Dynamon NRG 1012

Model EPD

“Concrete admixtures – Plasticizers and Superplasticizers”

(Declaration number EPD-EFC-20210198-IBG1-EN)

MAPEI®

DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPD

The European Federation of Concrete Admixtures Associations (EFCA) has developed Model Environmental Product Declarations (Model EPD) for six categories of admixtures. These model EPDs have been verified as being in compliance with EN 15804 +A2 and ISO 14025 and published by the Institut Bauen und Umwelt e. V. (IBU). The Model EPD are also available for download from the EFCA website.
Mapei S.p.A. is a member of ASSIAD (Associazione Italiana Produttori Additivi e Prodotti per Calcestruzzo) which is a national association member of EFCA. This gives the company the right to declare that a specific EFCA EPD applies to the named products listed below, by using an IBU-approved guideline procedure, to confirm that any particular product is within the scope of a specific product category Model EPD. This means that the Life Cycle Assessment (LCA) data and other content of the Model EPD apply to these named products and may be used for sustainability assessment of the construction products and construction projects, in which they are used.

Mapei declares that the product

Dynamon NRG 1012

meets the criteria of the attached Model EPD
"Concrete admixtures – Plasticizers and Superplasticizers"
(Declaration number EPD-EFC-20210198-IBG1-EN)

For any enquiries please contact us at sustainability@mapei.it

Mapei S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	European Federation of Concrete Admixtures Associations a.i.s.b.l. (EFCA)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-EFC-20210198-IBG1-EN
Issue date	16.12.2021
Valid to	15.12.2026

Concrete admixtures – Plasticizers and Superplasticizers

European Federation of Concrete Admixtures Associations a.i.s.b.l. (EFCA)

www.ibu-epd.com | https://epd-online.com

1. General Information

European Federation of Concrete Admixtures Associations a.i.s.b.l. (EFCA)

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-EFC-20210198-IBG1-EN

This declaration is based on the product category rules:
Concrete admixtures, 11.2017
(PCR checked and approved by the SVR)

Issue date
16.12.2021

Valid to
15.12.2026

Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

Concrete admixtures – plasticizers and superplasticizers

Owner of the declaration
European Federation of Concrete Admixtures Associations a.i.s.b.l. (EFCA)
Rue d'Arlon 55 BE-1040 Brussels, Belgium

Declared product / declared unit
1 kg of plasticizers and superplasticizers, density: 1 - 1.6 kg/l

Scope:
This verified EPD entitles EFCA to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for the product groups referred to for plants operated in Belgium, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, Turkey and the United Kingdom by companies that are members of EFCA National Associations in these countries and for a period of five years from the date of issue. It involves a Model EPD where the product displaying the highest environmental impact in a group was selected for calculating the Life Cycle Assessment. Please refer to the EFCA website www.efca.info for a list of National Associations.

The application of this EPD is only possible for member companies of EFCA's member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.

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 evidences.

The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard *EN 15804* serves as the core PCR
Independent verification of the declaration and data according to *ISO 14025:2010*
☐ internally ☒ externally

Matthias Schulz
(Independent verifier)

2. Product

2.1 Information about the enterprise

EFCA (European Federation of Concrete Admixtures Associations) was formed in 1984 as a partnership between national admixture associations in order to promote the interests of the industry at European level. For more information (such as membershiplist) see: www.efca.info

2.2 Product description/Product definition

Admixtures are liquid or powdery agents that are introduced in small amounts (< 5% by mass of the cement content) to concrete while it is being mixed and that enhance the properties of the fresh and/or hardened concrete.
Plasticizers and superplasticizers are admixtures which reduce the water content of mixed concrete without detriment to its consistency or enhance its

slump with or without change to the water content or cause both effects simultaneously. They can also display a retarding effect when used as combination products.
The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).

The product needs a declaration of performance taking into consideration *EN 934-2:2009+A1:2012, Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling* and the CE-marking. For the application and use the respective national provisions apply.

2.3 Application

Concrete admixtures are used as constituent materials for the production of concrete, mortar and grout (unreinforced concrete, reinforced and prestressed concrete, site-mixed and ready-mixed concrete, precast concrete). Their application should be in line with the manufacturer's technical documents and Declaration of Performance.

2.4 Technical Data

Plasticizers and superplasticizers must comply with the general requirements of *EN 934-1:2008* and the additional requirements of *EN 934-2:2009+A1:2012*. The corresponding requirements in line with *EN 934-1:2008* and *EN 934-2:2009+A1:2012* must be maintained.

Constructional data

Name	Value	Unit
Density /ISO 758/	1 - 1.6	g/ml
Solids content /EN 480-8/	-[1]	M.-%
pH value /ISO 4316/	-[1]	$-\log_{10}(a_{H+})$
Chloride content /EN 480-10/	Maximum value to be declared by the manufacturer	M.-%
Alkali content /EN 480-12/	Maximum value to be declared by the manufacturer	M.-%
Corrosion behavior /EN 934-1/, /EN 480-14/	-[2]	µ A/cm²
SiO2 content /EN 192-2/	-[3]	M.-%
Air content of fresh concrete /EN 12350-7/	Test mix ≤ 2% by volume above control mix unless stated otherwise by the manufacturer	Vol.-%
Compressive strength /EN 12390-3/	-[5]	N/mm²
Water reduction /EN 12350-2/, /EN 12350-5/ Plasticizer	Test mix ≥ 5% com-pared to control mix Superplasticizer: Test mix ≥ 12% com-pared to control mix	mm
Increasing / maintaining of consistence /EN 12350-2/, /EN 12350-5/ Superplasticizer	-[6]	mm
Setting time /EN 480-2/ Accelerator/Retarder	-[4]	min
Air void Characteristics in hardened concrete /EN 480-11/ Air entrainer	-[4]	mm
Capillary water absorption /EN 480-5/ Densifier	-[4]	g/mm²

[1] Value will be made available to user on request
[2] No corrosion behaviour test is required for admixtures which only contain active substances in the list of approved substances to *EN 934-1*, Annexe A.1 and in the list of declared substances to *EN 934-1*, Annexe A.2.
[3] Maximum value must only be indicated when SiO2 percentage by mass > 5 %
[4] Details not relevant for this type of admixture
[5] Concrete plasticizer:
At 7 and 28 days: Test mix ≥ 110 % of control mix
Superplasticizer (tested at equal consistency):
At 1 day:
Test mix ≥ 140 % of control mix
At 28 days:
Test mix ≥ 115 % of control mix
Superplasticizer (tested at equal w/c ratio): At 28 days:
Test mix ≥ 90 % of control mix
[6] Increase in consistence
Increase in slump ≥ 120 mm from initial (30 ± 10) mm
or
Increase in flow ≥ 160 mm from initial (350 ± 20) mm
Retention of consistence 30 min after the addition:
the consistency of test mix ≥ initial consistency of the control mix

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 934-2:2009+A1:2012, Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling.*

2.5 Delivery status

Plasticizers and superplasticizers are usually supplied in liquid, paste or powder form in containers made of steel or plastic.
Typical container sizes are canisters containing approx. 25 kg, drums with approx. 200 kg or Intermediate Bulk Containers (IBC) with 1000 kg. The containers are shipped on wooden pallets.
For larger applications, loose deliveries in tank trucks with a capacity in excess of 1 tonne are also used.

2.6 Base materials/Ancillary materials

Plasticizers and superplasticizers essentially contain either lignosulphonate, naphthalene sulphonate, melamine sulphonate and polycarboxylate/polycarboxylic or mixtures thereof.

