other	MJ	0,146	0,005	0,188	0,019	0,188	0,001	0,546
<b>Total</b>	MJ							<b>350,54</b>

## Emissions and environmental impacts

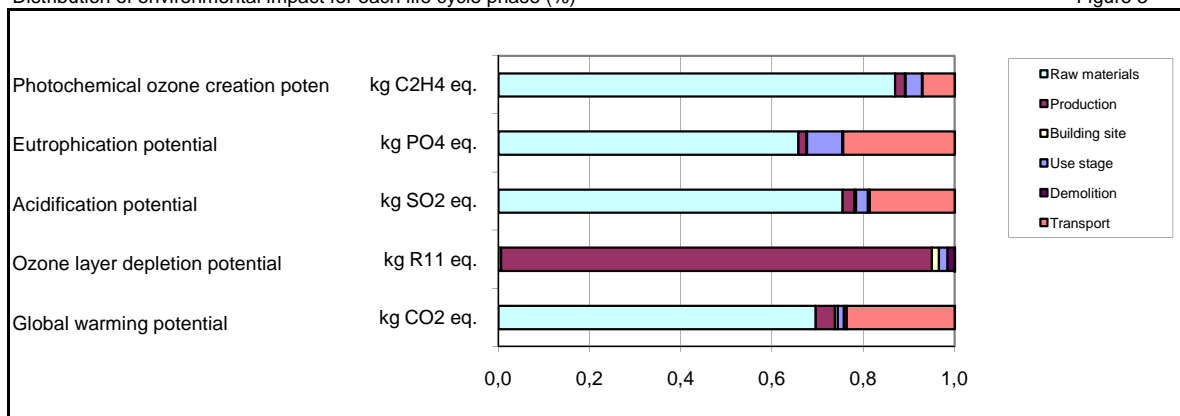
### Environmental impacts

Table 4

Indicator	Unit	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Global warming potential	kg CO <sub>2</sub> eq.	14,243	0,869	0,125	0,278	0,125	4,845	20,463
Ozone layer depletion potential	kg R11 eq.	2,12E-08	3,32E-06	5,29E-08	6,72E-08	5,29E-08	1,67E-09	3,52E-06
Acidification potential	kg SO <sub>2</sub> eq.	0,081	0,003	3,93E-04	0,003	3,93E-04	0,020	0,107
Eutrophication potential	kg PO <sub>4</sub> eq.	0,010	2,52E-04	3,09E-05	0,001	3,09E-05	0,004	0,015
Photochemical ozone creation pote	kg C <sub>2</sub> H <sub>4</sub> eq.	0,020	5,03E-04	2,65E-05	8,15E-04	2,65E-05	0,002	0,023

Distribution of environmental impact for each life cycle phase (%)

Figure 3



### Emissions and waste

Table 5

	Unit	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
<b>Emissions to air</b>								
NH <sub>3</sub>	g	17,564	0,004	7,73E-04	0,313	7,73E-04	0,029	17,912
CO <sub>2</sub>	g	13738,772	757,581	137,841	425,891	137,841	4791,645	19966,360
CO	g	79,945	0,307	0,111	5,451	0,111	6,956	92,882
HCl	g	0,038	0,015	0,004	0,024	0,004	0,001	0,086
Hg	g	5,34E-05	3,21E-05	1,01E-06	1,19E-04	1,01E-06	8,11E-07	2,07E-04
CH <sub>4</sub>	g	21,682	2,541	0,245	1,419	0,245	0,862	26,994
N <sub>2</sub> O	g	0,188	0,010	0,003	0,128	0,003	0,106	0,437
NOx	g	19,003	1,575	0,212	1,342	0,212	27,572	49,917
NM VOC	g	9,127	1,047	0,017	1,447	0,017	1,755	13,410
Particles	g	31,127	0,123	0,027	0,600	0,027	1,213	33,117
Pb	g	1,08E-04	6,70E-05	2,45E-05	4,28E-04	2,45E-05	1,31E-05	6,65E-04
SO <sub>2</sub>	g	34,095	1,686	0,214	1,206	0,214	0,544	37,960
<b>Emissions to water</b>								
BOD	g	0,210	0,085	8,51E-05	2,882	8,51E-05	0,001	3,179
COD	g	3,002	0,355	0,028	8,367	0,028	0,034	11,814
N	g	1,871	0,009	0,004	2,892	0,004	9,87E-04	4,781
P	g	0,200	4,40E-04	3,22E-05	0,041	3,22E-05	3,13E-04	0,241
<b>Waste</b>								
Waste to landfill	kg	6,575	1,477	0,256	0,024	12,989	0,031	-
Hazardous waste	kg	6,575	1,477	0,256	0,024	0,239	0,031	8,602

## Waste treatment of final product

Paroc fire proof panels will be sorted as mixed waste on the demolition site. The product shall be delivered to an authorized waste treatment plant where it can be material - recovered and deposited. It is estimated that 40 weight % (steel) of the element can be material recovered and 60 weight % (stone wool) must be deposited.

