ENVIRONMENTAL and HEALTH DECLARATION

ASPER *French standard NF P 01-010*

Fermacell 12.5 mm gypsum fibreboards

February 2014

This declaration is submitted in accordance with the specimen Environmental and Health Declaration approved by the "AIMCC" Building Materials Association (FDE&S Version 2005)

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INTRODUCTION

The framework used for submission of the environmental and health declaration concerning the Fermacell 12.5 mm gypsum fibreboard is the Environmental and Health Declaration produced by the "AIMCC" Building Materials Association (FDE&S Version 2005).

This document constitutes a suitable framework for presenting the environmental and health characteristics of building materials as per the French standard NF P 01-010, and for providing comments and additional useful information in due observance of the spirit of the standard in all sincerity and transparency (French standard NF P 01-010 § 4.2).

This document was produced by PE INTERNATIONAL.

Data producer (*NF P 01-010 § 4*).

The information in this declaration is supplied on the responsibility of Fermacell as per *NF P 01-010 § 4.6*.

Contact:
Philippe Rémy – philippe.rémy@xella.com
Julien Lepers – julien.lepers@xella.com

Fermacell SAS
30 rue de l'industrie
92563 Rueil Malmaison Cedex

READER'S GUIDE

Some remarks concerning the format of the data displayed
Scientific notation: - 4.2 E-06 = - 4.2 x 10^{-6}
For the sake of transparency, all Life Cycle Inventory (LCI) tables have been kept and are displayed in black or in grey: for each flow, values substantiating the "total" column by at least 99.9% are shown in black. Otherwise, they are shown in grey.

Acronyms used:
TLS: Typical Lifespan
FU: Functional Unit
LCA: Life Cycle Analysis
LCI: Life Cycle Inventory
CML: Centrum voor Milieukunde, Leiden University, Netherlands

1 Characterisation of the product as per NF P 01-010 § 4.3

1.1 Definition of the Functional Unit (FU)

2 The functional unit is 1 m² of gypsum fibreboard 12.5 mm thick. It is assumed the board is fitted to a typical partition with suitable additives.

Total lifespan is 50 years.
No site maintenance or upkeep is required during the utilisation phase.

1.2 Masses and basic data to calculate the functional unit (FU)

Quantity of the product, packaging for distribution and additional products in the functional unit on the basis of a Typical Lifespan (TLS) of 50 years:

Product: 1 m² of gypsum fibreboard with a mass per surface unit of 14.5 kg/m²

Packaging for distribution: wooden pallets and plastic wrapping film

Additional fitting products: adhesive and screws

Material loss when board is fitted: 5%

Reference flows for 1 m^2	
Per annuity	For the entire Typical Lifespan
Product: 0.021 m^2 of gypsum fibreboard (0.30 kg)	Product: 10.5 m^2 of gypsum fibreboard (15.26 kg)
Packaging for distribution (type and quantity): Wooden pallets: 4.02 g Plastic wrapping film: 0.14 g	Packaging for distribution (type and quantity): Wooden pallets: 201 g Plastic wrapping film: 6.9 g
Additional fitting products (type and quantity): Adhesive: 0.4 g Screws: 0.2 units (0.4 g)	Additional fitting products (type and quantity): Adhesive: 20 g/m^2 Screws: 10 units/m^2 (20 g)
Total weight of the reference flow after fitting: 0.29 kg (plaster-fibre composite board fitted, including adhesive and screws)	Total weight of the reference flow after fitting: 14.54 kg (plaster-fibre composite board fitted, including adhesive and screws)

These data were supplied by Fermacell experts.

1.3 Useful technical characteristics not included in the definition of the functional unit

Construction panels for universal fitting to partitions, linings and ceilings.
Fire resistance rating as per EN 13501-1: A2-s1-d0
Shock resistance rating as per EN 15283-1: GF-I board ("HD" - extra strength)
Heat conductivity: 0.32 W/m℃
Applicable in areas with a humidity classification of Eb+p

2 Inventory data and other data as per NF P 01-010 § 5 and comments on the product's effects on the environment and health as per NF P 01-010 § 4.7.2

The life cycle inventory data set out below were calculated for the functional unit defined in 1.1 and 1.2

A reader's guide to the tables is provided on page 4.

2.1 Consumption of natural resources (*NF P 01-010 § 5.1*)

2.1.1 Consumption of natural energy resources and energy indicators (*NF P 01-010 § 5.1.1*)

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**For the entire Typical Lifespan**
Consumption of natural energy resources								
Wood	kg	5.64E-13	7.26E-16	3.98E-15	0	4.40E-17	5.69E-13	2.85E-11
Coal	kg	1.42E-02	3.98E-05	4.30E-04	0	2.05E-04	1.49E-02	7.45E-01
Lignite	kg	2.35E-02	4.42E-04	5.22E-04	0	3.52E-04	2.48E-02	1.24E+00
Natural gas	kg	4.13E-02	7.23E-05	3.02E-04	0	2.07E-04	4.19E-02	2.09E+00
Oil	kg	3.54E-03	5.60E-03	3.99E-04	0	1.13E-03	1.07E-02	5.33E-01
Uranium (U)	kg	1.01E-06	2.01E-09	8.33E-09	0	5.70E-09	1.03E-06	5.14E-05
Energy indicators								
Total primary energy	MJ	3.54E-01	1.54E-02	2.90E-03	0	4.88E-03	3.77E-01	1.89E+01
Renewable energy	MJ	2.51E+00	2.59E-01	5.84E-02	0	7.38E-02	2.90E+00	1.45E+02
Non-renewable energy	MJ	2.86E+00	2.75E-01	6.13E-02	0	7.87E-02	3.27E+00	1.64E+02
Process energy	MJ	2.45E+00	2.75E-01	6.13E-02	0	7.87E-02	2.87E+00	1.43E+02
Matter energy	MJ	4.26E-01	0	0	0	0	4.06E-01	2.03E+01
Electricity	kWh	1.78E-01	0	0	0	0	1.78E-01	8.89E+00

