ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Lafarge Egypt
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	IBU-HOL-HOL-2402001-EG2024000008-ISUE001-EN
Issue date	10/12/2024
Valid to	09/12/2029

Concrete Ultra C25 (320) ECOPACT produced in plant East Cairo 3

Mix code Mix 16090334 version 1, EPD Version 1

Lafarge Egypt

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1. General Information

Lafarge Egypt	Ultra C25 (320) ECOPACT
Programme holder IBU - Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** Lafarge Egypt , Summit 15, El Teseen Street, City Center, Sector one, 5th Settlement, New Cairo Cairo, Egypt
Declaration number IBU-HOL-HOL-2402001-EG2024000008-ISUE001-EN	**Declared product / Declared unit** 1 m³ of unreinforced concrete Ultra C25 (320) ECOPACT
This declaration is based on the product category rules: Concrete components made of in-situ or ready-mixed concrete, 08.2024 (PCR checked and approved by the SVR) **Issue date** 10/12/2024 **Valid to** 09/12/2029	**Scope:** This document refers to the production of Ultra C25 (320) ECOPACT concrete, mix code Mix 16090334 version 1 produced in the plant of East Cairo 3 of Lafarge Egypt in Egypt for use as concrete in building construction and civil engineering. The EPD was calculated with the pre-verified software EN 15804 EPD Generator - RMX of Holcim. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidence. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard is simply referred to as *EN 15804*.
Hans Peters (Chairman Institut Bauen und Umwelt e.V.)	**Verification** The standard EN 15804 serves as the core PCR Independent verification of the declaration and data according to ISO 14025:2011 ☐ internally ☒ externally
Florian Pronold (Managing Director Institut Bauen und Umwelt e.V.)	Matthias Schulz (Independent verifier)

2. Product

2.1 Product description/Product definition
Concrete is produced by mixing cement, aggregates and water with potentially additional cementitious materials, fibers and additives.

The fresh concrete is generally poured into formwork, compacted and hardened in the desired form by hydration of the cement to form a solid artificial rock.

The declared product is unreinforced concrete that is delivered to the job site as ready-mix concrete. In the case of reinforced components, the proportion of reinforcing steel must be taken into account separately.

To calculate the life cycle assessment of the Ultra C25 (320) ECOPACT concrete in plant East Cairo 3, the production data from mix code Mix 16090334 version 1 were used.

For the use and application of the product the respective national provisions at the place of use apply, such as the building codes and the corresponding national specifications.

2.2 Application
Concrete is a widely used building material in the construction industry. It is used for example for the construction of walls, stairs, floor, foundations, bored piles or even complete structures such as bridges.

2.3 Technical data
Concrete Ultra C25 (320) ECOPACT has the following technical properties:

Technical data

Name	Value	Unit
Gross density	2399	kg/m^3
Compressive strength	C20/25	N/mm^2

This concrete product is produced according to standard ECP-203 (2020) Egyptian Code for Design and Construction of Reinforced Concrete Structures. National Housing and Building Research Center as a designed concrete.

This technical data fulfill the requirements according to *ECP 203* standard regarding quality control and conformity checks.

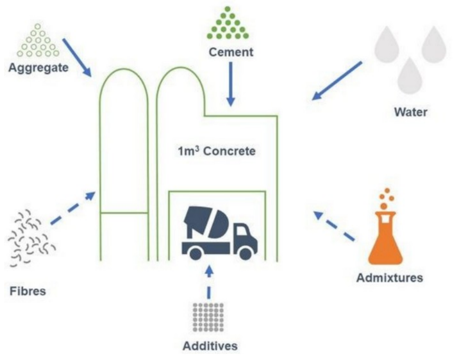
Testing is done according to *EN 12350* and *EN 12390*. Further technical data, as indicated in PCR B, are not relevant for this product. This is because properties such as thermal conductivity, tensile strength or modulus of elasticity can be found in the regulations for the design of concrete components and are therefore not routinely checked.

Performance characteristics for fresh concrete in relation to its characteristics according to the relevant technical regulation (no CE marking).

2.4 Delivery status
Fresh concrete is delivered to the customers in concrete truck mixers. It can also be picked up by the client using their trucks.