There is an existing possibility for recycling of stone wool, either direct reuse or material recycling to furnace. However, only marginal amounts of stone wool is collected and material-recovered today.

## Use of chemicals

Use of chemicals in the production process and in the final product is assessed according to guidelines for environmental information in SINTEF Technical Approval [6] and the methodology document for EcoProduct [7].

All priority substances according to list of priority substances [8] and REACH candidate list [9] are declared regardless of concentration.

In addition, substances giving EcoProduct score Red (bad or unacceptable) or White (average) are also declared.

### Chemicals in production process:

No hazardous substances according to list of priority substances [8] and REACH [9] are used in the production processes. The following substances are listed according to methodology in EcoProduct[7]:

Betegnelse	CAS	Amount [g]	Weight %	Process	Grouping according to EcoProduct
Methylene chloride	75-09-02	60,27	0,00659	Panel produksjon	1 CMR - effects
4,4'-Methylenediphenyl diisocyanate (MDI)	9016-87-9	105,1	0,01150	Adhesive produksjon	4 Allergenic

### Chemicals in final product

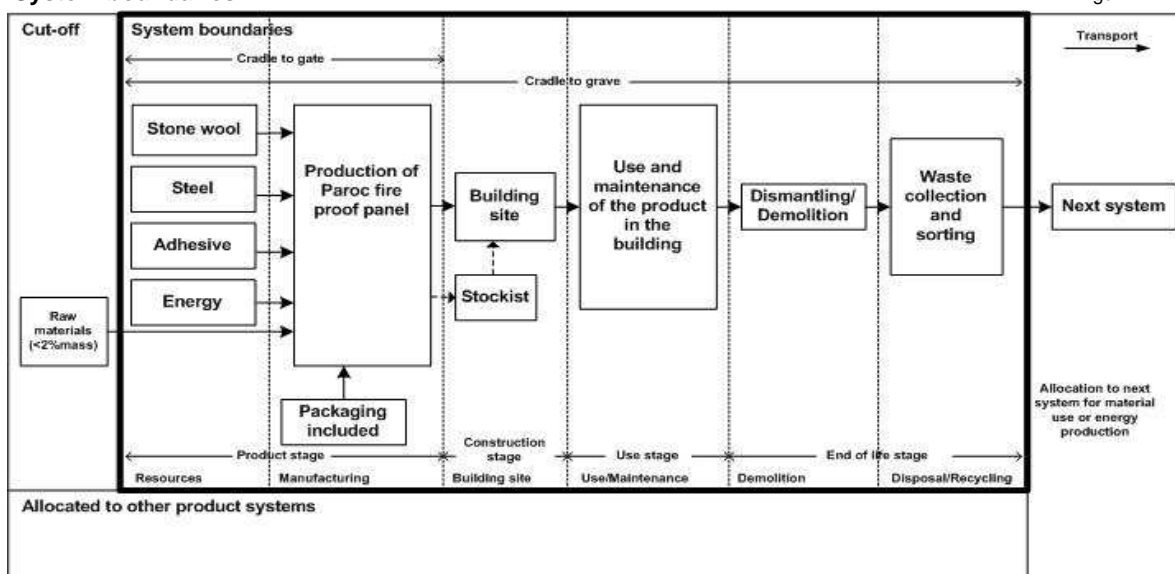
The product contains no hazardous substances with priority in quantities that pose any risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

The product has indoor air classification M1 and is not regarded as emitting any particles, gases or radiation that have a perceptible impact on the indoor climate, or that have any significant impact on

## Methodology

### System boundaries

Figur 4



## References

- [1] NS-ISO 14025:2006, Miljømerker og deklarasjoner - Miljødeklarasjoner type III - Prinsipper og prosedyrer
- [2] ISO 21930:2007, Sustainability in building construction - Environmental declaration of building products
- [3] PCR NPCR10 - Product category rules for preparing an environmental product declaration of Building boards
- [4] Sintef Byggforsk (2010): "Environmental Product Declaration (EPD) of Paroc Fire Proof panels", LCA-report
- [5] EN 15251:2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics
- [6] SINTEF Byggforsk 2010 - Information regarding declaration of environmental characteristics in SINTEF Technical Approval
- [7] Strand-Hanssen 2008 - EcoProduct: Metodebeskrivelse 2.0, SINTEF Byggforsk oppdragsrapport
- [8] List of priority substances (translation of a) in English). Climate and pollution agency. Updated 20.09.2010. <http://www.miljostatus.no/Tema/Kjemikalier/Kjemikalielister/Prioritetslisten/>
- [9] Candidate List of Substances of Very High Concern for authorisation, [http://echa.europa.eu/chem\\_data/authorisation\\_process/candidate\\_list\\_table\\_en.asp](http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp)