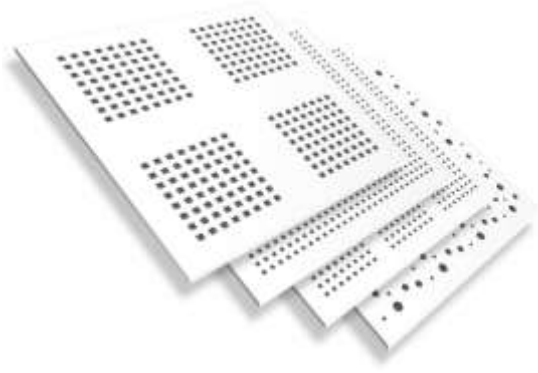
ENVIRONMENTAL AND HEALTH PRODUCT DECLARATION

EPD

In accordance with NF EN 15804+A1 and its French National supplement NF EN 15804/CN



PLADUR® FON+

Issue date: August 2020
Version: 1.0

www.pladur.es

Pladur®
Makes it a reality

Contents

Warning

The information in this declaration has been furnished under the responsibility of PLADUR® GYPSUM, S.A.U., (EPD issuer), according to NF EN 15804+A1 and the French national supplement NF EN 15804/CN.

Any use, in part or in whole, of the information displayed in this document shall at the very least be accompanied by the full reference to the original FDES and to the issuer thereof who shall be able to provide a full copy.

Reading guide

Details for enhanced reading the declaration or the data contained in the declaration.

The display inventory data meets the requirements of the NF EN 15804 + A1. In the following tables -9.0E-03 should be read as -9.0 x 10-3 (scientific writing).

The units used are specified to each stream, and they are:

- Kilogram “kg”
- Litter “l”
- Kilowatt hour “kWh”
- Mega joules “MJ”
- Square metre “m^2”
- Cubic metre “m^3”
- Carbon dioxide equivalent “CO_2 eq”
- Functional Unit “FU”
- Chlorofluorocarbon “CFC”
- Sulphur dioxide “SO_2”
- Phosphate “PO_4^{3-}”
- Antimony “Sb”

Abbreviations:

- EPD: Environmental Product Declaration
- PCR: Product Category Rules
- FDES: Environmental and Health Declaration Form
- LCA: Life Cycle Assessment
- UF: Functional Unit
- MNA: Module not evaluated

Precaution for use of EPD for product comparison

Construction product EPDs cannot be comparable if they do not comply with standard NF EN 15804+A1.

Standard NF EN 15804+A1 defines in paragraph 5.3 Comparability of EPD for construction products, the conditions whereby construction products may be compared, based on the information provided by the FDES:

"Comparison of the environmental performance of construction products using the EPD information shall be based on the product’s use in and its impacts on the building and shall consider the complete life cycle (all information modules)."

NOTE 1: The literal French translation of EPD (Environmental Product Declaration) is DEP (Déclaration Environnementale de Produit). However, in France, the term FDES (Environmental and Health Declaration Form) is commonly used and contains both the Environmental Declaration and Health information for the product covered by the FDES. The FDES is thus an "EPD" supplemented with health information.

1. General Information

Manufacturer: PLADUR® GYPSUM, S.A.U.
Ctra. Andalucía Km. 30.200
28343 VALDEMORO (Madrid) – Spain
www.pladur.es
Contact: David Sáenz de Villaverde
Mail: david.saenz@pladur.com

Production site: Valdemoro – SPAIN

Type of EPD: Cradle to grave, Individual EPD

Type of verification: An independent verification has been performed according to EN ISO 14025: 2.010. This external verification has been carried out by a third part

Name of the verifier: Nicolas Béalu from EVEA

Date of issue of the verification certificate: 31/08/2020

Publication date: August 2020

Valid until: August 2025

Programme name: Programme INIES http://www.inies.fr/

Programme operator: Association HQE. Avenue du Recteur Poincaré numéro 4 - 75016 Paris.

Product name: This EPD covers PLADUR® FON+.

PLADUR® FON+ plasterboards are high-density laminated plasterboards for continuous or suspended ceilings.

Product Category Rules: CEN standard EN 15804+A1 and the French national supplement NF EN 15804/CN provide the Product category definition rules (PCR).

Scope: This LCA is based on production data of the period November 2018 - October 2019 corresponding to the manufacturing sites located in Spain and distributed in France.

