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ENVIRONMENTAL PRODUCT DECLARATION

TURKEY EPD®
ENVIRONMENTAL PRODUCT DECLARATIONS

EPD®
THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

CEM II/A-LL 52.5 N Portland Limestone Cement

PROGRAMME
The International EPD® System

PROGRAMME OPERATOR
EPD Turkey

GEOGRAPHICAL SCOPE
Global

EPD REGISTRATION NUMBER
S-P-08761

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2028-07-13

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

Programme Information

Programme Information

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

Product category rules (PCR)
PCR 2019:14 Construction products (EN 15804:2012+A2.2019/AC:2021) Version 1.2.5

PCR review was conducted by
The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Independent verification of the declaration and data, according to ISO 14025:2021:

☐ EPD process verification ☑ EPD verification

Third party verifier
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Approved by
The International EPD® System Technical Committee, supported by the Secretariat

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

☐ Yes ☑ No

LCA Study & EPD Design Conducted by
Semtrio Sustainability Consulting
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EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, 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 comparability, see EN 15804 and ISO 14025.

Company Information

Owner of the EPD

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Medcem Cement factory was built by Medcem Madencilik ve Yapi Malzemeleri San Tic AŞ with the highest environmental awareness by using the latest technological systems and started its production activities in the second half of 2015.

Medcem Cement has an annual clinker production capacity of 3.5 million tons.

Our factory, whose production is mostly planned for export, aims to become a rapidly expanding and recognized brand in the world by steadily increasing its market share in the global market.

Medcem Cement is preparing to become one of the world's largest cement producers by multiplying its strength in the international market with its second line investment, the foundation of which was laid in August 2021.

The new investment, together with the increase in capacity, will provide an increase of approximately 30% in personnel employment.

Medcem Solid Waste Incineration Facility was established as Turkey's first Solid Waste Incineration Facility in Corlu with a total investment of 110 million dollars in 2015.

Our Solid Waste Incineration facility enables the conversion of paper wastes, treatment sludge and wastes from other paper mills in the vicinity, which are generated in the paper production process of Modern Karton, one of the group companies.

The facility makes a great contribution to the environment, the industrialists in the region and the country's economy with the disposal of wastes. The facility has a total capacity of 27.6 mw/h of electricity or 100 tons/h of steam.

With its new investment planned to be completed in 20 months, Medcem Cement will increase its annual clinker production capacity of 3.5 million tons to 6.5 million tons, resulting in a capacity increase of approximately 90%.

Product Information

Product Name:

CEM II/A-LL 52.5 N Portland Limestone Cement

In the cement industry, various efforts are underway to reduce the environmental impact of cement by increasing the use of alternative fuels, incorporating substitute additives into cement, and adding limestone additives, among other methods. Many of these sustainable practices also contribute to reducing the carbon footprint of concrete. These initiatives have made it possible to develop products with lower clinker content, which offer high performance and durability in concrete, while reducing the carbon footprint.

Our high-performance Portland limestone cement product, produced according to the EN197-1 cement standard, has a lower clinker content of 6-15% compared to ordinary Portland cement. This enables the reduction of carbon footprint without compromising the performance of concrete.
Furthermore, its chemical composition meets low alkali requirements, making it resistant to alkali-aggregate reactions in concrete

Production

Cement production process begins with mining of the main raw materials, such as limestone and clays. These raw materials are excavated from open mines. After drilling and blasting, they are loaded on to trucks and transported from quarry to the plant.

Besides limestone and clays, some other raw materials are also used for different purposes. For instance, in order to achieve the desired material composition for the kiln process, iron and aluminium sources, such as iron ore and bauxite, are supplied from the related sources. Gypsum is also supplied and used in the final stage of the cement production as a set regulator.

At the plant, first, all the raw materials are crushed with crushers and after crushing each material is stored and homogenized in the allocated storage unit. Then, the required materials (limestone, clay, iron ore, bauxite) to produce half product (Clinker, the main component of the cement) are taken to dosing hoppers and the proportion of each material is arranged with the weigh feeders below these hoppers.

Then, the formed Raw Mix. is fed to the Raw Mill Unit for fine grinding in order to increase the reaction surface area of the material and it becomes Raw Meal and this fine material is stored and homogenized in the Raw Meal Silo.

After the Silo, Raw Meal is first preheated and calcined at the preheater and calciner section of the pyroprocessing system.
Then, at the kiln section of the system, the calcined material is heated to a sintering temperature as high as 1450 °C and suddenly cooled by bursts of air where the chemical bonds of the calcined materials are broken down and then they are recombined into new compounds. By this way, Cement Clinker (the half product), the basic material required for the production of all cements, is produced and then it is stored in concrete silos.

