ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025:2006 and EN 15804:2012+A2:2019 for

C32/40 READY-MIX CONCRETE

by Readymix Industries (Israel) Ltd.

Programme:
The International EPD® System
www.environdec.com

Programme Operator:
EPD International AB

S-P Code:
S-P-05718

Publication Date:
2022-03-29

Validity Date:
2022-03-28

Geographical Scope:
Israel

EPD® THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM

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

The International EPD® System

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ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR):

2019:14 Version 1.11, 2021-02-05, Construction
Products and CPC 375 Construction Services, EN 15804:2012 + A2:2019 Sustainability of Construction Works

PCR review was conducted by:
The Technical Committee of the International EPD® System. See www.environdec.com/TCfor a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile

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

EPD process certification EPD verification ☑

Third party verifier: Prof. Vladimír Kočí

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 ☑

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

ABOUT THE COMPANY

The Readymix Group is Israel's leading producer and supplier of raw materials for the Construction Industry. Over the decades, the Group has built its reputation on providing building solutions based on products and services representing consistent high quality, excellence, and reliability. Readymix Industries (Israel) is a story of development, success, and contribution to the country's industry. In the early '60s, the British company RMC began to expand worldwide and established Readymix Industries (Israel) Ltd. in 1962. The hands that had cast the first concrete cube in the company's plant in December 1962, are the same hands that have brought the company this far. In 2005, RMC was acquired by CEMEX.
CEMEX is a leading vertically integrated heavy building materials company focused on four core businesses—Cement, Ready-Mix Concrete, Aggregates, and Urbanization Solutions. The Group is active in several fields and specializes in ready-mixed concrete, aggregates, infrastructure products, landscape products, chemical admixtures for concrete, and white cement.

The Readymix Group's Concrete Division is the leading producer of ready-mixed concrete and mortar in Israel. With a national network of plants from Kiryat Shmona in the north to Eilat in the south, the Group can ensure transfer and efficient supply to its customers. Readymix has supplied concrete for many of Israel's most prominent construction projects, including power stations, bridges, airports and many other important projects, such as Ben Gurion 2000 Airport, the Ayalon Highway, the Ashkelon and Herzliya marinas, the Cross-Israel Highway, the Haifa national soccer stadium and a desalination plant.

ABOUT THE PRODUCT

Concrete is a composite material consist of cement, coarse and fine aggregates, water, and minor additives. When water is mixed with cement and aggregates, the mixture forms a fluid slurry which can be poured easily. The reaction between water and cement occurres and within several hours it hardens and form a hard matrix binds. The final product is transported to the construction sites via concrete mixers.

The declared product is C32/40 ready-mix concrete which complies with the requirements. The density of the concrete is 2.33 tons per m³. The cement used in the product is CEM II 52.5 N / A-M SLV. Breakdown is as follows:

The use and end-of-life performances of the related product are valid in Israel.

PRODUCT COMPOSITION

- Cement || 11- 14 %
- Coarse Aggregates || 65- 60 %
- Fine Aggregates || 10- 12 %
- Water || 7- 8 %
- Additives || <1 %

Since fresh concrete is transferred to the construction sites via mixer tracks, there is no packaging use.

LCA INFORMATION

Functional Unit / Declared Unit	1 m³ of Ready-mix Concrete
Time Representativeness	2021
Database(s) and LCA Software Used	Ecoinvent 3.5 and SimaPro 9.0
System Boundaries	Cradle to grave and module D (A + B + C + D)

The inventory for the LCA study is based on the 2021 production figures for Readymix Industries (Israel) Ltd. that covers the production of C32/40 ready-mix concrete at their 52 plants located in Israel. This EPD's system boundary is cradle to grave and module D (A + B + C + D). Through modules A1-A5, the specific data from the manufacturer has been used in the calculations.

