

WHITE DRY MIXED CEMENT MORTARS & RENDERS

EPD Environmental Product Declaration
for white dry mixed cement mortars & renders

ELEFSINA PLANT



Programme: The International EPD® System
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An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication
at www.environdec.com





> GENERAL INFORMATION

Programme:	The International EPD® System
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR):

PCR 2019:14 Construction products (EN 15804:A2); Version 1.3.1; 2024-12-20

UN CPC: 375

PCR review was conducted by: The Technical Committee of the International EPD System.

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

EPD verification by accredited certification body

Third-party verification: Eurocert S.A. is an approved certification body accountable for the third-party verification.

The certification body is accredited by: ESYD, Accreditation number 21-8

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

For further information about compatibility, see EN 15804 and ISO 14025.

> COMPANY INFORMATION

Owner of the EPD: INTERMIX dry mortars, TITAN Cement Company S.A., a member of TITAN Group.

Contact: Panagiotis Papadeas, Environmental & Quality Director, Titan Greece, Cement Division

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Description of the organisation: Building materials manufacturer

Product-related or management system-related certifications: Product group classification: UN CPC 375, The CEN standard EN 15804 serves as the core Product Category Rules, PCR 2019:14 Construction products (EN 15804:A2); Version 1.3.1, PCR review was conducted by The Technical Committee of the International EPD® System and Independent third-party verification of the declaration and data in accordance with ISO 14025:2006.

Name and location of production site(s): Elefsina cement grinding plant, Elefsina, Greece

> INTRODUCTION

Building on more than 120 years of industry experience and driven by its commitment to sustainable growth, TITAN Group has become an international cement and building materials producer, serving customers in more than 25 countries worldwide through a network of 14 integrated cement plants and three cement grinding plants. TITAN also operates quarries, ready-mix plants, terminals, and other production and distribution facilities. We create value by transforming raw materials into products – cement, concrete, aggregates, dry mortars and other building materials. We serve society’s need for safe, durable, resilient, and affordable housing and infrastructure.

Climate change has mobilized organizations, in many sectors, towards a carbon-neutral future. In 2020, the Global Cement and Concrete Association (GCCA) announced its members’ Climate ambition to drive down the CO₂ footprint of operations and products and deliver carbon-neutral concrete to society by 2050. Meanwhile, there is a growing need for enhanced transparency of environmental performance of building materials, such as greenhouse gas (GHG) emissions. Cement is the key ingredient in manufacturing concrete, the second most used commodity in the world and among the major contributors to the embodied GHG of buildings and infrastructure works.

TITAN is working across the built environment value chain to deliver a carbon-neutral future in a circular economy, life cycle context. Aiming for a 35% reduction of the net direct specific CO₂ emissions by 2030 (compared to 1990 levels), TITAN has defined a road map for developing low-carbon cementitious products and collaborating in carbon capture R&D projects at the cement plants. The publication of the cement Environmental Product Declaration (EPD) is an important milestone in the road map, helping to communicate to customers the environmental performance of TITAN Greece cements.

Cement and other building materials EPDs will help shape the way the construction industry analyses the environmental impact of buildings and infrastructure works, now and in the future. Our EPDs will also provide a rigorous, science-based framework for driving environmental improvement throughout TITAN’s sites and supply chain, offering at the same time an advantage to customers wanting to be leaders in the sustainable infrastructure and building industry.



3 Cement Plants

1 Cement Grinding Facility

28 Ready-mix Plants

25 Quarries

1 Dry mortar plant

2 Processed engineered fuel facilities



> PRODUCT INFORMATION

Product name:

This is a product-specific EPD for white dry mixed cement base mortars and renders:

F-510 MARBLE WHITE FINISH COAT, F-610 WHITE FINISH COAT, M-510 ONE COAT WHITE MARBLE RENDER, M-610 ONE COAT WHITE RENDER

Product description:

Rendering mortars are mortars whose constituent substances are mixed at the factory and not at the construction site. According to how the mortar is being used, it can be categorised into three types of pre-made mortars: masonry mortar, rendering mortar, and screed material.

Rendering mortars contain superior quality TITAN cement, dried aggregates and specialized admixtures. They require only the addition of water at the job site, for the production of internal or external plaster, aggregates, water, and additions or admixtures, if necessary, for the production of external render or internal plaster. Rendering mortars

are applied to walls and ceilings in one or more layers as required. In addition to the aesthetic design of the surface, they are used as an external render for guarding against the effects of the weather and as internal plasters for providing an even substrate when applying paint coats or wallpaper.