Defoaming agents and preservatives are added as minor components and auxiliaries.
Active substance concentration lies between 10 and 40% by mass. The typical dosage of plasticizers lies between 0.2 and 1.6% (referred to the finished product) by mass in relation to the cement weight. The typical dosage of superplasticizers lies between 0.4 and 2.0% by mass in relation to the cement weight.
The products covered by this EPD typically contain the following proportions by mass of constituent materials and auxiliaries referred to:

Lignosulphonate*:	max. 40 %
Naphthalene sulphonate*:	max. 40 %
Melamine sulphonate*:	max. 45 %
Polycarboxylate*:	max. 45 %
Polyarylether	max. 35 %
Na-gluconate	max. 35 %
Additives:	max. 5 %
Water:	approx. 55 - 75 %

**Solid content*
These volumes are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases.
Note: For companies to declare their products within the scope of this EPD it is not sufficient to simply comply with the product composition shown above. The application of this EPD is only possible for member companies of EFCA's member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.
Concrete admixtures – Plasticizers and Superplasticizers are mixtures under the chemical legislation (*REACH* and Classification, Labelling and Packaging *CLP*).

1. substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC)

If this product contains substances listed in *the candidate list* (latest version) exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD
If the construction product (concrete admixture Plasticizers and Superplasticizers) contains SVHC exceeding 0.1 percentage by mass, the respective SVHC, its CAS number, information on the concentration and / or concentration range together with information on their hazardous properties are listed in the safety data sheet of the respective product.

2. CMR substances in categories 1A and 1B

If this product contains other carcinogenic, mutagenic, reprotoxic (*CMR*) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD.

If the construction product (concrete admixture - Plasticizers and Superplasticizers) contains CMR substances in categories 1A or 1B exceeding 0.1 percentage by mass, the respective CMR substances, information on the concentration and/or concentration range together with information on their hazardous properties are listed in the safety data sheet of the respective product.

3. Biocide products added to the construction product

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)

Usually the construction product (concrete admixture - Plasticizers and Superplasticizers) contain small amounts (< 0.5% by mass) of biocides of the product type "in-can preservatives".

The information which active substances are contained in the product can be found in the safety data sheet of the relevant product covered by this model EPD.

If the construction product (concrete admixture - Plasticizers and Superplasticizers) contains biocide products, the active substances, information on the concentration and/or concentration range, the product type together with information on their hazardous properties are listed in the safety data sheet of the respective product.

2.7 Manufacture
Concrete admixtures are usually manufactured by mixing ingredients (together) in batch mode and filling containers for dispatch. The process follows quality standards outlined in *EN 934-6:2019*.

2.8 Environment and health during manufacturing
As a general rule, no environmental or health protection measures other than those specified by law are necessary.

2.9 Product processing/Installation
During concrete manufacture, concrete admixtures are usually added along with the mixing water or included in premixed concrete.
Health and safety measures (eye protection, hand protection, possibly respiratory equipment and body protection) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site.

2.10 Packaging
Reusable containers are, where practicable taken back by the manufacturer and redirected into the production circuit. Empty plastic or steel containers which can no longer be used are recyclable.
Wooden reusable pallets are, where practicable taken back by the manufacturer or building material trader who returns them to the building product manufacturer redirecting them into the production process.

2.11 Condition of use
During the use phase, concrete admixtures are firmly bound into the cement matrix in hardened concrete. Concrete admixtures make an essential contribution towards optimizing the physical and chemical properties of concrete enhancing its performance, durability, economic value and sustainability.

2.12 Environment and health during use

During the use phase, concrete admixtures are firmly bound into the cement matrix in hardened concrete. No relevant risks are known for water, air and soil if the products are used as designated.

2.13 Reference service life

Not relevant as this declaration relates to a preliminary product.

2.14 Extraordinary effects

Fire

Not relevant as this declaration relates to a preliminary product.

Fire protection

Not relevant as this declaration relates to a preliminary product.

Water

Not relevant as this declaration relates to a preliminary product.

Mechanical destruction

Not relevant as this declaration relates to a preliminary product.

2.15 Re-use phase

Not relevant as this declaration relates to a preliminary product.

2.16 Disposal

Empty, dried containers are directed to the recycling process where practicable.
Packaging residue must be directed to proper waste disposal taking local guidelines into consideration.
Admixture residues, during the installation phase into the building, are directed to landfill. Admixture applied into the building and dismantled at the end of the product service life cannot be separated anymore from concrete. For this reason, this admixture is sent directly to landfill along with concrete. The European Waste Code (*EWC)* applicable for the declared product can be assimilated to the concrete *EWC 170101*.

2.17 Further information

More information is available in the manufacturers' product or safety data sheets on the manufacturers' Web sites or on request.
An electronic version of this declaration is available at www.efca.info and www.ibu-epd.com

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg concrete admixture with a density of 1-1.6 kg/l in accordance with the *IBU PCR* 11-2017 Part B for concrete admixtures.
The maximum dosage of Plasticizers and Superplasticizers is 2% by mass related to the cement content in the concrete.
The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).
Depending on the application, a corresponding conversion factor such as the density to convert volumetric use to mass must be taken into consideration.

The Declaration type is according to *EN 15804*: Cradle to gate with options, modules C1–C4, and module D.

Declared unit

Name	Value	Unit
Declared unit	1	kg
Gross density	1000 - 1600	kg/m^3
Conversion factor to 1 kg	-	-

3.2 System boundary

Modules A1, A2 and A3 are taken into consideration in the LCA:
- A1 Production of preliminary products
- A2 Transport to the plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables and waste treatment
-A5 Installation, admixtures applied into the building during A5 phase operations and packaging disposal.
-C1-C2-C4-D

The building deconstruction (demolition process) takes place in C1 module which considers energy production and consumption in terms of diesel and all the emissions connected with the fuel-burning process.
After the demolition, admixture is transported to the end-of-life processing (C2 module) where all the impacts related to the transport processes are considered. For precautionary principle and as worst-case scenario, disposal is the only end of life scenario considered. This is modelled by landfill process (module C4) where admixtures end their life cycle.
Module D accounts for benefits that are beyond the defined system boundaries. Credits are generated during the incineration of wastes in module A5, which are declared in module D.

3.3 Estimates and assumptions

For this EPD formulation and production data defined by EFCA were considered. Production waste was assumed to be disposed of to landfill without credits as a worst case.
An average of plastic containers and wooden pallets was considered in the LCA.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data were taken into consideration.
The manufacture of machinery, plant and other infrastructure required for production of the products under review was not taken into consideration in the LCA.
Transport of packaging materials is excluded.

3.5 Background data

Data from the *GaBi* database 10 (SP 40 (2020) data base was used as background data.

3.6 Data quality

Representative products were applied for this EPD and the product in the group displaying the highest

environmental impact was selected for calculating the LCA results. The background data sets used are no more than 4 years old.

Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.
The data quality of the background data is considered to be good.

3.7 Period under review

Representative formulations are valid for 2019 under consideration of data from 2011.

3.8 Allocation

Mass allocation have been applied when primary data have been used and implemented into the LCA model

3.9 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 *GaBi* database SP40 (2020) has been used. .

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
The packaging material contains biogenic carbon content which has been presented below.

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	0.0032	kg C

Modules A1-A3, A5, C1, C2, C4 and D are declared.

Assembly (A5)

Name	Value	Unit
Other resources for packaging	0.0311	kg
Material loss	0.01	kg

Material loss regards the amount of admixture not used during the application phase into the building. This amount is 1 % of the admixture which is considered to come into module A5 phase. This admixture percentage is considered as waste to disposal and related impacts have been considered into the LCA model and allocated to A5.