In order to create Cement (the final product), clinker is ground to a fine powder in a Cement Mill Unit with a small amount of gypsum (3-5%) to regulate how the cement will set. During this phase, different mineral materials, called “cement additives”, may be added alongside the gypsum. Used in varying proportions, these additives, which are of natural or industrial origin, give the cement specific properties such as reduced permeability, greater resistance to sulfates and aggressive environments, improved workability, or higher-quality finishes.

Finally, the cement is stored in silos before being shipped in bulk or in bags to the sites where it will be used.

Intended Use of Product

It can be used in all types of infrastructure projects that require long service life, including both substructure and superstructure works. They are suitable for applications such as drainage structures that may be exposed to moderate levels of sulphate attack from groundwater, as well as in constructions like sewers, bridges, and pavements.

Environmental Product Declaration

Technical Specifications

Chemical Requirements	Units of Measurement	Std. Limits	Test Results
SiO_2	%		17.00-20.00
Al_2O_3	%		4.00-5.00
Fe_2O_3	%		3.00-4.00
CaO	%		62.00-65.00
MgO	%		1.0-2.5
SO_3	%	Max. 4.00	2.40-3.20
Cl	%	Max 0.1	0.0020-0.0200
Loss on Ignition (LOI)	%		4.00-8.00
Free CaO	%		0.50-2.50
Cr (VI)	ppm		3-30
Na_2O	%		0.04-0.18
K_2O	%		0.40-0.60
Na_2OEq. (Na_2O + 0.658*K_2O)	%		0.30-0.60
Total Additive	%	Min. 6.0 Max. 20.0	6.10-16.00
Lime Saturation Factor (LSF)	-		107.00-115.00
Silica Modulus (SM)	-		2.10-2.70
Alumina Modulus (AM)	-		1.20-1.70

UN CPC Code : 37440, Portland cement, aluminous cement, slag cement, and similar hydraulic cements, except in the form of clinkers

Technical Specifications

Physical and Mechanical Requirements	Units of Measurement	Std. Limits	Test Results
Specific Gravity (ISO 17892-3)	gr/cm³		3.05-3.13
Specific Surface (EN 196-6)	cm²/g		4000-5000
Residue on 0.045 mm (EN 196-6)	%		0.1-2.0
Residue on 0.090 mm (EN 196-6)	%		0.0-0.2
Initial Setting Time (EN 196-3)	Minute	Min. 45	100-200
Final Setting Time (EN 196-3)	Minute		150-270
Soundness (EN 196-3)	mm	Max. 10.0	0.0-3.0
Normal Consistency (EN 196-3)	%		26.5-30.5

Compressive Strength Method, EN 196-1	Units of Measurement	Std. Limits	Test Results
2 Days	MPa	Min. 20.0	28.0-36.0
28 Days	MPa	Min. 52.5	57.0-66.0

UN CPC Code: 37440. Portland cement. aluminous cement. slag cement. and similar hydraulic cements. except in the form of clinkers

LCA Information

Declared Unit

1000 kg CEM II/A-LL 52.5 N Portland Limestone Cement manufactured in Silifke, Mersin facility (TR)

Reference Service Life

Not applicable.

Time Representativeness

The inventory for the LCA study is based on the period of 1st January 2022 and 31st December 2022

Database(s) and LCA software used

SimaPro v9.4.0.2 LCA software and Ecoinvent 3.7.1

Description of System Boundaries

Cradle to Gate (A1-A3)

Data Quality and Data Collection

data was used for module A3 (Processes the manufacturer has influence over) and was gathered from manufacturing plant. Specific data includes actual product weights, amounts of raw materials used. product content, energy consumption, transport figures, water consumption and amounts of wastes.

Allocation

The total values for the plant's raw material, energy consumption, water consumption, and waste output over a one-year period have been divided by the annual output of each product to provide a value per kg of cement produced.