Depending on the technical data, the base materials and processing aids used, and the practical application, rendering mortars can be categorised in the product groups of normal/finishing render, normal/finishing render with special properties.

Application:

Rendering mortars are produced in the factory for use as a base coat or finishing render on walls, ceilings and separating walls of structures which comply with the applicable standards, or on similar primers (e.g. in existing buildings).



Delivery status:

Rendering mortars – normal/finishing renders with special properties are produced and supplied as pre-made dry mortars. Pre-made dry mortar is a mortar made from raw materials which are fully dry in the factory, delivered to the construction site and mixed there into ready-to-use mortar according to manufacturer instructions and conditions. Delivery of the product is performed via pallets containing sacks of 30 kilos, big bags of 1.4 tn or in silos up to 27 tn per silo.

Base materials:

Dry mixed mortars and rendering mortars are composed of fine limestone aggregates, blended together with TITAN cement and special admixtures and additives that act as powerful air-entraining and plasticizing agents. The composition of each product is shown in the table below. Product declarations and certificates can be found on the company's website www.intermix.gr.

Product	Bulk density of dry mortar (Kg/Lt)	Cement	Fine Aggregate	Admixtures
F-510 MARBLE WHITE FINISH COAT	1.6 ± 0.10	7-8%	90-93%	0,5-1%
F-610 WHITE FINISH COAT	1.6 ± 0.10	7-8%	90-93%	0,5-1%
M-510 ONE COAT WHITE MARBLE RENDER	1.6 ± 0.10	10-11%	90-91%	0,3-0,5%
M-610 ONE COAT WHITE RENDER	1.6 ± 0.10	10%	89-90%	0,3-0,4%

Marble:

As per EN 13139 marble dust is used as a filler material in the manufacturing of paints, coatings, and adhesives due to its fine particle size and chemical properties.

Aggregate:

As per EN 13139 natural sands are used as natural raw materials, which contain natural minor and trace minerals along with the main or calcite (CaCO₃).

Fine aggregate:

As per EN 13139 limestone dusts which arise as a result of the preparation of natural sand for the production of aggregates, as well as very fine sands.

Cement:

As per EN 197-1 cement is used as a binder.

Hydrated lime:

As per EN 459-1 white hydrated lime is used as binder and is made by calcining natural limestone.

Air entraining admixture:

As per EN 934-2 these incorporate fine air particles in the wet product, to reduce the bulk density of fresh mortar, improve workability, and reduce the tendency of shrinkage and stress cracking.

UN CPC code: 375- Articles of concrete, cement and plaster

> LCA INFORMATION

Functional unit / declared unit:

The declared unit is one (1) tn (1.000 kg).

Reference service life:

Not relevant due to the cradle-to-gate boundary conditions.

Time representativeness:

The data used in this study cover the reporting year of 2022.

Database(s) and LCA software used:

GCCA Industry EPD Tool for Cement and Concrete and Ecoinvent database (v.4.1).

Goal and scope:

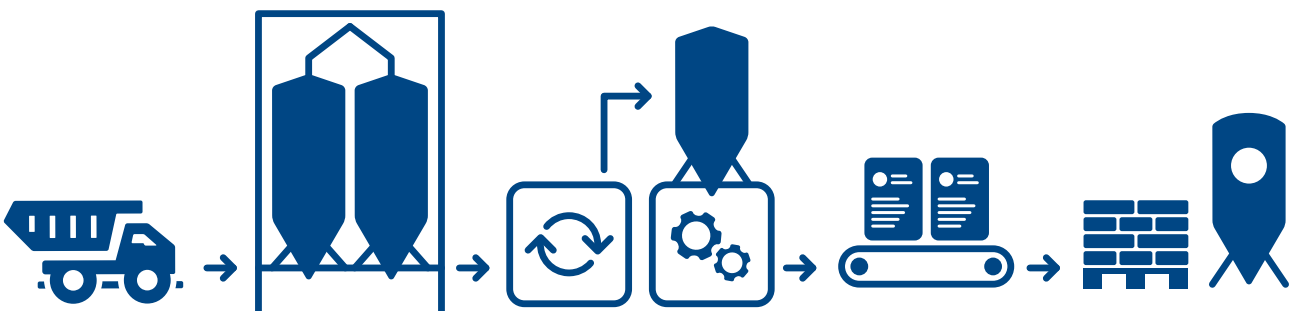
This EPD evaluates the environmental impacts of the production of one (1) tn of dry mixed mortars, renders & adhesives (A1-A3).