FDES destination: B2B

The LCA calculations, LCA report and the FDES document has been carried out by Anthesis Lavola.

2. Description of the functional unit and the product

Description of the functional unit

Considering the features of this product, the functional unit can be described as:

To cover 1 square meter (m^2) of ceiling with PLADUR® FON+ plasterboards, with a weight of 9.8 kg/m^2, over a life reference time of 50 years, conferring sound absorbent properties.

(This EPD covers PLADUR® FON+ plasterboards, with a thickness of 12.5 and different types of edges BA and BC and different perforation rates for continuous or suspended ceilings).

Description of the product and use of the product

PLADUR® FON+, both BA and BC plasterboards, are high-density laminated plasterboards for continuous or suspended ceilings. PLADUR® FON+ plasterboards have high-quality sound absorbent properties that lower acoustic reverberation and improve the comfort of the spaces in which they are used.

PLADUR® FON+ plasterboards are recommended for:

- Public and commercial spaces: hotels, restaurants, offices, hospitals, or schools.
- Conference halls or meeting rooms.
- Rooms and premises in general where the reverberation times need to be reduced and the acoustic comfort improved. Areas where the builders wish to install a ceiling with a special decorative purpose.

Other technical characteristics not included in the functional unit

The plasterboards are manufactured with the following specifications.

Parameter	Value
	PLADUR® FON+
Nominal weight (kg/m^2)	≈ 10
Thickness (mm)	12.5
Reaction to fire	A2-s1, d0

Description of the main components and/or materials of the product

PLADUR® FON+ plasterboards are composed of gypsum (calcium sulphate) and two coating sheets of cellulose.

The plasterboards are palletized and wrapped with polyethylene film.

Packaging description considered per Functional Unit:

Packaging description	Value (kg/FU)
Wood feet or pallet	5.28E-01
Protection corner	5.24E-03
Plastic film	1.27E-02
Paper seal and cardboard box	3.93E-01

Installation components for PLADUR® FON+ boards are described below:

Parameter	Value
PLADUR® setting joint compound	0.34 kg/m^2
Water	0.17 l/m^2
PLADUR® paper joint tape	1.3 m/m^2
PM PLADUR® screws	15 p/m^2 x 1.25 g/p = 18.75 g/m^2

During the life cycle of the product, no substances listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" as hazardous substances are used.

Description of the reference service life

The reference service life of plasterboards has been estimated to be at least 50 years according to the Standard 15686, when the indicated conditions for packaging, transport, storage, installation, use, maintenance, and repair are met.

Moreover, as they will be used on buildings, it coincides with the Building Reference Service Life, estimated as 50 years.

Parameter	Value
Reference service life	50 years
Declared product properties (at the gate) and finishes, etc.	The declared product has the properties determined by the manufacturer specification and it is CE certified.
Design application parameters (if instructed by the manufacturer), including references to any appropriate practices	The product shall be applied in accordance with the manufacturer's instructions.
Assumed quality of work, when installed in accordance with the manufacturer's instructions	The quality of the work is presumed to comply with the product specifications.
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV, and wind exposure, building orientation, shading, temperature	Not applicable
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	The product is subject to sanitary labelling on indoor air quality.
In-use conditions, e.g. frequency of use, mechanical exposure	The product shall be used under conditions that comply with the manufacturer's instructions.
Maintenance e.g. required frequency, type and quality and replacement of components	No maintenance is necessary when using the product.

3. Life cycle stages

Life cycle diagram

Product stage, A1-A3

Description of the stage

The product stage includes raw materials extraction, additives production, transport from the quarry or the additive supplier to the processing plant, and the manufacturing process.

A1 Raw materials supply

This module takes into account the supply and treatment of all raw materials and energy that occur upstream of the manufacturing process. In particular, it covers the supply of gypsum, core and paper sheets and additives.