2.5 Base materials/Ancillary materials

Name	Value	Unit
Cement	ca. 10-17%	M.%
Water	ca. 7-10%	M.%
Aggregate	ca. 70-90%	M.%
Cementitious	ca. <1%	M.%
Fibers	ca. <1%	M.%
Admixtures	ca. <1%	M.%



Note: dashed lines indicate production steps that do not necessarily apply to this concrete

This product contains substances listed in the ECHA candidate list (date: 12.11.2024) exceeding 0.1 percentage by mass: no

This product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture
The dosed aggregates are first premixed with cement as a binding agent and other additives. The mixture is then mixed with water to form a plastically deformable fresh concrete. This is transported to the customer where it is placed in the prepared formwork and compacted.

To ensure the quality of the concrete, quality assurance systems is installed in East Cairo 3 plant, which is based on the requirements for in-house production control in *ECP 203* standard.

2.7 Environment and health during manufacturing
Fresh concrete and residual water recycling is common practice in the East Cairo 3 plant. Not yet hardened concrete residues from mixers, concrete vehicles, bucket conveyors and concrete distributors are washed out and both the aggregate and the remaining water are reused as concrete raw materials.

Fresh concrete contains a strongly alkaline solution that is created when cement is mixed with water and can cause skin and eye irritation. The abrasiveness of the aggregate used can also support this irritation.

Cements used within this product are low in chromate, as per requirements of *REACH regulation*, in order to limit the development of allergic chromate dermatitis that can happen in the event of prolonged contact with the concrete.

Further information can be found in the safety data sheets.
www.lafarge.com.eg

2.8 Product processing/Installation

In general, after mixing the concrete is transported to the construction site with trucks, placed in the prepared formwork by direct pouring or pumping and usually compacted with internal vibrators. After a sufficiently long hardening time, the formwork is removed and the concrete is cured further with time.

2.9 Packaging

The delivery of concrete does not require the use of packaging material.

2.10 Condition of use

The composition of the concrete does not fundamentally change when it is used.

2.11 Environment and health during use

The natural ionizing radiation from concrete is low and harmless to health. The environmental compatibility of concrete is ensured by the fact that only standardized starting materials may be used that are a priori regarded as harmless.

2.12 Reference service life

A reference service of 50 years is used for modeling concrete’s use phase.

2.13 Extraordinary effects

Fire

According to EN 13501-1, concrete meets the requirements of building material class A1, "non-flammable". In the event of fire, no toxic gases and vapors can arise, and burning concrete components do not drip or fall off.

Fire protection

Name	Value
Building material class	A1 "not combustible"

Water

When exposed to water (e.g. floods), concrete is largely inert. No substances are washed out in quantities that could be hazardous to water.

Mechanical destruction

The mechanical destruction of concrete, e.g. by demolishing concrete, does not produce any substances that are hazardous to the environment or health.

2.14 Re-use phase

Components made of concrete can be dismantled. The concrete is first crushed and separated into individual grain fractions and used in road construction or in small proportions as recycled aggregate for the production of fresh concrete. If steel fibers or rebar is included in the concrete, this is separated during or after demolition and reused as scrap. Recovery of alternative fibers or rebar is not commonplace.

2.15 Disposal

For construction waste made of concrete, the waste codes 17 01 01 (concrete), 17 04 05 (steel fibers) and 17 02 13 (plastic fibers) (WCO) apply in accordance with the European list of waste.

2.16 Further information

Further information: www.lafarge.com.eg

3. LCA: Calculation rules

3.1 Declared unit
1 m³ of unreinforced concrete Ultra C25 (320) ECOPACT

In the case of reinforced components, the proportion of reinforcing steel must be taken into account separately.

Declared unit

Designation	Value	unit
Declared unit	1	m^3
Density	2399	kg/m^3
Conversion factor to 1 kg	4.17E-4	-

To calculate the life cycle assessment of the Ultra C25 (320) ECOPACT concrete in plant East Cairo 3, the production data from mix code Mix 16090334 version 1 were used.

3.2 System boundary

Type of EPD: cradle to gate with options, modules C1–C4, and module D (A1–A3 + C + D and additional modules A4, A5 and B1)

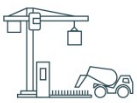
The selected system boundaries include the production of the concrete including the extraction of raw materials through to the installation, use and end of life of the finished product.

Material production and placement

Module A1: Extraction and processing of the raw materials used in concrete production

Module A2: Transport of the raw materials to the plant

Module A3: Concrete production in the plant and waste treatment



Module A4: Transport to the construction site

Module A5: Includes all processes associated with placing the concrete (e.g. pumping or installation by crane) as well as the production, transport and treatment of unused concrete (e.g. return concrete)

Use phase

Module B1: Carbonation during the use phase

Module B2-B7: For concrete components, maintenance, repair refurbishment or replacement measures are not usually required during the reference service life. Therefore, no environmental burden is considered in these modules.

End of life

Module C1: Dismantling / demolition of concrete buildings / components

Module C2: Transport of demolished concrete for processing

Module C3: Concrete waste processing

Module C4: Concrete waste disposal

Module D

Module D: Benefits and loads for the use of concrete demolition waste as replacement for primary materials

3.3 Estimates and assumptions
No estimates or assumptions were made that would be relevant for the interpretation of the life cycle assessment results.

3.4 Cut-off criteria
All raw materials for the production of concrete, all transport as well as all energy and water consumption for production, mixing, placing and waste treatment of the concrete were taken into account.

The environmental impacts from the production and use of the formwork were neglected for the life cycle assessment of the concrete production. With the usual frequency of use of formwork, the mass of resources and primary energy used is less than 1% of the total values for concrete production. The materials used for concrete curing were also excluded as they represent less than 1% of the total mass and primary energy use for concrete production.

3.5 Background data
The EN 15804 EPD Generator - RMX of Holcim version 1.0.0 dated 15.11.2024 was used for the life cycle assessment.

Datasets from EPDs and from the Ecoinvent (version 3.9.1) were used for the calculation.

3.6 Data quality
The data basis for this EPD is the continuous data acquisition in the East Cairo 3 plant. The data collected were reviewed for plausibility by Holcim Innovation Centre and were rated as very good quality.

The background datasets are on average less than 5 years old and their quality is overall rated as good or very good.

3.7 Period under review
For the life cycle assessment of the Ultra C25 (320) ECOPACT, data from the period 01/01/2023 to 31/12/2023 were used.

3.8 Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Egypt

3.9 Allocation
Cementitious products such as fly ash, blast furnace slag or silica fume are considered co-products and economic allocation is used.

The alternative fuels used for the production of the cements used are classified either as secondary fuels or as waste. Emissions from secondary fuels are included in the impact assessment results while emissions from waste fuels are reported as additional information according to the *IBU Cement PCR*. The waste status of the fuels concerned was verified using their waste codes. The exclusion of the impact due to the combustion of combustible waste was only applied to CO2 emissions, as other emissions (eg, NOx, SOx, etc.) were not easily differentiated from the different types of fuels.

Energy and auxiliary materials used in the production of concrete are allocated to each individual concrete mix based on the total volume of concrete produced in the plant.

Finally, the use of recycled and/or secondary raw materials is allocated to each individual concrete mix based on their actual composition.

3.10 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The Ecoinvent (version 3.9.1) background database is used.

4. LCA: Scenarios and additional technical information

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in product	0	kg C
Biogenic Carbon Content in accompanying packaging	0	kg C

Note: 1 kg biogenic Carbon is equivalent to 44/12 kg of CO_2

Module A3: Manufacturing
The carbon intensity of electricity used in manufacturing is 0.67 kg CO_2/kWh.

Module A4: Transport to jobsite
The following table shows the data used in the modelling of product transport to the jobsite:

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (per m^3 concrete)	4.50	lt diesel eq./100 km*
Transport distance	12.0	km
Capacity utilization (including empty runs)	43.5	%
Gross density of products transported	2399	kg/m^3
Capacity utilization volume factor	0.87	-

***** If trucks are not powered by diesel, the necessary energy consumption is converted into the equivalent diesel consumption. Therefore the total fuel consumption can be expressed in a single unit of liters of diesel equivalent / 100 km.