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	1	kg
Landfilling	1	kg

5. LCA: Results

Disclaimer:
EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)

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	ND	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	ND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg plasticisers and superplasticisers

Core Indicator	Unit	A1-A3	A5	C1	C2	C4	D
Global warming potential - total	[kg CO_2-Eq.]	1.53E+0	1.11E-1	2.79E-4	1.24E-2	1.53E-2	-4.40E-2
Global warming potential - fossil fuels	[kg CO_2-Eq.]	1.50E+0	8.95E-2	2.66E-4	1.18E-2	1.52E-2	-4.39E-2
Global warming potential - biogenic	[kg CO_2-Eq.]	3.61E-2	2.18E-2	1.24E-5	5.42E-4	4.80E-5	-1.03E-4
GWP from land use and land use change	[kg CO_2-Eq.]	4.64E-4	5.52E-6	6.39E-9	2.79E-7	4.37E-5	-3.06E-5
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.83E-15	6.83E-17	2.84E-20	1.24E-18	5.62E-17	-4.57E-16
Acidification potential, accumulated exceedance	[mol H^+-Eq.]	2.02E-3	3.48E-5	3.60E-6	3.73E-5	1.09E-4	-6.13E-5
Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg PO_4-Eq.]	2.41E-6	2.61E-8	5.75E-11	2.51E-9	2.61E-8	-5.64E-8
Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	1.92E-3	2.35E-5	1.63E-6	1.72E-5	2.80E-5	-1.59E-5
Eutrophication, accumulated exceedance	[mol N-Eq.]	5.92E-3	1.28E-4	1.79E-5	1.89E-4	3.08E-4	-1.70E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	1.64E-3	2.81E-5	4.91E-6	3.39E-5	8.48E-5	-4.56E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.53E-7	1.69E-9	8.06E-12	3.52E-10	1.36E-9	-7.19E-9
Abiotic depletion potential for fossil resources	[MJ]	2.85E+1	3.03E-1	3.81E-3	1.66E-1	1.99E-1	-7.44E-1
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m^3 world-Eq deprived]	1.68E-1	1.14E-2	5.27E-7	2.30E-5	1.59E-3	-4.54E-3

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg plasticisers and superplasticisers

Indicator	Unit	A1-A3	A5	C1	C2	C4	D
Renewable primary energy as energy carrier	[MJ]	2.08E+0	1.42E-1	1.20E-5	5.25E-4	2.61E-2	-1.62E-1
Renewable primary energy resources as material utilization	[MJ]	1.17E-1	-1.17E-1	ND	ND	ND	ND
Total use of renewable primary energy resources	[MJ]	2.20E+0	2.52E-2	1.20E-5	5.25E-4	2.61E-2	-1.62E-1
Non-renewable primary energy as energy carrier	[MJ]	2.27E+1	1.26E+0	3.81E-3	1.67E-1	1.99E-1	-7.44E-1
Non-renewable primary energy as material utilization	[MJ]	5.78E+0	-9.57E-1	ND	ND	ND	ND
Total use of non-renewable primary energy resources	[MJ]	2.85E+1	3.03E-1	3.81E-3	1.67E-1	1.99E-1	-7.44E-1
Use of secondary material	[kg]	0.00E+0	ND	ND	ND	ND	ND
Use of renewable secondary fuels	[MJ]	0.00E+0	ND	ND	ND	ND	ND
Use of non-renewable secondary fuels	[MJ]	0.00E+0	ND	ND	ND	ND	ND
Use of net fresh water	[m^3]	5.57E-3	2.84E-4	2.16E-8	9.41E-7	5.02E-5	-1.88E-4

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg plasticisers and superplasticisers

Indicator	Unit	A1-A3	A5	C1	C2	C4	D
Hazardous waste disposed	[kg]	1.35E-8	1.61E-10	3.70E-13	1.62E-11	3.03E-9	-2.97E-10
Non-hazardous waste disposed	[kg]	2.79E-2	2.04E-3	3.90E-7	1.70E-5	1.00E+0	-3.43E-4
Radioactive waste disposed	[kg]	6.96E-4	7.91E-6	4.09E-9	1.79E-7	2.27E-6	-5.54E-5
Components for re-use	[kg]	0.00E+0	ND	ND	ND	ND	ND
Materials for recycling	[kg]	0.00E+0	ND	ND	ND	ND	ND
Materials for energy recovery	[kg]	0.00E+0	ND	ND	ND	ND	ND
Exported electrical energy	[MJ]	0.00E+0	1.85E-1	ND	ND	ND	ND
Exported thermal energy	[MJ]	0.00E+0	3.36E-1	ND	ND	ND	ND