Comments on consumption of natural energy resources and energy indicators:

Natural energy resources are consumed mainly during the production phase. The effects of the phases of deployment, of deployment lifespan, end of lifespan and transport are negligible in comparison to the production phase.

During factory production, the manufacturing process uses natural gas directly in addition to electricity.

Coal, lignite, a portion of the oil and a portion of natural gas are used to produce energy (electricity) and the consumables. Production of plasterboard does not directly consume any coal, lignite or oil.

Total primary energy consumption is 88.5% influenced by consumption of non-renewable forms of energy. The other 11.5% is accounted for by renewable forms of energy.

2.1.2 Consumption of natural non-energy resources (*NF P 01-010 § 5.1.2*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**For the entire Typical Lifespan**
Antimony (Sb)	kg	2.64E-11	3.97E-14	3.97E-14	0	8.04E-14	2.67E-11	1.34E-09
Silver (Ag)	kg	3.69E-10	2.68E-11	3.59E-09	0	4.37E-12	3.99E-09	2.00E-07
Clay	kg	3.36E-05	1.87E-06	4.87E-04	0	9.73E-03	1.03E-02	5.13E-01
Arsenic (As)	kg	0	0	0	0	0	0	0
Bauxite (Al_2O_3)	kg	8.76E-06	6.65E-08	2.18E-07	0	1.96E-07	9.24E-06	4.62E-04
Bentonite	kg	3.76E-05	7.01E-06	1.08E-06	0	1.86E-06	4.76E-05	2.38E-03
Bismuth (Bi)	kg	0	0	0	0	0	0	0
Boron (B)	kg	0	0	0	0	0	0	0
Cadmium (Cd)	kg	0	0	0	0	0	0	0
Limestone	kg	2.47E-03	8.88E-05	2.25E-04	0	3.48E-04	3.13E-03	1.57E-01
Sodium carbonate (Na_2CO_3)	kg	0	0	0	0	0	0	0
Potassium chloride (KCl)	kg	3.40E-12	1.92E-13	1.95E-13	0	2.77E-12	6.56E-12	3.28E-10
Sodium chloride (NaCl)	kg	4.93E-05	9.51E-06	3.28E-04	0	6.16E-05	4.48E-04	2.24E-02
Chromium (Cr)	kg	9.28E-06	1.78E-08	7.93E-08	0	2.65E-08	9.40E-06	4.70E-04
Cobalt (Co)	kg	2.81E-11	4.56E-14	2.14E-13	0	1.17E-13	2.85E-11	1.43E-09
Copper (Cu)	kg	5.12E-06	1.37E-08	6.95E-07	0	1.80E-08	5.85E-06	2.92E-04
Dolomite	kg	3.42E-06	2.94E-09	2.87E-08	0	1.02E-08	3.46E-06	1.73E-04
Tin (Sn)	kg	3.14E-12	4.14E-15	2.23E-14	0	1.50E-15	3.17E-12	1.59E-10
Feldspar	kg	1.00E-21	5.14E-24	1.06E-23	0	5.69E-23	1.08E-21	5.38E-20
Iron (Fe)	kg	2.21E-06	4.45E-06	5.04E-04	0	1.85E-04	6.96E-04	3.48E-02
Fluorite (CaF_2)	kg	1.27E-06	5.87E-08	1.12E-08	0	1.12E-08	1.35E-06	6.74E-05
Gravel/sand	kg	7.22E-04	3.10E-06	2.66E-04	0.00E+00	8.45E-03	9.45E-03	4.72E-01
Gypsum (natural)	kg	7.49E-02	2.58E-07	7.40E-08	0.00E+00	8.34E-08	7.49E-02	3.75E+00
Lithium (Li)	kg	0	0	0	0	0	0	0
Kaolin (Al_2O_3, $2SiO_2$,$2H_2O$)	kg	1.24E-06	9.95E-08	4.95E-08	0	6.64E-07	2.06E-06	1.03E-04