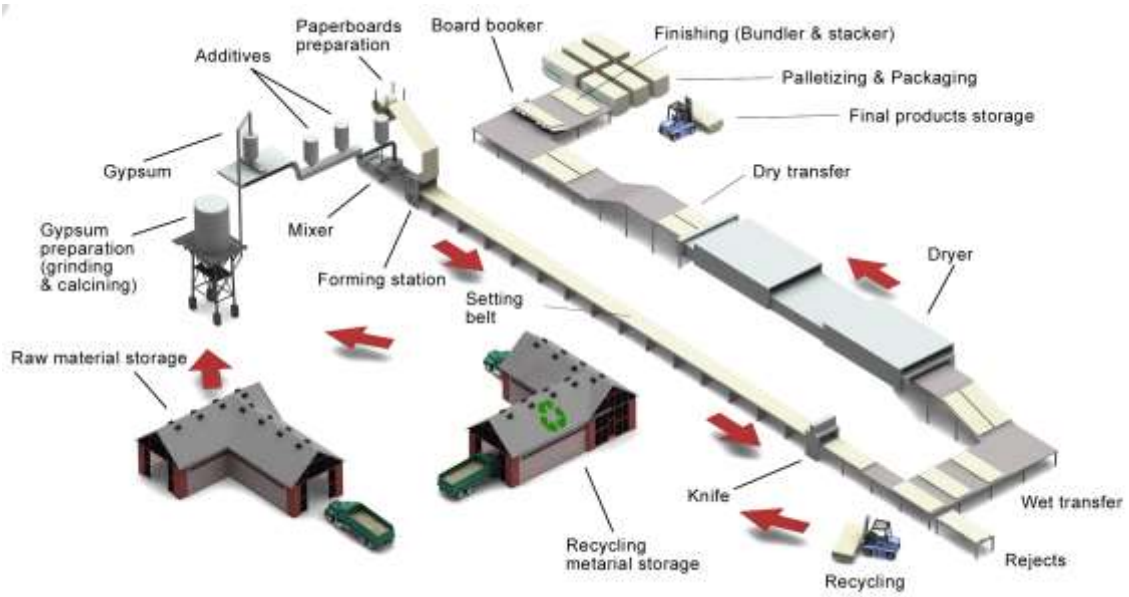
A2 Transport

Raw materials are transported from the quarry and suppliers to the manufacturing sites. The model comprises transport by road for each raw material.

A3 Manufacturing

This module includes energy and water consumption in the manufacturing process, as well as management of waste resulting from the process and packaging production.

Manufacturing process diagram



Raw materials are homogeneously mixed in the mixer to form gypsum plaster, which is discharged through output pipes on a paperboard sheet that is advancing on the forming belt. In parallel, a second paperboard sheet is added to form the Laminated Plasterboard. The board continues advancing on the production line until it acquires enough hardness to be cut. It is subsequently dried in a continuous process. After that, the board is drilled and trimmed. Finally, it is stacked, palletised, and shrink-wrapped to form the packaged product.

This manufacturing process allows the introduction of recycled material at the beginning of the production process.

Construction stage, A4-A5

Description of the stage

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

A4 Transport to the construction site

This module includes transport from the manufacturing factories to the construction site. The product distribution is mainly done to Spain, France, and Portugal, but as FDES geographical scope is France, a 100% French market scenario is considered.

Transport is calculated based on a scenario including the following parameters:

Parameter	Value
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long-distance truck, boat etc.	Lorry of 16-32 tones capacity EURO VI
Distance to the construction site	PLADUR® FON+ plasterboards are manufactured in Spain. Considering the French market, the average distance is 700 km.
Capacity utilization (including empty returns)	38% of the volume capacity 100% empty returns
Bulk density of transported product	784 kg/m^3

A5 Installation in the building

This module includes materials that are necessary for the installation of the product in the building.

Parameter	Value
Installation instructions	PLADUR® FON+ plasterboards are indicated to be installed using PLADUR® joint compound (that must be mixed with water to obtain an adequate joint compound) and PLADUR® paper joint tape.
Ancillary materials for installation (specified by material)	PLADUR® joint compound: 0.34 kg/m^2 of plasterboard PLADUR® paper joint tape: 1.3 m/m^2 of plasterboard Screws: 15 screws of 1.25 g per m^2 of plasterboard
Water use	0.17 litres/m^2 Joint compound must be mixed with clean water in the recommended amount in a clean container and be stirred with a mechanical beater. It is recommended to leave the obtained dough stand between 5 and 10 minutes before application.
Other resource use	None
Quantitative description of energy type (regional mix) and consumption during the installation process	No energy is required for product installation
Waste produced on the building site before waste processing, generated by the product's installation (specified by type)	5% of product and ancillary materials as installation waste: Plasterboard: 0.05 m^2 PLADUR® joint compound: 0.017 kg PLADUR® paper joint tape: 0.065 m Screws: 0.75 p Packaging waste: Wood: 0.185 kg Protection corner: 5.50E-03 kg Plastic film: 1.33E-3 kg Paper and cardboard: 0.41 kg
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	Wasted plasterboard and installation materials: landfill Packaging waste. Protection corner, Plastic film and Paper and cardboard: landfill Packaging waste. Wood: Collection for recycling
Direct emissions to ambient air, soil, and water	No direct emissions are emitted to air, soil, or water

Life stage in use (excluding potential savings), B1-B7

Description of the stage

The use phase is divided into seven modules:

- B1: Use or application of the installed product
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6/B7: Use of energy and water

No technical operations are required during the use phase. Thus, plasterboards have no environmental impacts during this stage.