For the B1 module, the calcination effect is included. Some portion of the CO_2 emitted during the cement production is taken back during the use phase (B1) of the concrete, known as the calcination process. The reason is the reaction of the calcium hydroxide in the cement paste with the CO_2 in the atmosphere. The amount of CO_2 uptake is determined using calculations based on Table BB.1 in EN 16757 following the simplified method (Sanjuán et al., 2020). The concrete does not require any maintenance (B2), repair (B3), replacement (B4), refurbishment (B5), operational energy use (B6), or operational water use (B7) during its Service Life. Additionally, the effect of calcination during the end-of-life phase of the concrete is also included considering the simplified method. Reference service life is considered as 50 years.

The end-of-life stage (Modules C1-C4) and resource recovery stage (Module D) are modeled on the assumptions that 55.4 % of the construction waste is recycled and the rest is sent to a landfill in Israel. The deconstruction / demolition of the concrete is assumed to be done by a 129 kW construction excavator with a hydraulic hammer. The transport of demolished concrete to a landfill is assumed to be 40 km.

The system boundaries in tabular form for all modules are shown in the table below.

	Product stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction - Demolition	Transport	Waste Processing	Disposal	Future reuse, recyling or energy recovery potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL
Specific Data Used	>90%	>90%	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	NR					-	-	-	-	-	-	-	-	-	-	-	-
Variation-Sites	<10%					-	-	-	-	-	-	-	-	-	-	-	-

X = Included in LCA, ND = Not Declared

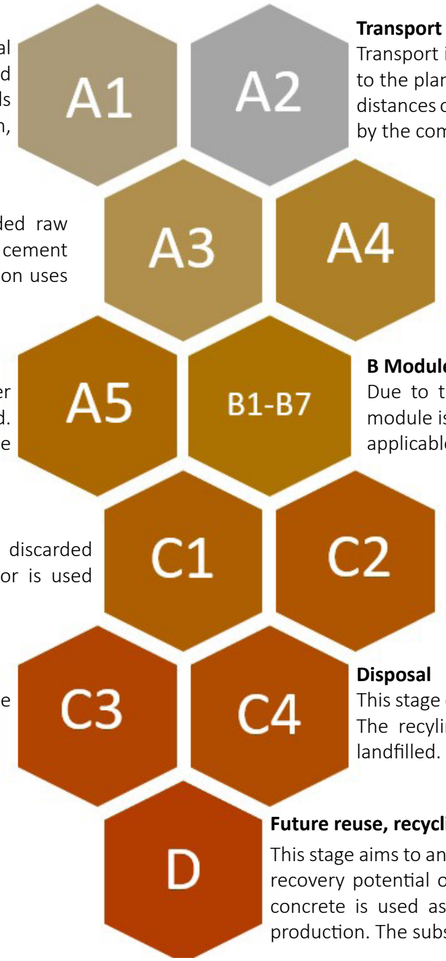
Raw Material Supply
Production starts with acquiring the raw materials. Raw material stage includes raw material extraction and/or preparation and pre-treatment processes before production. The main materials used in the products are cement, gravel, sand, water, fly ash, and minor additives.

Manufacturing
Concrete production starts with gathering all of the needed raw materials to produce a particular type of concrete. Then, the cement is mixed with water and other aggerates. The mixing operation uses rotation to properly blend all the components uniformly.

Construction Installation
The diesel consumption and the efficiency of the concrete mixer truck and the concrete pump at construction site is included. The water consumption is assumed to be 669 lt/m3 concrete during this stage.

Demolition / Deconstruction
This stage includes the demolition / deconstruction of the discarded concrete. It is assumed that 129 kW construction excavator is used during the demolition of the concrete.

Waste Processing
Waste processing refers to the processing steps for the discarded concrete for its final end-of-life phase.



Transport of Raw Materials
Transport is relevant for delivery of raw materials and other materials to the plant and the transport of materials within the plant. Transport distances of the raw materials to different manufacturing sites provided by the company for each route.

Transport to Site
Transport routes for the final product to sites are provided by the company. Based on the given information, the product shipment distances of the routes are calculated.