Magnesium (Mg)	kg	2.80E-05	1.82E-07	1.85E-06	0	1.89E-06	3.19E-05	1.60E-03
Manganese (Mn)	kg	2.72E-06	9.23E-08	5.27E-06	0	3.16E-07	8.40E-06	4.20E-04
Mercury (Hg)	kg	5.95E-17	9.52E-19	1.21E-18	0	1.29E-17	7.45E-17	3.73E-15
Molybdenum (Mo)	kg	6.13E-08	1.22E-10	5.46E-10	0	1.55E-10	6.21E-08	3.11E-06
Nickel (Ni)	kg	-3.20E-07	-5.42E-10	-2.59E-09	0	-1.17E-09	-3.24E-07	-1.62E-05
Gold (Au)	kg	5.74E-11	9.02E-14	4.06E-13	0	2.96E-13	5.82E-11	2.91E-09
Palladium (Pd)	kg	9.22E-13	1.49E-15	7.02E-15	0	3.85E-15	9.34E-13	4.67E-11
Platinum (Pt)	kg	1.56E-12	2.53E-15	1.19E-14	0	6.52E-15	1.58E-12	7.92E-11
Lead (Pb)	kg	6.49E-07	8.55E-08	1.12E-05	0	2.08E-08	1.20E-05	5.98E-04
Rhodium (Rh)	kg	1.56E-13	2.53E-16	1.19E-15	0	6.52E-16	1.58E-13	7.92E-12
Rutile (TiO_2)	kg	1.61E-08	1.21E-09	2.30E-09	0	2.94E-09	2.25E-08	1.13E-06
Silica (SiO_2)	kg	8.20E-05	1.85E-06	3.61E-04	0	6.77E-03	7.21E-03	3.61E-01
Sulphur (S)	kg	3.44E-12	4.81E-14	6.41E-14	0	6.43E-13	4.19E-12	2.10E-10
Barium sulphate (Ba SO_4)	kg	7.78E-10	9.00E-11	2.53E-09	0	7.58E-10	4.16E-09	2.08E-07
Barium sulphate (Ba SO_4)	kg	1.01E-09	3.74E-12	1.56E-11	0	1.02E-11	1.04E-09	5.21E-08
Tungsten (W)	kg	0	0	0	0	0	0	0
Vanadium (V)	kg	4.33E-09	5.57E-12	3.05E-11	0	3.37E-13	4.36E-09	2.18E-07
Zinc (Zn)	kg	1.15E-07	2.81E-08	3.75E-06	0	5.34E-09	3.90E-06	1.95E-04
Zirconium (Zr)	kg	1.72E-20	0	0	0	0	1.72E-20	8.62E-19
Raw plant materials not already specified	kg	0	0	0	0	0	0	0
Raw animal materials not already specified	kg	0	0	0	0	0	0	0
Intermediate products not reported (total)	kg	0	0	0	0	0	0	0

Comments on consumption of natural non-energy resources:

The process to manufacture plaster-fibre composite boards uses both natural gypsum and gypsum from coal plants (see chapter 2.1.4 addressing unspecified materials recovered = desulphogypsum).

These amounts are, however, relatively small, and do not make a large contribution to the depletion of natural resources.

2.1.3 Consumption of water (samples) (*NF P 01-010 § 5.1.3*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Water: lakes	Litre	3.14E+00	0.013	9.62E-02	0	4.49E-02	3.31E+00	1.65E+02
Water: sea	Litre	1.33E-02	0.00155	6.10E-04	0	1.19E-03	2.06E-02	1.03E+00
Water: water table	Litre	5.21E-01	0.00339	2.30E-02	0	6.34E-02	6.27E-01	3.13E+01
Water: origin unspecified	Litre	6.20E-03	0	0	0	0	6.20E-03	3.10E-01
Water: rivers	Litre	2.80E+02	0.199	2.49E+00	0	2.49E+00	2.86E+02	1.43E+04
Drinking water (network)	Litre	0	0	0	0	0	0	0
Water consumed (total)	Litre	2.56E+00	0.0436	7.43E-02	0	3.45E-01	3.39E+00	1.70E+02

Comments on water consumption (samples):

Total water consumption over the entire Typical Lifespan equals 170 litres, chiefly used during the production phase (75%).

2.1.4 Consumption of recovered materials and energy (*NF P 01-010 § 5.1.4*)

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Energy recovered	MJ	4.36E-04	2.21E-05	0	0	3.37E-04	7.05E-04	3.53E-02
Materials recovered: total	kg	1.93E-01	0	4.74E-05	0	0	1.93E-01	9.66E+00
Materials recovered: steel	kg	0	0	4.74E-05	0	0	4.74E-05	2.37E-03
Materials recovered: aluminium	kg	0	0	0	0	0	0	0

Materials recovered: metal (unspecified)	kg	0	0	0	0	0	0	0
Materials recovered: paper/cardboard	kg	4.91E-02	0	0	0	0	4.91E-02	2.45E+00
Materials recovered: plastic	kg	0	0	0	0	0	0	0
Materials recovered: cullet	kg	0	0	0	0	0	0	0
Materials recovered: biomass	kg	0	0	0	0	0	0	0
Materials recovered: minerals	kg	0	0	0	0	0	0	0
Materials recovered: desulphogypsum	kg	1.44E-01	0	0	0	0	1.44E-01	7.20E+00

Comments on consumption of energy and materials recovered:

The energy recovered is from secondary fuels chiefly used to produce raw materials.

The main material recovered that is used to manufacture plasterboard is desulphogypsum, accounting for 7.20 kg over the entire Typical Lifespan.
Waste paper fibres are also used in the manufacturing process. During the deployment phase, screws are used to fasten plaster-fibre composite boards. Small quantities of scrap metal are used to manufacture the screws.