Manufacture:

Rendering mortars are made in the Elefsina INTERMIX grinding facility in the following steps:

- Drying of aggregates
- Separating dried aggregates by particle size and store at dedicated silos
- Conveyance of cement, dried aggregates and admixtures, according to specific proportioning
- Mixing
- Conveyance of finished products
- Packaging of finished products in bags or placing bulk in silos
- Loading and shipping of the finished product

The raw materials – sand, binder, aggregates, processing aids, admixtures, and additions are stored at the manufacturing plant in silos. From the silos, the raw materials are gravimetrically dosed and intensely mixed according to the respective formulation. The resulting end product is either placed in silos for bulk delivery, or bagged and palletized.



Environment and health during manufacturing:

The current state of the art includes the 100 % return of dry waste in production. In all places where dust can arise during production in the factory, this waste is fed into a central filter system using the appropriate extraction systems, taking into account the occupational limit values. The very fine dust filtered out in these systems are then fed back into the manufacturing process. As part of the quality management systems introduced, any off-specification batches are detected immediately by the automated process monitoring system and are fed into circulation with the appropriate recovered-goods silos, i.e. they are fed back into the production process in very small quantities. This procedure is also applied for product residues which are transported back to the manufacturing plant in small quantities in silos or sacks.

Product processing/Installation:

Rendering mortars are normally processed by specialized equipments at the project site. They are extracted from the silo with a dry materials screw conveyor or dropped bag by bag in the machine hopper and mixed with a mixing pump before being conveyed and applied. Silo mixing pumps can also be used.

The rendering mortars are then levelled, and textured if necessary, on site with suitable tools.

With the cement and lime binders in mineral pre-made mortars, the fresh mortar mixed with water is strongly alkaline. Prolonged contact (e.g. knees in wet mortar) can cause serious skin damage owing to the alkalinity. Personal protective measures must therefore be taken (EU Health & Safety Data Sheet) to avoid any contact with eyes or skin.

No special measures are required for protection of the environment. Unchecked dust emissions must be avoided. Mineral pre-made mortars must not enter the sewer system, surface water, or ground water.

Packaging:

Bagged stored on wooden pallets, pallets wrapped in plastic film, silo-based goods stored in steel silos.

Condition of use:

Rendering mortars must be protected from long-term weather effects, e.g. by properly connecting the facade base. The cracking resistance of rendering mortars made from mineral pre-made mortars can be increased with fiber mesh reinforcement in the tension-stressed areas of the render.

Data quality:

ISO 14044 was applied in terms of data collection and quality requirements. The data concerning the modules A1 (raw material supply), A2 (transportation) and A3 (product manufacturing) and were provided by Titan Cement Company S.A. and involved all input and output materials to the plant, the consumed utilities (energy, water) and the

distances and means of transport for each input stream. Regarding electricity mix, the latest (2022) national residual electricity mix as published in DAPEEP SA, were utilized (<https://www.dapeep.gr/viosimi-anaptixi/energeiako-meigma/>). The background data for the module A1 e.g. electricity generation, raw materials and fuels production were recovered from GCCA Environmental Product Declaration tool (v4.1). GCCA's Industry EPD Tool for Cement and Concrete is a web-based calculation tool for EPDs of clinker, cement, concrete and precast elements, available in both International and North American versions. The present report refers to the International version only.

The latter complies with the latest cement and concrete PCRs registered at the International EPD® System (Environdec), namely c-PCR-001 Cement and building limes (EN 16908) for cement registered as complementary PCRs of PCR 2019:14 Construction products (EN 15804+A2).

The GCCA EPD tool (v4.1) is developed by Quantis <https://quantis-intl.com/> and verified by Studio Fieschi <http://www.studiofieschi.it/en>. The International EPD® System, which provides the framework to develop and publish EPDs based on ISO 14025 and EN 15804, gives the final approval of the tool's compliance with the rules. The underpinning database for the GCCA EPD tool is the version of the Ecoinvent database (v.3.5) and cement manufacturing data obtained through the GNR process (<https://gccassociation.org/sustainability-innovation/gnr-gcca-in-numbers/>).