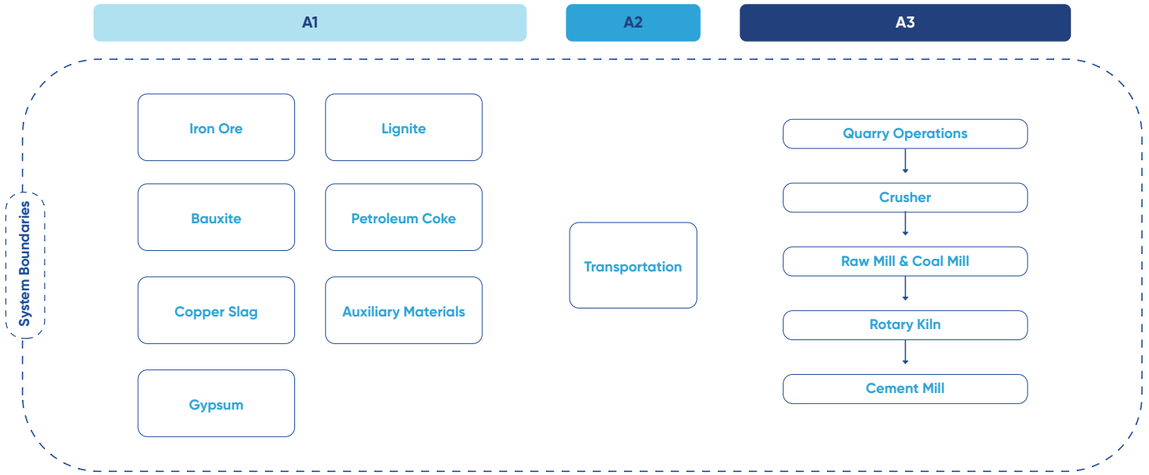
Cut-off Rules

Life Cycle Inventory data for a minimum of 99% of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				RESOURCE RECOVERY STAGE
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintanence	Repair	Replacement	Refurbishment	Operaitional energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Recycling Potential
MODULES	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	GLO	GLO	TR	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data used	>99%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

System Diagram



Description of Declared Modules

A1 - Raw Materials Supply

This module takes into account raw material extraction, processing and energy used in the production process.

A2 - Transport to the Manufacturer

This module includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as seaway and roadway.

A3 - Manufacturing

This stage includes energy and water consumption during the manufacturing process. The processing of any waste arising from this stage is also included. Followed production processes are as;

- Quarry Operations
- Crusher
- Raw Mill & Coal Mill
- Rotary Kiln
- Cement Mill

Information on which life cycle stages are not considered

This EPD only covers the Cradle to Gate (A1-A3) stages. According to EN 15804:2012+A2.2019/AC:2021, the productor material is physically integrated with other productsduring installation so they cannot be physically separatedfrom them at end-of-life so the end-of-life scenarios are excluded from this study. End-of-life scenarios for cement can be found in EPDs for concrete and mortar.

Content Declaration

Content Declaration of 1000 kg of CEM II/A-LL 52.5 N Portland Limestone Cement

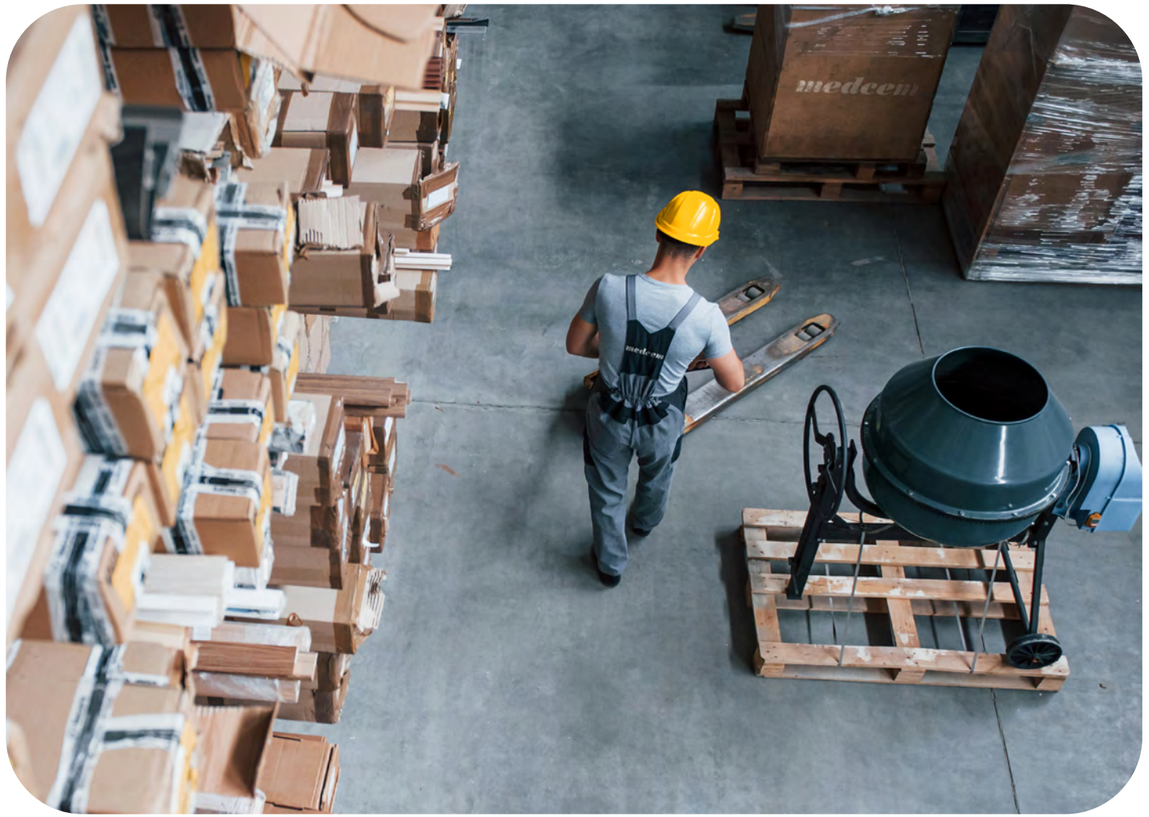
PRODUCT	CLINKER, WEIGHT-%	GYPSUM, WEIGHT-%	LIMESTONE, WEIGHT-%	AUXILIARY MATERIALS, WEIGHT-%	RENEWABLE MATERIAL, WEIGHT-%	BIOGENIC CARBON, WEIGHT-%
CEM II/A-LL 52.5 N Portland Limestone Cement	75%-91%	3%-5%	6%-20%	<1%	0	0