2.2 Emissions into air, water and the ground (*NF P 01-010 § 5.2*)

2.2.1 Emissions into the air (*NF P 01-010 § 5.2.1*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Hydrocarbons (unspecified)	g	1.69E-02	2.58E-03	4.82E-04	0	7.29E-04	2.07E-02	1.03E+00
Hydrocarbons (unspecified, except methane)	g	6.89E-03	2.26E-03	1.09E-03	0	2.64E-03	1.29E-02	6.44E-01
PAH[a] (unspecified)	g	1.59E-06	7.88E-08	3.10E-08	0	4.24E-08	1.75E-06	8.73E-05
Methane (CH_4)	g	3.10E-01	1.75E-02	6.76E-03	0	8.18E-03	3.42E-01	1.71E+01
Volatile organic compounds (for example, acetone, acetate etc.)	g	7.09E-03	2.26E-03	1.10E-03	0	2.64E-03	1.31E-02	6.54E-01
Carbon dioxide (CO_2)	g	1.08E+02	1.86E+01	3.39E+00	0	5.01E+00.	1.35E+02	6.76E+03

Carbon monoxide (CO)	g	7.25E-02	1.72E-02	1.19E-02	0	1.57E-02	1.17E-01	5.86E+00
Oxides of nitrogen (N0x in NO_2)	g	1.58E-01	9.96E-02	6.34E-03	0	2.84E-02	2.92E-01	1.46E+01
Nitrogen protoxide (N_2O)	g	5.40E-03	7.60E-04	3.38E-04	0	1.11E-04	6.61E-03	3.30E-01
Ammonia (NH3)	g	3.17E-03	3.43E-03	1.72E-04	0	3.32E-04	7.10E-03	3.55E-01
Dust (unspecified)	g	5.79E-02	1.02E-03	3.77E-03	0	5.80E-02	1.21E-01	6.04E+00
Oxides of sulphur (S0x in SO_2)	g	1.29E-01	8.21E-03	4.45E-03	0	1.18E-02	1.53E-01	7.67E+00
Hydrogen sulphide (H_2S)	g	8.20E-03	4.30E-05	7.06E-05	0	4.01E-05	8.35E-03	4.18E-01
Hydrocyanic acid (HCN)	g	4.65E-09	1.18E-10	7.84E-09	0	6.42E-10	1.33E-08	6.63E-07
Phosphoric acid (H_3PO_4)	g	0	0	0	0	0	0	0
Organic chlorinated compounds (in Cl)	g	2.21E-08	6.99E-10	1.30E-09	0	3.93E-09	2.80E-08	1.40E-06
Hydrochloric acid (HCl)	g	5.55E-03	2.15E-05	1.36E-04	0	1.04E-04	5.81E-03	2.91E-01
Inorganic chlorinated compounds (in Cl)	g	2.37E-05	5.88E-06	1.74E-05	0	1.47E-05	6.17E-05	3.08E-03
Unspecified chlorinated compounds (in Cl)	g	0	0	0	0	0	0	0
Organic fluorated compounds (in F)	g	3.20E-07	7.48E-10	4.94E-09	0	2.79E-09	3.28E-07	1.64E-05
Inorganic fluorated compounds (in F)	g	3.51E-04	4.72E-06	4.35E-06	0	4.51E-06	3.65E-04	1.82E-02
Halogenated compounds (unspecified)	g	4.85E-05	1.62E-07	4.28E-07	0	2.77E-07	4.94E-05	2.47E-03
Unspecified fluorated compounds (in F)	g	0	0	0	0	0	0	0
Metals (unspecified)	g	3.44E-05	8.21E-07	3.23E-05	0	2.12E-06	6.96E-05	3.48E-03
Alkaline and alkaline earth metals, unspecified, non-toxic	g	0	0	0	0	0	0	0
Antimony and its compounds (in Sb)	g	4.83E-07	3.22E-09	8.67E-07	0	4.72E-09	1.36E-06	6.79E-05
Arsenic and its compounds (in As)	g	3.00E-06	3.21E-08	2.13E-07	0	7.98E-08	3.33E-06	1.66E-04
Cadmium and its compounds (in Cd)	g	3.67E-07	1.81E-08	1.39E-08	0	9.26E-08	4.92E-07	2.46E-05

Chromium and its compounds (in Cr)	g	2.18E-06	8.13E-08	1.31E-06	0	1.54E-07	3.72E-06	1.86E-04
Hexavalent chromium (in Cr)	g	2.52E-13	2.65E-15	3.01E-13	0	7.81E-16	5.56E-13	2.78E-11
Cobalt and its compounds (in Co)	g	4.90E-07	3.29E-08	2.11E-08	0	1.37E-08	5.57E-07	2.79E-05
Copper and its compounds (in Cu)	g	3.44E-06	8.51E-08	1.52E-06	0	1.51E-07	5.19E-06	2.59E-04
Tin and its compounds (in Sn)	g	4.20E-06	4.32E-08	7.71E-08	0	3.38E-08	4.35E-06	2.18E-04
Manganese and its compounds (in Mn)	g	2.52E-05	4.42E-07	4.43E-05	0	2.68E-06	7.26E-05	3.63E-03
Mercury and its compounds (in Hg)	g	3.35E-06	4.76E-07	1.94E-07	0	3.16E-06	7.19E-06	3.59E-04
Nickel and its compounds (in Ni)	g	2.63E-06	3.62E-07	1.84E-07	0	2.11E-07	3.38E-06	1.69E-04
Lead and its compounds (in Pb)	g	1.79E-05	3.65E-07	2.25E-05	0	1.46E-06	4.22E-05	2.11E-03
Selenium and its compounds (in Se)	g	1.22E-05	6.51E-08	1.35E-07	0	7.47E-08	1.25E-05	6.24E-04
Tellurium and its compounds (in Te)	g	4.54E-10	2.30E-11	-1.05E-10	0	1.23E-10	4.96E-10	2.48E-08
Zinc and its compounds (in Zn)	g	3.58E-05	2.03E-07	7.01E-07	0	2.58E-07	3.70E-05	1.85E-03
Vanadium and its compounds (in V)	g	3.31E-06	1.01E-06	2.87E-07	0	3.55E-07	4.96E-06	2.48E-04
Silicon and its compounds (in Si)	g	1.66E-08	2.42E-11	1.19E-10	0	4.32E-11	1.68E-08	8.38E-07
[a] PAH: Polycyclic Aromatic Hydrocarbons								