B Modules
Due to the calcination of concrete during the use phase, the B1 module is included, whereas the rest of the B modules (B2-B7) is not applicable for the related product.

Transport
This stage is related with the transportation of concrete waste to a waste processing area. The transport distance of the waste material is taken 40 km.

Disposal
This stage considers the impacts of the disposal of the related product. The recyling rate of construction waste is 55.4 % and the rest is landfilled.

Future reuse, recycling or energy recovery potential
This stage aims to analyze the benefits coming from the reuse, recyling or energy recovery potential of the investigated product. It is assumed that the recyled concrete is used as a substitute for the gravel content during the concrete production. The substitution rate is taken as 1 % of the reclyed concrete.

MORE INFORMATION

Allocations

Raw materials transportation were weighted according to 2021 transportation figures. In addition, hazardous and nonhazardous waste amounts were also allocated from the 2021 total waste generation.

Cut-Off Criteria

1% cut-off applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The SimaPro 9.0 LCA software and the Ecoinvent 3.5 LCA database were used to calculate the environmental impacts. The regional energy datasets were used for all energy calculations.

Plants included in the EPD

This EPD includes the production of the C25/30 ready-mix concrete at the 52 plants of the Readymix Industries (Israel) Ltd. located in Israel. The location of the plants are indicated on the side.

Variation - Sites

The percentage of raw meterials and the energy requirements do not change from one plant to another. Thus, the variation of sites in terms of GWP-GHG is less than 10 %.

LOCATION OF THE PLANTS

- Alon Tavor
- Arad
- Ashdod
- Ashkelon
- Be'er-Sheba
- Beit-She'an
- Carmiel
- Clanswa
- Dimona
- Eilat
- Eyal
- Gan-Yavneh
- Givat Shaul
- Golani
- Hadera
- Haifa
- Hartuv
- Hatzor
- Holon
- Kadarim
- Kadmany- Maghar
- Kadmany- Yarka
- Katzrin
- Kiryat Bialik
- Kiryat Shmona
- Kiryat-Gat
- Messubim
- Modiim
- Nazareth
- Netivot
- Ofakim
- Petach-Tikva
- Premix-Readymix- Netanya
- Rehovot
- Rishon LeZion
- Rosh Ha'ayin
- Sapir
- Shfaram
- Teffen
- Tiberias
- Tirat HaCarmel
- Tlalim
- Tzemach
- Yavneh
- Yehiam
- Zefat
- Zichron Yaacov