Moreover PLADUR® FON+ plasterboards are classified as A+ according to the French VOC label.

End-of-life stage, C1 - C4

Description of the stage

This step includes the following different modules: C1, deconstruction or demolition; C2, transport to the waste treatment plant; C3, waste treatment for reuse, recovery and/or recycling; C4 waste disposal.

End-of-life

Parameter	Value
Demolition	It is assumed that plasterboards are demolished using tools that consume diesel and some particles are emitted to the atmosphere during this demolition. Energy consumption and particle emissions from bibliography has been considered: Diesel consumption: 35.9MJ/Tn Particles emission: 0.15 kg/Tn
Collection process specified by type	10.17 kg/m^2 collected as mixed demolition waste (plasterboard and installation materials)
Recovery system specified by type	0 kg for reuse, recycling, or energy recovery (0%)
Disposal specified by type	10.17 kg to landfill (100%)
Assumptions for scenario development, e.g. transportation	Waste is transported 50 km by lorry 16-32 tones EURO VI.

Recycling/reuse/recovery potential,D

Module D, of benefits and loads beyond the system boundaries, has not been evaluated.

4. Information for the life cycle analysis calculation

PCR used	CEN standard EN 15804+A1 and the French national supplement NF EN 15804/CN provide the Product category definition rules (PCR)
System boundaries	From cradle to grave Stages: A1-3, A4-5, B1-7, C1-4 Module D not evaluated
Allocations	Allocation criteria are based on mass and m^2 of produced plasterboard
Geographic representativity and time-related representativity of primary data	The representativity is: - Geographic: manufactured in Spain for the French market - Temporal: manufactured during the period November 2018 - October 2019 Primary data obtained from the company (2018 and 2019) and generic data from Ecoinvent 3.5 (cut-off) Software used: Simapro (v9.0)

5. Results of the life cycle analysis

In tables below, results for the functional unit are summarized.

ENVIRONMENTAL IMPACTS																		
Environmental impacts	**Production Stage**	**Construction Stage**			**Use Stage**								**End-of-life stage**					**Total Life Cycle**	**D Benefits and loads beyond the system boundary**
	Total A1 - A3 production	A4 Transport	A5 Installation	**Total A4-A5**	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Use of energy	B7 Use of water	**Total B1-B7**	C1 Deconstruction / Demolition	C2 Transport	C3 Waste processing	C4 Landfill disposal	**Total C1-C4**		
Global Warming kg CO_2 eq/FU	4.36E+00	1.21E+00	6.71E-01	1.88E+00	0	0	0	0	0	0	0	0	3.34E-02	8.19E-02	0	1.32E-01	2.47E-01	6.49E+00	MNA
Ozone Depletion kg CFC 11 eq/FU	3.77E-07	2.24E-07	5.52E-08	2.79E-07	0	0	0	0	0	0	0	0	6.07E-09	1.52E-08	0	3.13E-08	5.26E-08	7.08E-07	MNA
Acidification of soil and water kg SO_2 eq/FU	1.29E-02	2.90E-03	2.95E-03	5.84E-03	0	0	0	0	0	0	0	0	2.54E-04	1.96E-04	0	3.00E-01	3.00E-01	3.19E-01	MNA
Eutrophication kg $(PO_4)^{3-}$ eq/FU	2.75E-03	3.88E-04	5.76E-04	9.64E-04	0	0	0	0	0	0	0	0	5.50E-05	2.63E-05	0	1.46E-04	2.27E-04	3.94E-03	MNA
Photochemical ozone creation Ethene eq/FU	7.72E-04	1.84E-04	2.27E-04	4.11E-04	0	0	0	0	0	0	0	0	6.68E-06	1.25E-05	0	1.20E-02	1.20E-02	1.32E-02	MNA
Depletion of abiotic resources (elements) kg Sb eq/FU	5.67E-06	3.71E-06	1.31E-06	5.02E-06	0	0	0	0	0	0	0	0	1.13E-08	2.51E-07	0	1.55E-07	4.17E-07	1.11E-05	MNA
Depletion of abiotic resources (fossil) MJ/FU	4.88E+01	1.85E+01	6.32E+00	2.48E+01	0	0	0	0	0	0	0	0	4.81E-01	1.25E+00	0	3.07E+00	4.80E+00	7.84E+01	MNA
Water pollution - m^3/FU	1.35E+00	4.09E-01	2.16E-01	6.24E-01	0	0	0	0	0	0	0	0	1.03E-02	2.76E-02	0	1.61E-01	1.99E-01	2.18E+00	MNA
Air Pollution - m^3/FU	7.14E+02	1.20E+02	8.15E+01	2.02E+02	0	0	0	0	0	0	0	0	4.22E+01	8.14E+00	0	1.24E+03	1.29E+03	2.21E+03	MNA