Module A5: Installation of concrete
The following table shows the data used in the modelling of product installation:

Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0.25	kWh
Other energy carriers	18.7	MJ
Material loss	62.5	kg

Module B1: Carbonation
Through carbonation, concrete components absorb carbon dioxide from the air during their useful life. This can be expressed as a negative global warming potential in module B1 and is calculated according to EN 16757 using the following data.

Carbonation during use

Name	Value	Unit
Structure type	Building	-
Exposure condition	Building, exterior, in ground	-
Service life	50	yr
Area to volume ratio	5	m^2/m^3
Weight per unit area	480	kg/m^2

Carbonation results for alternative scenarios can be calculated using the following formula

$$CO_2 uptake = \frac{k * \sqrt{t}}{1000} * A_i * D_c * C_{factor}$$

where

k = k-factor sourced from *EN 16757* standard depending on structure type, exposure condition and concrete strength class [mm/year$^{0.5}$]
t = service life (yr)
A_i = area of concrete element (m^2/m^3)
D_c = degree of carbonation sourced from *EN 16757* standard depending on structure type and exposure condition (%)
C_{factor} = 74.8 (kg CO2/m^3). It is calculated as per *EN 16757* standard based on the concrete composition

Module B2-B7:
No maintenance or repair is usually required for concrete during its reference service life. In addition, no energy or water are consumed during its use.

Module C1-C4:
According to the current state of the art, structures made of concrete and reinforced concrete are mainly dismantled with long-front excavators equipped with demolition claws.

Name	Value	Unit
Diesel consumption for demolition process	2.9	lt/m^3
Demolition waste collected	2399	kg

The data for the treatment of concrete waste at end of life is not available.

Therefore, two scenarios for 100% recycling (Scenario 1) and 100% landfill (Scenario 2) are considered in this life cycle assessment.

After demolition the concrete debris is transported to the crushing plant (Scenario 1; C2) or landfill (Scenario 2;C2/1) according to the following details.

Name	Scenario 1	Scenario 2	Unit
Truck	10.5	10.5	km
Train	0	0	km
Barge	0	0	km

In Scenario 1 (100% recycling) the processing of concrete rubble is usually carried out using jaw or impact crushers, which, in addition to pure breaking, also perform a pre-screening and metal separation (C3). No impacts for waste disposal are reported (C4).

In Scenario 2 (100% landfill) the concrete debris without any further processing is landfilled (C4/1). No impacts for waste processing are reported (C3/1).

Name	Scenario 1	Scenario 2	Unit
For reuse	0	0	kg
For recycling	2399	0	kg
For landfill	0	2399	kg

The carbonation of concrete rubble during the end of life phase is modelled according to the guidelines of EN 16757 standard for both Scenario 1 (C3) and Scenario 2 (C4/1).

Module D: Benefits and loads beyond the system boundary

In Scenario 1 (100% recycling), the output at the end of the crushing process can replace the primary materials sand / gravel and crushed stone as secondary material. Potentially recovered steel fibers can be used for the production of new steel products. The results for Scenario 1 are reported in module D.

No Module D results (D/1) are calculated for Scenario 2 (100% landfill).

The benefits in the LCA results for the replacement of primary raw materials are shown in module D.

5. LCA: Results

The table below contains the life cycle assessment results for a declared unit of 1 m³ of unreinforced concrete Ultra C25 (320) ECOPACT.

The characterization factors of the "Environmental Footprint reference Package 3.1" were used to determine the LCA results.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	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	x	x	x	ND	MNR	MNR	MNR	ND	ND	x	x	x	x	x

