Life Cycle Assessment

For the KP 222 plaster by Orbond

Publication date: 6/09/2023

In accordance with ISO 14040/44 and EN 15804+A2 the PCR of

Construction Products.

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General Information

LCA Owner	Knauf Orbond https://www.orbond.co.il/
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Independent verification of the declaration and data, according to ISO 14040/44 and EN15804+A2:2019.	
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Declarations of LCA

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

The LCA is based on the standard EN 15804+A2. LCAs of construction products may not be comparable if they do not comply with this standard. Only LCAs which are based on the PCR of construction products EN 15804+A2 and comply with the rules of this standard can be compared.

Summary

The following declaration is a summary of a cradle to gate (A1 – A3) LCA (Life Cycle Assessment) of cement plaster that is used for internal applications in the construction sector. The study modeled the production process of KP222 cement plaster that manufactures in Israel.

The main objective of the study was to provide information to Orbond regarding the environmental impacts of the raw materials, transportation and manufacturing of the cement plaster, in compliance with the leading LCA standards for construction materials (ISO 14040, ISO 14044 and EN 15804:2012+A2:2019/AC:2021). Additional main objectives of the study were to identify and quantify the most significant stages contributing to the environmental impacts, in order to enable a potential reduction.

Company Info

Knauf Orbond is an Israeli company. It produces a variety of solutions for the construction industry including KP 222 cement plasters.

Knauf Orbond considers sustainability to be a core value. It prefers building materials that has won sympathy among environmental authorities around the world and their products are defined as green building products. The cement plasters offered by Knauf Orbond have now a verified LCA and a green label mark by the standard institution of Israel for dry mixtures for construction.

Cement is a powder produced from limestone, silica, clay, aluminum and ferrous oxides and sand that are mined from quarries. The product does not contain any toxic and harmful substances and its manufacturing process and usage produce almost no waste.

Knauf Orbond offers the construction industry a wide and rich range of products, including locally produced products and products manufactured by the German company Knauf.

The Knauf corporate operates about 320 plants in about 80 countries on five continents.

Product Information

- **KP 222** – cement plaster for internal use to be applied In Two layers. it contains water resistant polymer for leveling internal and external walls and ceilings. The product used as a primary layer and a leveling layer at residential, industrial and public buildings.

Name of Product	Material	KP 222
Raw Materials	Silica	68%-70%
	Grey Cement	24%-30%
	Limestone	74%-76%
	Lime	0-1.5%
	Additives	0.5-1
Weight of Product [kg]		40
Materials	Wooden pallet	<1%
	Plastic stretch hood	<1%
	Polyester Strapping	<1%
UN CPC	375 – Articles of concrete, cement and plaster	

Life Cycle Assessment Calculation Rules

Declared Unit: The declared unit is 1 kg of cement plaster.
Type of LCA: Cradle to gate.

Declared modules: A1 - A3.

Goal and Scope: This LCA evaluates the environmental impacts of the production of 1 kg of Orbond plaster from cradle to gate.

Reference Service Life (RSL): 50 years. This value is the amount of time that we recommend our products last for without refurbishment, and corresponds to standard building design life.

Cut–off Criteria: The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR of the EPD International Institution. The study does not exclude any hazardous materials or substances. The study includes all major raw materials and energy consumption. All inputs and outputs of the unit processes with available data are included in the calculation. There is no neglected unit process of more than 1% of total mass or energy flows, and in fact components with a share of even less than 1% are included.

Allocations: In this study, as per EN 15804, allocation is conducted in the following order:
1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

Overall and in general, allocations were avoided whenever possible. Nevertheless, allocations were made in the general energy usage.
Allocation used in Ecoinvent 3.8 environmental data sources follows the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804 standard.

Assumptions and Limitations:

- Assumptions were made regarding the transportation for all materials required for manufacturing and packaging the product. The calculation was distance based.
- Approximated generic data has been used for additives which were not found in the Ecoinvent datasets, in addition to other databases and to research that was carried out.
- Generic data of larger areas have been used for a few materials and processes inputs.

Geography: The study represents the manufacturing of cement plaster in manufacturing factory in Israel.

Time Representativeness: The data is representative for the year of 2021 and was collected for 12 months from January to December.

Software: Simapro 9.4.0.3.