RESOURCE USE																		
Resource Use	Production Stage	Construction Stage			Use Stage								End-of-life stage					Total Life Cycle	D Benefits and loads beyond the system boundary
	A1 - A3 production	A4 Transport	A5 Installation	Total A4-A5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Use of energy	B7 Use of water	Total B1-B7	C1 Deconstruction / Demolition	C2 Transport	C3 Waste processing	C4 Landfill disposal	Total C1-C4		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - MJ/FU	1.44E+01	1.99E-01	1.62E+00	1.82E+00	0	0	0	0	0	0	0	0	2.83E-03	1.35E-02	0	9.90E-02	1.15E-01	1.63E+01	MNA
Use of renewable primary energy resources used as raw materials- MJ/FU	1.70E+01	0.00E+00	1.05E+00	1.05E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	1.80E+01	MNA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)- MJ/FU	3.13E+01	1.99E-01	2.66E+00	2.86E+00	0	0	0	0	0	0	0	0	2.83E-03	1.35E-02	0	9.90E-02	1.15E-01	3.43E+01	MNA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials- MJ/FU	5.82E+01	1.99E+01	7.04E+00	2.69E+01	0	0	0	0	0	0	0	0	5.20E-01	1.34E+00	0	3.33E+00	5.19E+00	9.03E+01	MNA
Use of non-renewable primary energy resources used as raw materials- MJ/FU	5.44E-01	0.00E+00	7.50E-02	7.50E-02	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	6.19E-01	MNA
Total use of non-renew primary energy resources (primary energy and primary energy resources used as raw materials)- MJ/FU	5.88E+01	1.99E+01	7.12E+00	2.70E+01	0	0	0	0	0	0	0	0	5.20E-01	1.34E+00	0	3.33E+00	5.19E+00	9.09E+01	MNA
Use of secondary material- kg/FU	5.10E-01	0.00E+00	2.55E-02	2.55E-02	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	5.36E-01	MNA
Use of renewable secondary fuels - MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00	MNA
Use of non-renewable secondary fuels - MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00	MNA
Net use of fresh water - m3/FU	2.81E-02	3.05E-03	3.63E-03	6.68E-03	0	0	0	0	0	0	0	0	6.40E-05	2.06E-04	0	3.02E-03	3.29E-03	3.81E-02	MNA

WASTE CATEGORY																		
Waste Category	Production Stage	Construction Stage			Use Stage								End-of-life stage					Total Life Cycle	D Benefits and loads beyond the system boundary
	A1 - A3 production	A4 Transport	A5 Installation	Total A4-A5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Use of energy	B7 Use of water	Total B1-B7	C1 Deconstruction / Demolition	C2 Transport	C3 Waste processing	C4 Landfill disposal	Total C1-C4		
Hazardous waste disposed -kg/FU	1.24E-01	1.17E-02	2.15E-02	3.32E-02	0	0	0	0	0	0	0	0	2.84E-04	7.93E-04	0	5.29E-02	5.40E-02	2.11E-01	MNA
Non-hazardous waste disposed - kg/FU	9.27E-01	9.88E-01	7.91E-01	1.78E+00	0	0	0	0	0	0	0	0	1.88E-03	6.68E-02	0	1.02E+01	1.03E+01	1.30E+01	MNA
Radioactive waste disposed - kg/FU	2.19E-04	1.26E-04	3.15E-05	1.58E-04	0	0	0	0	0	0	0	0	3.40E-06	8.55E-06	0	1.88E-05	3.07E-05	4.07E-04	MNA