The database of Ecoinvent v.3.5 was used to complete any missing data. Generic data used in this study concerning:

- CO₂ emission factors for different transportation way
- CO₂ emission factors for fuels and raw materials
- Specific emission factor of used energy mix (kg CO₂/kWh)
- The energy source behind electricity is GWP-GHG=7,03E-01 kg CO₂ eq./kWh

There is no missing data for the case of Elefsina plant, since all the required raw data were provided by the technical staff of the plant, using all the available sources which are:

- i) The ERP system (SAP) that company uses
- ii) Flow meters for consumed and recycled water

Geographical scope:

Worldwide

Allocations:

The allocation is performed according to the PCR. As no co-products are produced, the flow of materials and energy and the associated release of substances and energy into the environment is related exclusively to the concrete produced. No by-products occur during ready mix concrete production; therefore, there is no need for allocations in by-products.

The study does not include the followings:

- Capital equipment production
- Equipment maintenance
- Human labour and employee transport

Assumptions:

For the road transportation a lorry 16-32 metric ton, EURO4 was used.

The dry mixed mortar recipe (materials percentage participation) was defined by the pre-verified and automated ERP system (SAP) that company uses.

For these mortars packaging has been taken into account and the results of the specific cement types include the amount of cement, which is packaged.

The used materials for mortars packaging are:

- i) wooden pallets
- ii) paper bags
- iii) plastic film

By using the sales of mortars of 2022, the impact of packaging were incorporated into the final results. Sales of bagged mortars were separated from bulk sales and the weighted average burden by packaging was calculated. Thus, the results include both the part of bulk and bagged mortars.

Cut-off rules:

The cut-off rule for insufficient data or data gaps that are less than 1% of the total input mass or mass per module was applied. In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1% of renewable and

non-renewable primary energy usage and 1% of the total mass input of that unit process. The total of neglected input flows for the stages ‘cradle through gate’ shall be a maximum of 5% of energy usage and mass.” (EN 15804). Regarding the LCA model, the default cut-off criteria are applied for all processes from the Ecoinvent database. In addition, all custom processes developed for the specific purposes of the project are consistent with the rules and guidelines of the Ecoinvent database, and hence the same cut-off criteria are applied.

Comparability:

EPD performance for construction products that they do not comply with EN 15804 may not be comparable. EPDs from separate programs but within the same product category may not be comparable as well.

Description of system boundaries:

The scope of this study is “Gradle to gate” covering the product stage (modules A1-A3), since the product fulfils the three conditions required by EN 15804, about the exclusion of modules C1-C4 and D.

The EPD covers the product stage (“cradle to gate”, A1-A3), since the three criteria of EN 15804 are met for the exclusion of stages B1-B7, C1-C4 and D.



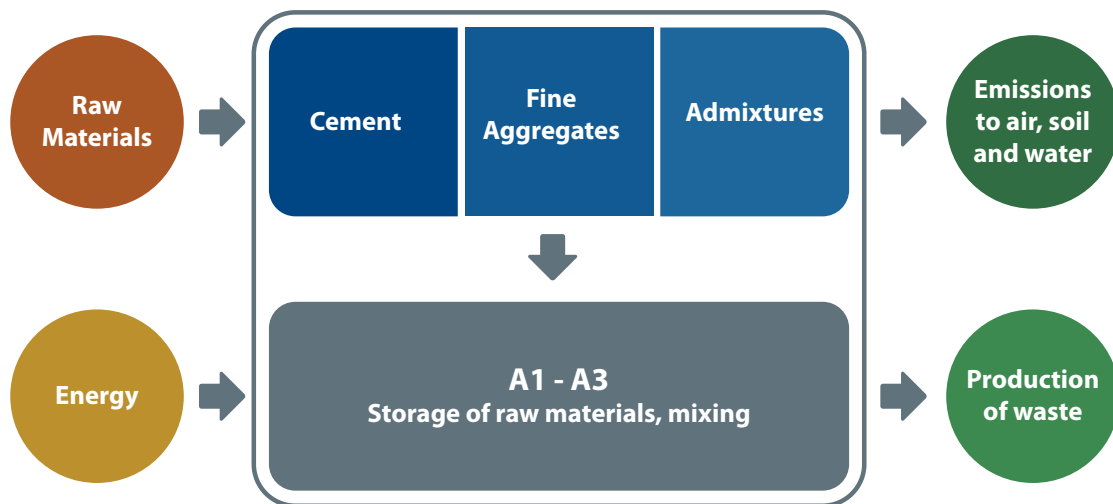


SYSTEM DIAGRAM

The scope of this study is “Gradle to gate” covering the product stage (modules A1-A3), since the product fulfills the three conditions required by EN 15804:2012+A2:2019, about the exclusion of modules C1-C4 and D.