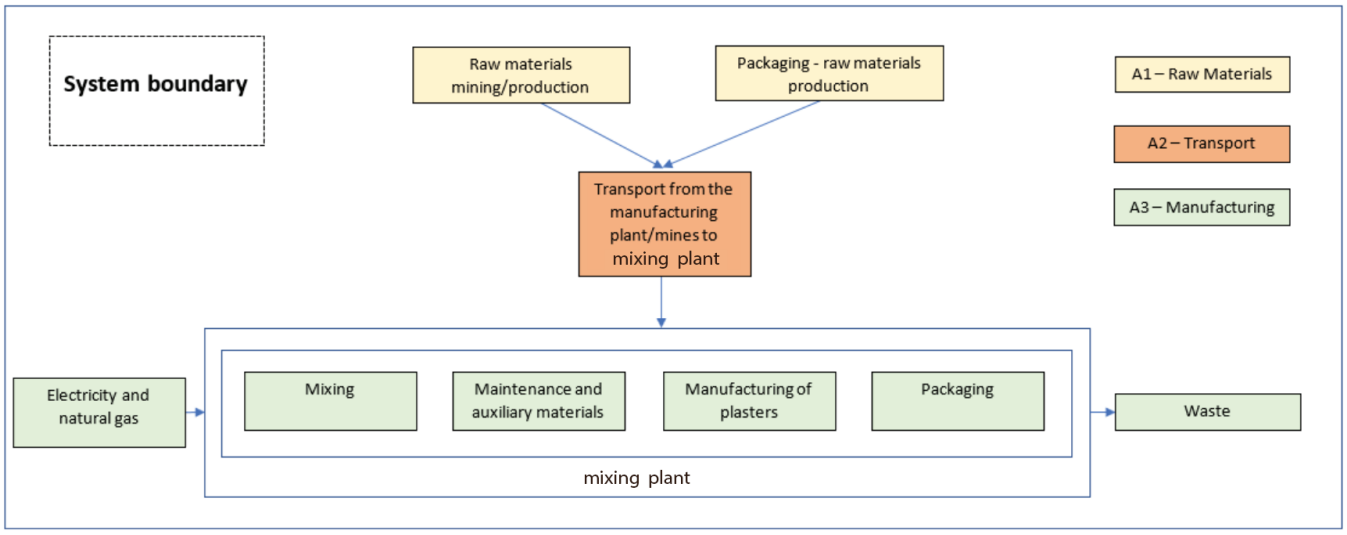
Foreground Data: The LCA is based on production data e.g., material flows and energy consumption, provided by Ashbond.

Background Data: For modelling the LCA, the latest version of Ecoinvent (v3.8-2021) was used. The LCA is based on production data. Since there are hardly any datasets available for Israel, background data for larger area which Israel is included in was used for the life cycle inventory. For electricity data, an Israeli dataset was prepared according to the data of 2019, from the official report of research organization of the ministry of environmental protection from Jan. 2021.
The electricity mix of high voltage electricity grid according to 2020 data is given by a formal report from the ministry of energy in Israel, and is as follows: 32.3% of hard coal, 64.9% of natural gas, 0.4% of oil and 2.3% of other and renewable.

Impact Model Applied: EN 15804 + A2 method.

Life Cycle Stages

The general life cycle of the cement plaster is as shown in the following figure:



System Boundaries

System boundaries chosen for the LCA (X - module included in LCA, MND - module not declared):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	IL, EUR, Global	IL, EUR, Global	IL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Specific data used	>90			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Variation – products	0%			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Variation – sites	0%			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Within this Life Cycle Assessment, the following processes are considered:

Module A1 – Supply of raw materials: The declared cement plaster consists of cement, aggregates mix and additives. The raw materials supply includes raw material extraction/ production that are taken into account in this study. The raw materials of packaging i.e., wooden pallets, paper bags and polyethylene are also included in this module. For each raw material an inventory of the most accurate data according to the primary data provided by the producer is collected and modeled.

Module A2 – Transport of raw materials: The cement is produced abroad in a nearby country. Accordingly, transport distances are short and done by ships and trucks. The aggregates are mainly extracted in Israel and transported locally. Further raw materials are supplied from manufacturers within Israel or other European countries.

Module A3 – Manufacturing: The manufacturing includes mixing of cement with aggregates and additives according to the relevant recipes of each product. The end products are packaged into bags and compiled on wooden pallets. Powder plaster products must be protected from moisture absorption, therefore during transportation and storage they are stored in enclosed spaces. Electricity is consumed during the manufacturing process, in addition to maintenance procedures.

Exclusion of Modules

Modules A4-A5, B1-B7 are not mandatory and excluded from this LCA according to the PCR of construction products EN 15804+A2.

Modules C1-C4 and D can be ommited if the LCA fulfill all three conditions mentioned in the PCR according to EN15804+A2 clause 5.2.