* The product does not contain “Candidate List of Substances of Very High Concern (SVHC)” compounds.

*The main input of the product, clinker, contains clay, limestone, iron ore, copper slag, and bauxite.

Packaging Materials

CEM II/A-LL 52.5 N Portland Limestone Cement is sold in bulk form.



Environmental Product Declaration

Environmental Performance

Potential Environmental Impact Mandatory Indicators According to EN 15804

RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
Indicator	Unit	Total A1-3
GWP-fossil	kg CO_2 eq	776
GWP -biogenic	kg CO_2 eq	1.12
GWP-luluc	kg CO_2 eq	0.780
GWP-total	kg CO_2 eq	778
ODP	kg CFC 11eq	2.62E-05
AP	mol H+ eq	1.19
EP-Freshwater	kg P eq	3.85E-02
EP-marine	kg N eq	0.219
EP-Terrestrial	mol N eq	2.44
POCP	kg NMVOC eq	0.729
ADP-minerals & metals*	kg Sb eq	4.55E-04
ADP-fossil*	MJ	3670
WDP	m^3	53.0

*** Disclaimer:** The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

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-aquatic freshwater =** Eutrophication potential, fraction of nutrients reaching aquatic 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

Potential Environmental Impact Additional Mandatory and Voluntary Indicators

RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
Indicator	Unit	Total A1-3
GWP-GHC[1]	kg CO_2 eq	776
RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
PM	[disease inc.]	8.75E-06
IRP	[kBq U235 eq]	7.25
ETP-fw	[CTUe]	2585
HT-C	[CTUh]	6.01E-08
HT-NC	[CTUh]	1.74E-06
SQP	[pt]	961

Acronyms

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; **PM =** Potential incidence of disease due to PM emissions; **IRP =** Potential Human exposure efficiency relative to U235; **ETP-fw =** Potential Comparative Toxic Unit for ecosystems; **HT-C =** Potential Comparative Toxic Unit for humans; **HT-nc =** Potential Comparative Toxic Unit for humans; **SQP =** Potential soil quality index (SQP)

[1] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Environmental Product Declaration

Use of Resources

RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
Indicator	Unit	Total A1-3
PERE	MJ	248
PERM	MJ	0
PERT	MJ	248
PENRE	MJ	4000
PENRM	MJ	0
PENRT	MJ	4000
SM	kg	0
RSF	MJ	0
NRSF	MJ	0
FW	m^3	8.94

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 resources; **SM =** Use of secondary material; **RSF =** Use of renewable secondary fuels; **NRSF =** Use of non-renewable secondary fuels; **FW =** Use of net fresh water

Waste Production

RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
Indicator	Unit	Total A1-3
Hazardous waste disposed	kg	0
Non-hazardous waste disposed	kg	0
Radioactive waste disposed	kg	0

Output Flows

RESULTS FOR 1000 KG CEM II/A-LL 52.5 N PORTLAND LIMESTONE CEMENT		
Indicator	Unit	Total A1-3
Components for re-use	kg	0
Material for recycling	kg	0.108
Materials for energy recovery	kg	0
Exported energy, electricity	MJ	0
Exported energy, thermal	MJ	0

References

ISO 14040 2006 Environmental management - Life cycle assessment - Principles and framework

ISO 14044 2006 Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14025 2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14020 2000 Environmental labels and declarations - General principles

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

The International EPD® System www.environdec.com

The International EPD® System The General Programme Instructions v4

The International EPD® System PCR 2019:14 Construction products (EN 15804:2012+A2.2019/AC:2021) Version 1.2.5

Ecoinvent 3.7 www.ecoinvent.org

SimaPro LCA Software www.simapro.com

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