Product Stage			Construction Stage		Use Stage							End-of-life Stage				Resource Recovery
Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

More information: X= included, ND = module not declared



> ENVIRONMENTAL INFORMATION

For construction services, the total value of A1-A3 shall be replaced with the total value of A1-A5.

Core environmental impact indicators

Indicator	Unit	M-610
		A1-A3
GWP-tot	kg CO ₂ eq.	1.24E+02
GWP-GHG	kg CO ₂ eq.	1.24E+02
GWP-fos	kg CO ₂ eq.	1.24E+02
GWP-bio	kg CO ₂ eq.	8.20E-02
GWP-luc	kg CO ₂ eq.	9.15E-02
ODP	kg CFC11 eq.	6.11E-06
AP	mol H ⁺ eq.	5.33E-01
EP-fw	kg P eq.	1.31E-02
EP-mar	kg N eq.	6.62E-02
EP-ter	mol N eq.	1.55E+00
POCP	kg NMVOC _{eq.}	3.99E-01
ADPE	kg Sb _{eq.}	1.30E-04
ADPF	MJ	1.09E+03
WDP	m ³ _{eq.}	6.79E+01

Acronyms

GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

1. Eutrophication aquatic freshwater shall be given in both kg PO₄⁻³ eq and kg P eq.
2. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

* Disclaimer: M-610 has been a representative product based on production volumes (>95% of volumes).

Use of resources

Indicator	Unit	M-610
		A1-A3
PERE	MJ	2.45E+02
PERM	MJ	3.56E+02
PERT	MJ	6.01E+02
PENRE	MJ	1.07E+03
PENRM	MJ	1.91E+01
PENRT	MJ	1.09E+03
SM	kg	4.34E+00
RSF	MJ	2.81E+01
NRSF	MJ	4.92E+01
NFW	m ³	1.60E+00

Acronyms

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; NFW = Use of net fresh water

Use of resources

Indicator	Unit	M-610
		A1-A3
CRU	kg	0.00E+00
MFR	kg	4.26E-02
MER	kg	0.00E+00
EE	MJ	0.00E+00

Acronyms

CRU = Components for re-use; MR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy

Other environmental information describing waste categories

Indicator	Unit	M-610
		A1-A3
HWD	kg	2.92E-02
NHWD	kg	2.05E-01
RWD	kg	2.43E-04

Acronyms

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed





> ADDITIONAL INFORMATION

Intermix hereby declares that all mortars, renders and screeds are in compliance with the REACH Regulation (EC) No 1907/2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals. Cement does not contain any Substances of Very High Concern (SVHC) currently on the candidate list. REACH SVHC list is not static and is updated frequently, thus the company will continue to evaluate, research and review to fulfil the demands of the regulation. More information about cement safety handling is available at the Safety Data Sheet (SDS) published at the company's website www.intermix.gr.

Differences versus previous versions

First EPD version – No previous versions

References

- **GPI v.4.0:2021-03-29** General Programme Instructions of the International EPDR System
- **PCR 2019:14 v.1.3.1** Product Category rules | Construction products | The International EPD® System
- **EN 15804:2012+A2:2019/AC:2021** Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
- **CPC 375**
- **ISO 14020:2000** Environmental labels and declarations - General principles
- **ISO 14025:2006** Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- **ISO 14040:2006** Environmental management - Life Cycle Assessment - Principles and framework
- **ISO 14044:2006** Environmental management - Life Cycle Assessment - Requirements and guidelines
- **Industry EPD Tool for Cement and Concrete** (<https://concrete-epd-tool.org/>)
 - User Guide (v4.1, International version, 9 October 2023)
 - LCA Model (v4.1, International version, 9 October 2023)
 - LCA Database (v4.1, 9 October 2023)
- **DAPEEP SA:** Renewable Energy Sources Operator & Guarantees of Origin | Greece | www.dapeep.gr
- **Life Cycle Assessment**
Comparative Life Cycle Assessment: Masonry with mineral mortar and masonry with PU foam bonding in accordance with ISO 14040 and ISO 14044; carried out on behalf of IWM; Fraunhofer Institute for Building Physics IBP, Stuttgart/ Holzkirchen 2008

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