Environmental Impacts

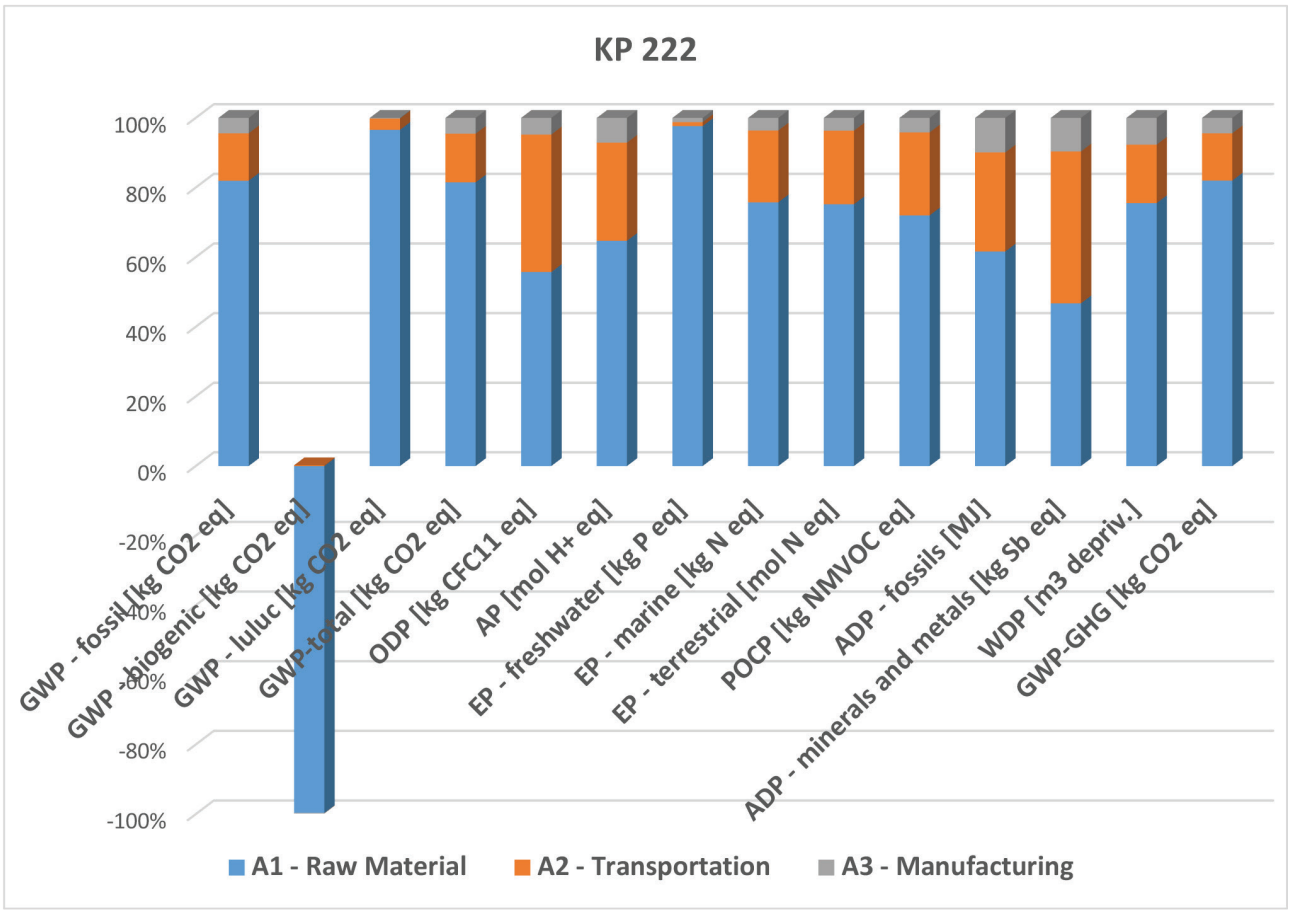
All characterization models, characterization factors and methods used are as defined in the PCR of construction products EN 15804+A2 Annex C Tables C.1-C.4.

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following tables and figures represent the impact category assessment results of this LCA. All the core environmental impact indicators, resources use, waste and output flows were calculated for the cement plaster and added to this section of the LCA. Additional environmental impact indicators that are not mandatory were excluded from this LCA according to EN15804+A2, clause 7.2.3.2. The impact category indicators acronyms are explained in the "Abbreviations of Indicators" sector of this LCA below.

The Environmental Impacts of the KP 222 plaster.