OUTPUT FLOWS																		
Output Flows	Production Stage	Construction Stage			Use Stage								End-of-life stage					Total Life Cycle	D Benefits and loads beyond the system boundary
	A1 - A3 production	A4 Transport	A5 Installation	Total A4-A5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Use of energy	B7 Use of water	Total B1-B7	C1 Deconstruction / Demolition	C2 Transport	C3 Waste processing	C4 Landfill disposal	Total C1-C4		
Components for re-use kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNA
Materials for recycling kg/FU	5.82E-01	0.00E+00	2.14E-01	2.14E-01	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.95E-01	MNA
Materials for energy recovery kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNA
Exported Energy - Electricity - MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNA
Exported Energy - Steam- MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNA
Exported Energy - Process gases - MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNA

6. Aditional information on release of dangerous substances to indoor air, soil and water during the use stage

Indoor air

VOCs and Formaldehyde

According to the French rule on sanitary labelling on indoor air quality ("qualité de l'air intérieur"), started in the "Décret n° 2011-321 du 23 mars 2011 (NOR: DEVL1101903D) et l'arrêté du 19 avril 2011 (NOR: devl1104875a)", on the labelling of emissions of volatile organic compounds of construction products, wall or floor covering and paints and varnishes, PLADUR® FON+ plasterboards have been rated as class A+ product by an independent labelled laboratory: EUROFINS.

The limit values of the emissions' classes refer to the total of the VOC emissions and also to the evaluation of 10 single substances (in µg/m^3). A+ rating is the highest level of certification.

The basis of testing is ISO 16000 and the certificate test numbers are 392-2013-00022001 / 392-2013-00039301/392-2013-00039305.

Absence of carcinogenic, mutagenic and toxic to reproduction (C.M.R.) substances

The test has also evaluated accomplishment with the French regulation on 4 carcinogenic, mutagenic and toxic to reproduction substances ("4 substances C.M.R.), stated in Rule of April the 30th 2009 (NOR: DEVP0908633A) and Rule of May the 28th 2009 (NOR: DEVP0910046A).

These four tested substances are:

- Trichloroethylene, CAS number: 79-01-6.
- Benzene, CAS number: 71-43-2.
- Bis(2-ethylhexyl) phthalate, CAS number: 117-81-7.
- Dibutyl phthalate, CAS number: 84-74-2.

Radioactivity

Gypsum is a material where natural radioactivity is the lowest of all mineral building materials. Thus, plasterboard radioactivity is negligible compared to the natural radioactivity of the environment.

Growth of microorganisms

No growth of microorganisms is observed at the gypsum board surfaces under normal conditions of design and use of buildings.

Soil and water

This product is not classified as toxic for water or the environment in its safety data sheet, under normal use conditions.

7. Contribution of product to quality of life inside buildings

Characteristics of product involved in creating hygrothermal comfort conditions in the building

Not applicable.

Characteristics of product involved in creating acoustic comfort conditions in the building

PLADUR® FON+ plasterboards have high-quality sound absorbent properties that lower acoustic reverberation and improve the comfort of the spaces in which they are used.

Characteristics of product involved in creating visual comfort conditions in the building

Not applicable under normal use conditions.

Characteristics of product involved in creating olfactory comfort conditions in the building

The product is odorless, but it has not been measured according to any standard.

8. Additional information

LCA interpretation

Product stage (modules A1-3) is the most relevant life cycle stage for all impact categories. Its contribution to environmental impact categories goes from 32% of the life cycle impact (Air pollution) to 70% (Eutrophication), except for Acidification and Photochemical ozone creation, where its impact is less than 6%.

The product distribution has a significant impact, with more than 10% of the life cycle impact, for 6 of the 9 analysed impact categories. This stage has a maximum contribution of 33% for Depletion of abiotic resources (elements) impact category.

The installation stage accounts with maximum 15% of the impact (Eutrophication).

As it is assumed the most conservative scenario for the product end of life, 100% of to landfill, modules C1-4 account a significant impact specially for three impact categories: Acidification (94%), Photochemical ozone creation (91%) and Air pollution (58%).

No technical operations are required during the use phase. Thus, plasterboards have no environmental impacts during this stage.