NB: With regard to radioactive emissions, this table must be completed as soon as transposition of the EU Euratom directive on radioactive emissions has been published.

Comments on emissions into the air:

Air emissions are primarily carbon dioxide (CO_2), which account for 99% of the total. CO_2 emissions are mostly produced during the manufacturing phase (80%) and the transport phase (4%).

CO_2 emissions and other emissions into the air are mainly caused by upstream processes in the electricity production chain, particularly the combustion of energy carriers for the production of electricity.

2.2.2 Emissions into water (*NF P 01-010 § 5.2.2*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
COD (Chemical Oxygen Demand)	g	2.92E-02	5.52E-04	5.30E-04	0	1.31E-03	3.16E-02	1.58E+00
BOD5 (5-day Biochemical Oxygen Demand)	g	8.58E-04	3.03E-05	1.05E-04	0	5.09E-04	1.50E-03	7.51E-02
Materials in suspension	g	4.42E-10	5.88E-13	3.13E-12	0	3.20E-13	4.46E-10	2.23E-08
Cyanide (CN-)	g	4.76E-07	3.01E-08	4.79E-07	0	1.40E-07	1.13E-06	5.63E-05
AOX (adsorbable organic halogen compounds)	g	7.07E-05	2.72E-06	2.11E-05	0	2.85E-05	1.23E-04	6.15E-03
Hydrocarbons (unspecified)	g	3.15E-05	3.20E-05	1.63E-05	0	6.37E-06	8.61E-05	4.31E-03
Nitrogenous compounds (in N)	g	8.12E-03	1.79E-03	1.97E-04	0	4.92E-04	1.06E-02	5.30E-01
Phosphorated compounds (in P)	g	1.50E-04	2.81E-05	1.52E-05	0	7.55E-05	2.68E-04	1.34E-02
Organic fluorated compounds (in F)	g	0	0	0	0	0	0	0
Inorganic fluorated compounds (in F)	g	1.51E-01	2.59E-04	1.15E-03	0	7.86E-04	1.53E-01	7.66E+00
Unspecified fluorated compounds (in F)	g	0	0	0	0	0	0	0
Organic chlorinated compounds (in Cl)	g	7.07E-05	2.72E-06	2.11E-05	0	2.85E-05	1.23E-04	6.15E-03
Inorganic chlorinated compounds (in Cl)	g	6.99E-01	2.27E-01	4.56E-02	0	5.23E-02	1.02E+00	5.12E+01
Unspecified chlorinated compounds (in Cl)	g	0	0	0	0	0	0	0
PAH (unspecified)	g	1.08E-08	2.73E-09	5.47E-10	0	1.14E-09	1.52E-08	7.62E-07
Metals (unspecified)	g	1.09E-03	7.97E-05	4.04E-05	0	4.39E-04	1.65E-03	8.26E-02
Aluminium and its compounds (in Al)	g	6.10E-04	2.41E-06	6.96E-06	0	4.58E-06	6.24E-04	3.12E-02

Arsenic and its compounds (in As)	g	8.81E-06	5.19E-06	4.91E-07	0	1.13E-06	1.56E-05	7.81E-04
Cadmium and its compounds (in Cd)	g	2.12E-06	2.24E-06	1.96E-07	0	4.93E-07	5.05E-06	2.52E-04
Chromium and its compounds (in Cr)	g	6.51E-05	8.80E-06	1.94E-06	0	2.25E-06	7.81E-05	3.91E-03
Hexavalent chromium (in Cr)	g	5.54E-07	2.83E-09	7.56E-08	0	3.78E-07	1.01E-06	5.05E-05
Dissolved organic compounds (unspecified)	g	7.28E-04	1.98E-05	1.16E-04	0	3.75E-04	1.24E-03	6.19E-02
Alkaline and alkaline earth metals, unspecified, non-toxic	g	1.51E-01	2.42E-03	1.53E-02	0	2.83E-03	1.71E-01	8.57E+00
Dissolved inorganic compounds (unspecified)	g	4.23E-04	7.03E-07	3.20E-06	0	1.94E-06	4.29E-04	2.15E-02
Copper and its compounds (in Cu)	g	1.54E-05	8.66E-06	8.91E-07	0	2.29E-06	2.72E-05	1.36E-03
Tin and its compounds (in Sn)	g	7.80E-12	1.74E-14	6.71E-14	0	6.23E-14	7.95E-12	3.97E-10
Iron and its compounds (in Fe)	g	8.15E-02	1.49E-04	6.60E-04	0	4.83E-04	8.28E-02	4.14E+00
Mercury and its compounds (in Hg)	g	3.67E-07	1.88E-08	2.42E-08	0	2.08E-08	4.31E-07	2.15E-05
Nickel and its compounds (in Ni)	g	2.63E-06	3.62E-07	1.84E-07	0	2.11E-07	3.38E-06	1.69E-04
Lead and its compounds (in Pb)	g	2.14E-05	2.71E-06	6.92E-07	0	7.00E-07	2.55E-05	1.28E-03
Zinc and its compounds (in Zn)	g	1.49E-05	8.59E-07	2.50E-06	0	2.19E-06	2.05E-05	1.03E-03
Water discharged	Litre	2.83E+02	7.54E-01	2.59E+00	0	2.75E+00	2.89E+02	1.45E+04