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³

Core Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO_2-Eq.]	234	4.81	8.67	-2.47	10.4	2.66	2.66	3.53	0	0	12.2	-14.7	0
GWP-fossil	[kg CO_2-Eq.]	234	4.81	8.66	-2.47	10.4	2.66	2.66	3.53	0	0	12.2	-14.7	0
GWP-biogenic	[kg CO_2-Eq.]	0.33	1.67E-3	0.01	0	1.44E-3	7.98E-4	7.98E-4	7.18E-4	0	0	0.01	-0.02	0
GWP-luluc	[kg CO_2-Eq.]	0.04	2.62E-3	1.62E-3	0	1.19E-3	1.32E-3	1.32E-3	4.62E-4	0	0	0.01	-0.01	0
ODP	[kg CFC11-Eq.]	2.25E-6	1.05E-7	1.07E-7	0	1.65E-7	4.16E-8	4.16E-8	1.27E-7	0	0	4.22E-7	-2.43E-7	0
AP	[mol H^+-Eq.]	0.97	0.02	0.05	0	0.10	0.01	0.01	0.03	0	0	0.11	-0.08	0
EP_freshwater	[kg P-Eq.]	1.34E-3	4.24E-5	4.72E-5	0	3.75E-5	2.49E-5	2.49E-5	1.40E-5	0	0	1.42E-4	-3.04E-4	0
EP_marine	[kg N-Eq.]	0.32	0.01	0.02	0	0.04	3.16E-3	3.16E-3	0.01	0	0	0.04	-0.02	0
EP_terrestrial	[mol N-Eq.]	3.43	0.08	0.19	0	0.49	0.03	0.03	0.12	0	0	0.45	-0.27	0
POCP	[kg NMVOC-Eq.]	1.08	0.03	0.06	0	0.14	0.01	0.01	0.04	0	0	0.16	-0.08	0
ADPE	[kg Sb-Eq.]	9.56E-4	1.77E-5	2.69E-5	0	3.78E-6	7.37E-6	7.37E-6	4.74E-6	0	0	2.08E-5	-9.06E-5	0
ADPF	[MJ]	2078	69.1	92.9	0	136	38.7	38.7	84.2	0	0	363	-189	0
WDP	[m³ world-Eq depr.]	95.6	0.31	2.98	0	0.30	0.20	0.20	0.24	0	0	16.1	-80.5	0

Legend	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	55.3	1.16	1.80	0	0.77	0.49	0.49	2.42	0	0	3.08	-10.2	0
PERM	[MJ]	0.94	0	0.02	0	0	0	0	0	0	0	0	0	0
PERT	[MJ]	56.3	1.16	1.82	0	0.77	0.49	0.49	2.42	0	0	3.08	-10.2	0
PENRE	[MJ]	2032	69.1	91.7	0	136	38.7	38.7	84.2	0	0	363	-189	0
PENRM	[MJ]	46.2	0	1.20	0	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	2078	69.1	92.9	0	136	38.7	38.7	84.2	0	0	363	-189	0
SM	[kg]	0	0	0	0	0	0	0	0	0	0	0	2399	0
RSF	[MJ]	83.5	0	2.17	0	0	0	0	0	0	0	0	0	0
NRSF	[MJ]	47.1	0	1.23	0	0	0	0	0	0	0	0	0	0
FW	[m³]	2.21	0.01	0.07	0	0.01	0.01	0.01	0.01	0	0	0.39	-1.89	0

Legend	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 nonrenewable 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 freshwater

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	3.89	0.07	0.13	0	0.11	0.04	0.04	0.05	0	0	0.25	-0.63	0
NHWD	[kg]	133	4.35	66.3	0	0.61	3.71	3.71	0.33	0	0	2400	-8.00	0
RWD	[kg]	0.01	2.42E-5	1.57E-4	0	1.49E-5	8.45E-6	8.45E-6	4.41E-6	0	0	5.37E-5	-1.07E-4	0
CRU	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0.08	0	2.21E-3	0	0	0	0	2399	0	0	0	0	0
MER	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0

Legend	HWD = Hazardous waste disposed; NHWD = Nonhazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2: 1 m^3

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PM	[Disease Incidence]	1.45E-5	6.20E-7	9.44E-7	0	2.06E-5	2.67E-7	2.67E-7	6.42E-7	0	0	2.41E-6	-1.40E-6	0
IRP	[kBq U235-Eq.]	0.90	0.04	0.03	0	0.03	0.01	0.01	0.01	0	0	0.10	-0.17	0
ETP-fw	[CTUe]	751	35.2	37.2	0	65.0	20.8	20.8	20.6	0	0	171	-61.7	0
HTP-c	[CTUh]	1.30E-7	2.40E-9	4.20E-9	0	3.20E-9	1.20E-9	1.20E-9	1.30E-9	0	0	6.20E-9	-1.31E-8	0
HTP-nc	[CTUh]	7.58E-7	7.26E-8	2.86E-8	0	2.21E-8	2.82E-8	2.82E-8	1.40E-8	0	0	7.77E-8	-1.30E-7	0
SQP	[-]	709	45.3	40.9	0	9.17	39.1	39.1	3.41	0	0	721	-208	0