The Impact Assessment - for 1 kg of KP 222					
Impact Category	**Unit**	**A1**	**A2**	**A3**	**Total**
GWP-fossil	kg CO2 eq	2.46E-01	4.09E-02	1.33E-02	3.01E-01
GWP-biogenic	kg CO2 eq	-8.28E-03	1.88E-05	-1.68E-05	-8.28E-03
GWP-luluc	kg CO2 eq	5.54E-04	1.87E-05	9.07E-07	5.73E-04
GWP-total	kg CO2 eq	2.39E-01	4.10E-02	1.33E-02	2.93E-01
ODP	kg CFC11 eq	1.24E-08	8.75E-09	1.06E-09	2.22E-08
AP	mol H+ eq	6.19E-04	2.70E-04	6.81E-05	9.57E-04
EP-freshwater	kg P eq	2.79E-05	3.23E-07	3.46E-07	2.85E-05
EP-marine	kg N eq	2.25E-04	6.14E-05	1.07E-05	2.98E-04
EP-terrestrial	mol N eq	2.43E-03	6.83E-04	1.19E-04	3.23E-03
POCP	kg NMVOC eq	6.17E-04	2.04E-04	3.57E-05	8.57E-04
ADP-fossil	MJ	1.29E+00	5.95E-01	2.08E-01	2.09E+00
ADP – minerals & metals	kg Sb eq	1.41E-07	1.31E-07	2.91E-08	3.01E-07
WDP	m3 depriv.	8.86E-03	1.97E-03	9.00E-04	1.17E-02
Disclaimer 1	This impact category deals mainly with eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effect due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.				
Disclaimer 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 experience with the indicator.				


KP 222
100%
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
GWP - fossil [kg CO2 eq]
GWP - biogenic [kg CO2 eq]
GWP - luluc [kg CO2 eq]
GWP-total [kg CO2 eq]
ODP [kg CFC11 eq]
AP [mol H+ eq]
EP - freshwater [kg P eq]
EP - marine [kg N eq]
EP - terrestrial [mol N eq]
POCP [kg NMVOC eq]
ADP - fossils [MJ]
ADP - minerals and metals [kg Sb eq]
WDP [m3 depriv.]
GWP-GHG [kg CO2 eq]
A1 - Raw Material
A2 - Transportation
A3 - Manufacturing

Indicators Describing Resource Use – for KP 222					
Parameter	Unit	A1	A2	A3	Total
PERE	MJ	2.22E-01	6.63E-03	5.30E-03	2.34E-01
PERM	MJ	1.07E-01	0.00E+00	0.00E+00	1.07E-01
PERT	MJ	3.29E-01	6.63E-03	5.30E-03	3.41E-01
PENRE	MJ	1.27E+00	5.95E-01	2.08E-01	2.08E+00
PENRM	MJ	1.99E-02	0.00E+00	0.00E+00	1.99E-02
PENRT	MJ	1.29E+00	5.95E-01	2.08E-01	2.10E+00
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m3	3.70E-04	6.52E-05	2.74E-05	4.62E-04

Environmental Information Describing Waste Categories – for KP 222					
Parameter	Unit	A1	A2	A3	Total
HWD	kg	1.32E-06	1.46E-06	2.96E-07	3.07E-06
NHWD	kg	1.02E-02	2.77E-02	9.20E-04	3.89E-02
RWD	kg	6.19E-06	3.91E-06	3.00E-07	1.04E-05
CRU	kg	0	0	0	0
MFR	kg	0	0	0	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Abbreviations of Indicators

GWP-fossil	Global warming potential of fossil fuels
GWP-luluc	Global warming potential of land use and land use change
GWP-biogenic	Global warming potential of biogenic carbon
GWP-total	Global warming potential total
ODP	Depletion potential of the stratospheric ozone layer
AP	Acidification potential
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 of accumulated exceedance, the oversaturation of an eco-system with non-organic nutrients
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADP - minerals & metals	Abiotic depletion potential for – minerals and metals
ADP-fossil	Abiotic depletion potential for fossil resources
WDP	User deprivation potential, deprivation weighted water consumption
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	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	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
HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed
CRU	Components for re-use
MFR	Materials for recycling
MER	Materials for energy recovery
EEE	Exported electrical energy
EET	Exported thermal energy

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References

Orbond technical data sheets
/https://www.orbond.co.il

"The energy economy in Israel 2019"
by The Ministry of Energy.

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations principles and procedures.

ISO 14040:2006 Environmenta management. Life cycle assessment principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment requirements and guidelines.

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

Ecoinvent database v3.8 (2021)