Regarding resource use indicators, 73% of the primary energy use comes from non-renewable sources, while 27% comes from renewable sources. 88% of the renewable energy is consumed in the product stage, whereas this stage consumes 64% of the non-renewable primary energy. 22% of the non-renewable energy is used in A4 module for the product distribution.

74% of water consumed takes place in the product stage, while 8% is consumed in module A4, 10% is consumed in the installation module (A5) and 8% in module C4 of end of life disposal. It has to be considered that water is directly consumed in both the manufacturing process and installation.

Waste disposed (hazardous, non-hazardous, and radioactive waste) are generated in various life cycle stage: 8% in product stage, 8% in A4 module, 6% in A5 module and 78% in end of life stage, mainly in C4 module.

ENVIRONMENTAL CATEGORY AND INDICATOR	A1-A3 PRODUCTION STAGE	A4 TRANSPORT	A5 INSTALLATION	B1-B7 USE STAGE	C1-C4 END OF LIFE STAGE	TOTAL LIFE CYCLE
Global Warming	4.36	1.21	0.67	0.00	0.25	**6.49 kg CO_2eq/m^2**
Depletion of abiotic resources (elements)	5.67E-06	3.71E-06	1.31E-06	0	4.17E-07	**1.11E-05 kg Sb eq/m^2**
Total use of primary energy resources	90.10	20.06	9.78	0.00	5.30	**125 MJ/m^2**
Net use of fresh water	2.81E-02	3.05E-03	3.63E-03	0	3.29E-03	**3.81 E-02 m^3/m^2**
Waste generation	1.05	1.00	0.81	0.00	10.34	**13.20 kg/m^2**

Environmental commitment

PLADUR® plasterboards are manufactured in the company facilities in Valdemoro (Madrid) and Gelsa (Zaragoza), in compliance with the Directive laying down the obligations on integrated prevention and pollution control.

The facilities have the Integrated Environmental Authorisation, ACIC-MO-AAI-1007/14 10-AM-00076.4/06 record. This authorization was granted by the Ministry of Environment on September the 23rd 2009 and modified automatically by the same Ministry on February the 2nd 2015.

Data related to pollutant emissions to air, soil and water and waste transferred from the facility are annually reported, according to 166/2006 Regulation and 508/2007 Decree and PLADUR® installation has the greenhouse gases emission authorization, also granted by the Ministry of Environment (10-AGEI-M-002/2014).

The company has also made the necessary arrangements to comply with the REACH Regulation, on the registration, evaluation, authorization and restriction of substances and chemical preparations, obtaining the following registration number: 01-2119444918-26-0236.

Moreover, PLADUR® Gypsum S.A.U. (PLADUR®) has implemented an Environmental Management System in accordance with UNE-EN-ISO 14001:2015, certified by AENOR, that covers the following activities: design and manufacture of plasterboards in different sizes and characteristics (standard, waterproof, vapor barrier, fire resistance, thermal and acoustic insulating, honeycomb sandwich and decorative panels), adhesive compounds and associated metal profiles. Certification number is GA-2011/0624.

The Quality Management System of PLADUR® Gypsum S.A.U. allows that the raw materials rejected during the production process are recycled internally, reducing impacts derived from the extraction and processing of raw materials. Moreover, materials used for manufacturing PLADUR® products are characterized by having a low impact over their life cycle. PLADUR® Gypsum S.A.U. facilities are located near the main raw material quarries, reducing impacts related to transportation.

Water efficiency is also a priority for PLADUR® Gypsum S.A.U. Specifically, in Valdemoro plant there is a pond where rainwater and industrial wastewater are collected, to be entered again in the industrial processes after being treated.

The main objectives or the organization related to the environment are:

- Minimizing air emissions
- Reducing hazardous waste
- Valuing non-hazardous waste
- Optimizing water consumption
- Increasing energy efficiency
- Improving spills prevention system

Specifically, there is an organizational commitment to climate change, energy efficiency, natural resources preservation and atmospheric emissions reduction that is translated into:

- Regular monitoring on CO_2 emissions
- Periodic measurements on emission points to control emitted pollutant levels
- Natural gas is used as fuel for the manufacturing process
- Natural gas is also used as preferred fuel for the vehicle fleet (trucks)
- Good energy management practices are applied in a continuous improvement management system

Criteria on energy efficiency are implemented in all manufacturing activities in order to respect the environment, preserve natural resources, reduce atmospheric emissions and contribute to minimize climate change effects.

PLADUR®

www.pladur.es

Pladur®
Makes it a reality