Comments on emissions into water:

Most emissions into water occur during the production phase. Water discharged accounts for almost 100% of emissions. The main portion is water processed in turbines to produce hydroelectricity, while another large portion is made up of water used to cool electricity power plants.

2.2.3 Emissions into the ground (*NF P 01-010 § 5.2.3*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Arsenic and its compounds (in As)	g	2.08E-10	0	0	0	8.53E-12	2.37E-10	1.19E-08
Biocides[a]	g	0	0	0	0	0	0	0
Cadmium and its compounds (in Cd)	g	1.29E-06	1.15E-06	2.00E-08	0	1.02E-07	2.55E-06	1.28E-04
Chromium and its compounds (in Cr)	g	1.70E-05	2.66E-05	4.39E-07	0	2.41E-06	4.64E-05	2.32E-03
Copper and its compounds (in Cu)	g	1.68E-05	2.66E-05	2.49E-07	0	2.38E-06	4.59E-05	2.30E-03
Tin and its compounds (in Sn)	g	0	0	0	0	0	0	0
Iron and its compounds (in Fe)	g	1.92E-07	9.17E-09	1.54E-07	0	6.90E-08	4.23E-07	2.12E-05
Lead and its compounds (in Pb)	g	2.50E-05	3.98E-05	2.68E-07	0	3.51E-06	6.86E-05	3.43E-03
Mercury and its compounds (in Hg)	g	1.70E-07	2.66E-07	4.40E-09	0	2.41E-08	4.64E-07	2.32E-05
Nickel and its compounds (in Ni)	g	8.32E-06	1.33E-05	8.62E-08	0	1.17E-06	2.29E-05	1.14E-03
Zinc and its compounds (in Zn)	g	6.67E-05	1.06E-04	8.89E-07	0	9.41E-06	1.83E-04	9.16E-03
Heavy metals (unspecified)	g	5.16E-09	4.00E-10	2.12E-10	0	1.80E-09	7.57E-09	3.78E-07
Alkaline and alkaline earth metals, unspecified	g	1.83E-03	1.30E-04	1.16E-04	0	8.85E-04	2.96E-03	1.48E-01
Inorganic compounds distributed in soil, unspecified, non-toxic	g	5.31E-04	2.99E-06	2.41E-04	0	1.50E-04	9.24E-04	4.62E-02

[a] Biocides: for example, pesticides, herbicides, fungicides, insecticides, bactericides etc.

Comments on emissions into the ground:

Emissions into the ground during the plasterboard manufacturing process mainly occur during production of the energy consumed.
With regard to other phases in the life cycle, emissions into the ground are mainly due to fuel supplies.

2.3 Production of waste (*NF P 01-010 § 5.3*)

2.3.1 Upgraded waste (*NF P 01-010 § 5.3*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Energy recovered	MJ	0	0	3.62E-02	0	0	3.62E-02	1.81E+00
Materials recovered: total	kg	0	0	0	0	0	0	0
Materials recovered: steel	kg	0	0	0	0	0	0	0
Materials recovered: aluminium	kg	0	0	0	0	0	0	0
Materials recovered: metal (unspecified)	kg	0	0	0	0	0	0	0
Materials recovered: paper/cardboard	kg	0	0	0	0	0	0	0
Materials recovered: plastic	kg	0	0	0	0	0	0	0
Materials recovered: cullet	kg	0	0	0	0	0	0	0
Materials recovered: biomass	kg	0	0	0	0	0	0	0
Materials recovered: minerals	kg	0	0	0	0	0	0	0
Materials recovered: unspecified	kg	0	0	0	0	0	0	0

2.3.2 Waste disposals (*NF P 01-010 § 5.3*)

A reader's guide to the tables is provided on page 4.

	Units	Production	Transport	Deployment	Deployment lifespan	End of lifespan	Total life cycle	
Flows							**Per annuity**	**Per annuity**
Hazardous waste	kg	1.07E-05	0	4.89E-05	0	4.06E-05	1.00E-04	5.01E-03
Non-hazardous waste	kg	2.52E-04	2.44E-05	3.60E-04	0	4.79E-05	6.84E-04	3.42E-02
Inert waste	kg	6.65E-01	1.60E-03	2.44E-02	0	3.00E-01	9.91E-01	4.95E+01
Radioactive waste	kg	1.88E-04	3.72E-07	1.55E-06	0	1.04E-06	1.91E-04	9.57E-03

Comments on production of waste and procedures for handling waste

Wooden pallets and plastic wrapping film are used for packaging. During the installation phase, quantities of these materials are considered as construction site waste. If heat recycling is carried out at incineration plants with an energy-recovery feature, the amount of energy declared may be recovered.