Legend	PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETPfw = Potential comparative Toxic Unit for ecosystems; HTPc = Potential comparative Toxic Unit for humans (cancerogenic); HTPnc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Tips

$2,51e2 = 2,51 \times 10^2 = 251$ $4,25e-3 = 4,25 \times \frac{1}{10^3} = 0,00425$

On Global Warming Potential (GWP):
Net values are declared for all GWP indicators in A1 – A3. The waste status of the (waste-based) fuels used in cement production has been verified. Gross emissions (i.e. including CO2 from incineration of waste) are 239 kg CO2-eq. / t (GWP-total), 238 kg CO2-eq. / t (GWP fossil), 0.33 kg CO2 eq. / t (GWP-biogenic).

For wastes with biogenic carbon content, gross CO2 emissions correspond to the uptake of biogenic CO2 during the biomass growth phase.

Disclaimer 1 – for the indicator “potential Human exposure efficiency relative to U235“. 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 radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 –for the indicators: “abiotic depletion potential for fossil resources”, “abiotic depletion potential for non-fossil resources”, “water (user) deprivation potential”, “deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans - cancer effects”, “potential comparative toxic unit for humans – non-cancer effects”, “potential soil quality index”. 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.

6. LCA: Interpretation

The following table shows the most important influencing factors on important indicators of the impact and life cycle inventory analysis.

Category	GWP_{total}	AP	$EP_{terrestrial}$	POCP	PERT	PENRT	ADPE	FW	PM
Cement	72.4 %	66.9 %	61.2 %	60.2 %	45.2 %	54.2 %	84.9 %	15.7 %	46.2 %
Aggregate	6.16 %	7.56 %	6.95 %	7.16 %	14.2 %	9.27 %	8.15 %	64.1 %	8.39 %
Cementitious	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Fibers	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Admixtures	5.25 %	1.67 %	1.38 %	1.22 %	31.3 %	11.0 %	0.13 %	2.02 %	1.19 %
Other materials and processes	16.2 %	23.9 %	30.4 %	31.4 %	9.36 %	25.6 %	6.86 %	18.1 %	44.2 %
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Legend	**Cement:** Includes the impacts for the production of all cements used. **Aggregate:** Includes the impacts for the production of sand and gravel. **Cementitious:** Includes the impacts for the production of all cementitious materials used such as slag, fly ash or limestone. **Fibers:** Includes the impacts for the production of fibers. **Admixtures:** Includes the impacts for the production of concrete admixtures such as plasticisers or retarders. **Other materials and processes:** Includes the impacts of materials or production processes not covered by the above categories.

In the production of concrete, cement production dominates all impact categories. This applies in particular to the global warming potential (GWP).

Another major influencing factor is the extraction/production and transport of the raw materials. The contribution of other processes in the plant is high in all the indicators.

7. Requisite evidence

7.1 Radioactivity

Measurements of the specific activity (gamma spectrometry) in Europe resulted in the following typical values for concrete (*Radiation Protection 112*) (in Bq/kg concrete).

Element	Typical values (max values)
RA226	40 (240)
Th228	30 (190)
K40	400 (1600)

Radiation exposure in an apartment block made of concrete with the above average activity concentrations will equate to an annual effective dose of about 0.25 mSv (excess to the dose received outdoors) (*Radiation Protection 112*).

In Egypt there are currently no statutory limit values for assessing the radioactivity of building materials.

7.2 VOC emissions and leaching

The environmental compatibility of concrete is ensured by the fact that only standardized starting materials may be used that are a priori regarded as harmless. Therefore, no tests are normally carried out for VOC emissions and leaching of concrete.

8. References

Standards

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EN ISO 14025
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EN 15804
EN 15804:2012+A2+AC:2021, Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products

EN 16757
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ECP 203

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