LCA RESULTS	**Environmental Impacts for 1 m³ Ready-Mix Concrete**															
Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP- Fossil	kg CO_2 eq	310	7.13	2.20	-21.0	0	0	0	0	0	0	6.38	15.9	2.17	5.42	-0.098
GWP- Biogenic	kg CO_2 eq	2.86	0.004	0.006	0	0	0	0	0	0	0	0.002	0.006	-0.022	0.011	-11.3E-6
GWP- Luluc	kg CO_2 eq	0.078	0.002	0.001	0	0	0	0	0	0	0	0.001	0.006	229E-6	0.002	-68.8E-6
GWP- Total	kg CO_2 eq	313	7.14	2.21	-21.0	0	0	0	0	0	0	6.38	15.9	2.15	5.43	-0.098
ODP	kg CFC-11 eq	17.9E-6	1.53E-6	474E-9	0	0	0	0	0	0	0	1.38E-6	3.44E-6	183E-9	2.23E-6	-16.9E-9
AP	mol H+ eq	1.02	0.019	0.020	0	0	0	0	0	0	0	0.067	0.047	0.039	0.051	-0.001
*EP- Freshwater	kg P eq	0.034	0.001	372E-6	0	0	0	0	0	0	0	229E-6	0.001	0.002	0.001	-21.5E-6
EP- Freshwater	kg (PO_4) eq	0.104	0.002	0.001	0	0	0	0	0	0	0	0.001	0.004	0.006	0.002	-65.9E-6
EP- Marine	kg N eq	0.287	0.004	0.008	0	0	0	0	0	0	0	0.029	0.010	0.006	0.018	-215E-6
EP- Terrestrial	mol N eq	3.21	0.043	0.090	0	0	0	0	0	0	0	0.323	0.104	0.059	0.195	-0.002
POCP	kg NMVOC	0.850	0.016	0.025	0	0	0	0	0	0	0	0.089	0.039	0.016	0.057	-0.001
ADPE	kg Sb eq	0.027	185E-6	17.9E-6	0	0	0	0	0	0	0	9.78E-6	425E-6	8.47E-6	49.6E-6	-340E-9
ADPF	MJ	1846	101	30.3	0	0	0	0	0	0	0	87.8	234	83.8	152	-1.36
WDP	m^3 depriv.	133	0.287	28.0	0	0	0	0	0	0	0	0.118	0.769	0.383	6.79	-0.476
PM	disease inc.	9.95E-6	429E-9	488E-9	0	0	0	0	0	0	0	1.77E-6	1.00E-6	48.9E-9	1.00E-6	-9.8E-9
IR	kBq U-235 eq	7.43	0.524	0.199	0	0	0	0	0	0	0	0.399	1.09	0.015	0.677	-0.009
ETP- FW	CTUe	3567	81.7	25.0	0	0	0	0	0	0	0	52.9	207	44.7	98.3	-1.02
HTTP- C	CTUh	76.7E-9	2.28E-9	1.6E-9	0	0	0	0	0	0	0	1.85E-9	5E-9	535E-12	2.27E-9	-66.3E-12
HTTP- NC	CTUh	2.58E-6	86.3E-9	35.5E-9	0	0	0	0	0	0	0	45.6E-9	202E-9	25.8E-9	70.2E-9	-1.48E-9
SQP	Pt	1454	71.0	4.68	0	0	0	0	0	0	0	11.2	160	8.96	318	-1.16
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change- biogenic, GWP-luluc: Climate change- land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion- elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics- particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.															
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site, A5: Construction Installation, B1: Use, C1: Deconstruction / Demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.															
Disclaimer 1	This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects 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 experienced with the indicator.															
*Disclaimer 3	EP-freshwater: This indicator is calculated both in kg PO_4 eq and kg P eq as required in the charactarization model. (EUTREND model, Struijs et al, 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)															

Resource use for 1 m³ Ready-Mix Concrete																
Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	68.0	1.45	0.910	0	0	0	0	0	0	0	0.475	2.65	0.404	1.23	-0.048
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	68.0	1.45	0.910	0	0	0	0	0	0	0	0.475	2.65	0.404	1.23	-0.048
PENRE	MJ	1846	101	30.3	0	0	0	0	0	0	0	87.8	234	83.8	152	-1.36
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	1846	101	30.3	0	0	0	0	0	0	0	87.8	234	83.8	152	-1.36
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.64	0.018	1.19	0	0	0	0	0	0	0	0.008	0.041	0.023	0.166	-0.011
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.															

Waste&Output Flows for 1 m³ Ready-Mix Concrete																
Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NHWD	kg	972E-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RWD	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE (Electrical)	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.															
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site, A5: Construction Installation, C1: Deconstruction / Demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.															

Climate impact according to PCR 2019:14 for 1 m³ Ready-Mix Concrete																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
*GHG-GWP	kg CO_2 eq	309	7.07	2.17	-21.0	0	0	0	0	0	0	6.31	15.7	2.13	5.32	-0.096
GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology * 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																

REFERENCES

/GPI/ General Programme Instructions of the International EPD® System. Version 4.0.

/EN ISO 9001/ Quality Management Systems- Requirements

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/EN ISO 50001/ Energy Management Systems- Requirements

/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

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations- Type III environmental declarations — Principles and procedures

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/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2019:14 Version 1.11 DATE 2019-12-20

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

/Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

/SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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