Waste disposed of is mostly inert waste. It must be pointed out that this contains rubble and remains from preparation of ore to produce electricity.

3 Representative environmental impacts of construction materials as per NF P 01-010 § 6

All these impacts are stated or calculated in accordance with the indications of section 6.1 of the NF P01-010 standard, on the basis of section 2 and for the reference functional unit per annuity defined in sections 1.1 and 1.2 of this declaration, and also for the functional unit over the Typical Lifespan.
[Impact category: CML2001 with the 2010 updated conversion coefficients]

N°	**Environmental impact**		
1	Consumption of energy resources Total primary energy Renewable energy Non-renewable energy	 3.27 MJ/FU 0.38 MJ/FU 2.90 MJ/FU	 164 MJ 18.9 MJ 145 MJ
2	Depletion of resources (ADP)	1.18 E-03 kg Sb-Equiv./FU	5.88 E-02 kg Sb-Equiv.
3	Total water consumption	3.39 litre/FU	170 litres
4	Solid waste Upgraded waste (total) Waste disposed of: Hazardous waste Non-hazardous waste Inert waste Radioactive waste	 0 kg/FU 0.100 g/FU 0.684 g/FU 0.99 kg/FU 0.191 g/FU	 0 kg 5.01 g 34.2 g 49.5 kg 9.57 g
5	Climate change	0.147 kg CO_2 Equiv./FU	7.33 kg CO_2-Equiv.
6	Atmospheric acidification	4.25 E-04 kg SO_2 Equiv./FU	2.12 E-02 kg SO_2-Equiv.
7	Air pollution	8.10 m^3/FU	405 m^3
8	Water pollution	0.031 m^3/FU	1.56 m^3
9	Destruction of the stratospheric ozone layer	6.33E-011 kg CFC Equiv. R11/FU	3.16E-009 kg R11-Equiv.
10	Formation of photochemical ozone	1.43E-005 kg Ethene-Equiv./FU	7.13 E-04 kg Ethene-Equiv.
Other indicators (not NF P 01-010 standard)			
11	Eutrophication	4.99E-05 kg Phosphate-Equiv./FU	2.50E-03 kg Phosphate-Equiv.

4 The product's contribution to assessment of health risks and risks to standards of living inside buildings as per NF P 01-010 § 7

Contribution of the product			
To assessment of health risks	Indoor health quality	4.1.1	See paragraphs below
	Health quality of water	4.1.2	
To standards of living	Hygrothermic comfort	4.2.1	See paragraphs below
	Acoustic comfort	4.2.2	
	Visual comfort	4.2.3	
	Olfactory comfort	4.2.4	

4.1 Useful information for the assessment of health risks (*NF P 01-010 § 7.2*)

4.1.1 Contribution to indoor health quality (*NF P 01-010 § 7.2.1*)

- VOC

Fermacell gypsum fibreboards underwent VOC emission tests in an eco-institute emission test chamber in 2010 in accordance with DIN ISO 16000-3 and DIN ISO 16000-6. The results show that total VOC emissions were 46 µg/m^3..

- Radioactivity

Like natural gypsum, the natural radioactivity of desulphogypsum is the lowest of all mineral building materials. In this regard, the radioactivity of plasters (hydrated gypsum) is negligible with respect to the natural radioactivity of the environment.

4.1.2 Contribution to health quality of water (*NF P 01-010 § 7.2.2*)

This is not applicable, as the product is not in contact with water used for human consumption, or with runoff water, infiltration water, the water table or surface water.

4.2 The product's contribution to standards of living inside buildings (*NF P 01-010 § 7.3*)

4.2.1 Characteristics of the product assisting in the creation of hygrothermic comfort in buildings (*NF P 01-010 § 7.3.1*)

The humidity rating of Fermacell gypsum fibreboard under normal climate conditions, tested as per EN 322, varies between 1.01 and 1.5%.
Fermacell gypsum fibreboard's water vapour diffusion resistance is Sd = 0.16 m (water vapour diffusion factor μ = 13).
Fermacell gypsum fibreboard may be used in areas with a humidity classification of Eb+p.

The heat conductivity of Fermacell gypsum fibreboard is 0.32 W/m.°K.

4.2.2 Characteristics of the product assisting in the creation of acoustic comfort in buildings (*NF P 01-010 § 7.3.2*)

Fermacell gypsum fibreboard forms part of the composition of a large number of layouts with high-performance noise attenuation, and this has been certified by official bodies. The acoustic performance of Fermacell fibreboard structures depends on their composition and deployment.

4.2.3 Characteristics of the product assisting in the creation of visual comfort in buildings (*NF P 01-010 § 7.3.3*)

Fermacell gypsum fibreboard is used with cladding and is concealed, and therefore has no impact on visual comfort.

4.2.4 Characteristics of the product assisting in the creation of olfactory comfort in buildings (*NF P 01-010 § 7.3.4*)

The use of water as a binder for the two components, gypsum and cellulose fibres, and a total absence of any chemical binders or abrasive products make it impossible for the board to create any olfactory discomfort.

5 Other contributions by the product, especially with regard to concerns for eco-management of buildings, economics and general environmental policy

5.1 Eco-management of buildings

5.1.1 Energy management

The heat conductivity of Fermacell gypsum fibreboard is 0.32 W/m.°K.

5.1.2 Water management

Not applicable.

5.1.3 Upkeep and maintenance

The estimated lifespan of Fermacell gypsum fibreboard is 50 years. It does not require any specific maintenance.

5.2 Economic concerns

Not applicable.

5.3 General environmental policy

5.3.1 Natural resources

The utilisation of natural gypsum is still relatively infrequent, and does not make a large contribution to the depletion of natural resources. The utilisation of desulphuration plaster (desulphogypsum) in flue gas helps save resources of natural gypsum.

5.3.2 Emissions into the air and into water

Production sites have facilities for processing waste, particularly gypsum dust, which is retrieved and reused in raw materials.
The same is true of emissions into water - production sites retrieve the water and reuse it in the manufacturing process.

5.3.3 Waste

Most manufacturing waste is recycled at production sites and reused in the board manufacturing process.
Site waste is classified as 17 08 02, and can be disposed of as rubble or household waste.
Recycled paper is also used as a raw material during the Fermacell gypsum fibreboard manufacturing process.

6 Appendix: Characterisation of data to calculate the Life Cycle Inventory (LCI)

This appendix is the result of the report attached to the declaration (see Introduction).

6.1 Definition of the LCA (Life Cycle Analysis) system

Description of flows considered in the product's life cycle.

6.1.1 Phases and flows included

Production
Modelling of the production phase takes account of the following:

- extraction and production of raw materials, and also transportation of the largest materials
- on-site manufacturing of the product (energy, waste, emissions, packaging)
- production of the energy used by the site and consumables

Transport
Modelling of the transport phase considers production of diesel (extraction and refining) and its combustion during transportation of the product from the manufacturing site to the building site. The average transportation distance from manufacturing sites to building sites in France is 740 km.

Deployment
The board is meant to be fitted to a typical partition with suitable additives, adhesive and screws. Scrap rate during deployment is taken to be 5%. It is assumed that packaging material is incinerated.

Deployment lifespan
Total lifespan is 50 years. No site maintenance or upkeep is required during the utilisation phase.

End of lifespan
Modelling of the end-of-lifespan phase takes account of the following:

- transportation of the plaster-fibre composite board (including fitting additives) to a waste disposal facility (50 km considered)
- the waste disposal process itself

6.1.2 Flows omitted

All available data directly related to manufacture of the product have been included in the LCA.
No cutoff criteria have been applied to calculate the results of the LCA.
The following flows, however, were not considered:

- lighting, heating and cleaning of workshops
- the administrative department
- transportation of personnel
- manufacturing of the production tool and transport systems (machines, trucks etc.)

(NF P 01-010 allows these flows to be omitted from the system's boundaries)

6.1.3 Rule for defining boundaries

Section 4.5.1 of the French standard NF P 01-010 establishes the cutoff threshold as 98%, and this is the minimum threshold considered. No classified flows have been omitted. These flows were not taken into consideration because they were negligible.

6.2 Data sources

6.2.1 Characterisation of the main data

Manufacture

- Year: 2007
- Geographic representativity: Xella / Fermacell plants in Wijchen (DE), Siglingen (DE) and Münchehof (DE).
  It should be borne in mind that Fermacell opened a fourth production plant in Orejo, northern Spain, in May/June 2013. The production process is based on the same technology as the other plants, and therefore the environmental performance is expected to be similar. However, as no reliable data are available for the time being, the Spanish plant was not included in the calculations.
- Technological representativity: the results obtained represent average production of plaster-fibre composite boards by Fermacell. The calculation is based on the average of 3 production plants, weighted on the basis of their respective volumes of production. The data used correspond to the standard technologies used to produce rubber flooring.
- Source: Fermacell

Transport

- Year: 2012
- Geographic representativity: GLO
- Technological representativity: the data used correspond to standard truck technologies.
- Source: Fermacell, for distance (740 km in France), and the GaBi database developed by PE INTERNATIONAL for the other data.

Deployment

- Year: 2011
- Geographic representativity: EU-27
- Source: Fermacell, for the technical information, and the GaBi database for the other data.

End of lifespan

- Year: 2011
- Geographic representativity: EU-27

6.2.2 Energy data

Energies and fuels

Inventory data for this set of data are from the professional GaBi database.

Electricity model

Electricity production was modelled on the basis of PE INTERNATIONAL data. The data used in this modelling process are set out below. The data refer to 2009.

Source: International Energy Agency - IEA Statistics 2011 Electricity Information.

Table 1: Origins of electricity in Germany 2009

Origins	%
Nuclear	21.50
Natural gas	12.57
Lignite	23.20
Coal	16.82
Coal gas	0.95
Hydraulic power	3.94
Wind power	6.16
Fuel oil	1.54
Coal gas	0.95
Electricity imports	6.60
Biogas	2.40
Biomass	1.73
Waste	1.54
Electricity imports	6.60

6.2.3 Non-LCI data

The life cycle inventory was drawn up in 2013. The non-LCI data shown in sections 4 and 5 of this document were supplied by Fermacell.

6.3 Traceability

The life cycle inventory was drawn up in 2013 by PE INTERNATIONAL, and the data added were produced by calculations carried out by the GaBi software package, version 6.

Calculations and written documentation were supplied by PE INTERNATIONAL.