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg plasticisers and superplasticisers

Indicator	Unit	A1-A3	A5	C1	C2	C4	D
Potential incidence of disease due to PM emissions	[Disease Incidence]	ND	ND	ND	ND	ND	ND
Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for ecosystems	[CTUe]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential soil quality index	[-]	ND	ND	ND	ND	ND	ND

Potential Human exposure efficiency relative to U235, 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 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.

ADP minerals & metals, ADP fossil, WDP, ETF-fw, HTP-c, HTP-nc, SQP, 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.

Additional environmental impact indicators (suggested by *EN15804+A2*, table 4) are not declared in the EPD. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high and as there is limited experience with the indicator (see ILCD classification in *EN 15804*, table 5). For this reason, results based on these indicators are not considered suitable for decision-making process and are thus not declared in the EPD.

6. LCA: Interpretation

When considering upstream production and transport of pre-products as well as manufacturing of the concrete admixture (modules A1-A3), the main driver of impacts in all categories is the production of pre-products (module A1), generally more than 75 %.

For global warming potential (GWP) about 87 % the impacts are from pre-products production processes and related chemical precursors. The manufacturing process is the second contributor (less than 10 % of the total GWP). Important contributors to this indicator during the manufacturing process are European electricity mix production consumed during the admixture production process (module A3) and the plastic produced and consumed for final product packaging. European electricity grid mix is an important contributor to ozone depletion potential (23%). The European electricity grid mix also has an influence on acidification (6 %) and eutrophication freshwater (6%). Renewable primary energy demand (PERT) is influenced by electricity production (about 21%) and for the rest by pre-products production. Non-renewable primary energy demand (PENRT) is influenced almost only by pre-products production (about 91%) and electricity for 4 %. Treatment of production waste has negligible contribution to impacts in all categories except eutrophication freshwater (16 %), where landfilling of production waste has an influence. Packaging production has an influence mainly only for photochemical ozone production (6 %). The other life cycle phases have minor influence, generally lower than 8 %.

A5 module is mainly dominated by the incineration process of packaging wastes, in particular the incineration of plastic (HDPE) is the main contributor for all indicators followed by incineration of wood packaging. This module accounts also for the calorific value of the packaging considered as an output and therefore with a negative value. This influence PENRM, non-renewable energy content by plastic packaging and PERM, renewable energy content by wood packaging.

Considering the entire end of life modules, landfill for construction wastes is the main contributor for all the impact considered, followed by the truck used for transporting the waste from the building site to the landfill.
C1 module: the combustion of fuel occurring during demolition processes is the main contributor for this module and for all the impacts considered.
C2 module: trucks used for waste transport and related combustion emissions are the main contributor for all impacts considered.
C4 module: landfill process and in particular energy consumed for landfill management and operation is the main contributor for all the impacts considered.

D module is influenced by the potential credits generated during installation module (A5), thanks to the energy produced by the incineration processes used for packaging disposal and secondly by the incineration of the admixture residue when this material can be incinerated (thanks to its calorific value). If the admixture has a calorific value, it can be sent to incineration because during this phase, the residual admixture is not melted with concrete.

7. Requisite evidence

As this involves a declaration of preliminary products, special tests and evidence within the framework of drawing up this Model Environmental Product Declaration have not been carried out or provided.

8. References

Candidate list
Candidate list List of those eligible for approval substances of very high concern to the European Chemicals Agency, as of July 2021.

CLP
Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, as of Febrary 03-2021

CPR
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EN ISO 9001:2015
EN ISO 9001:2015, Quality management systems – Requirements (ISO 9001:2015)

EN 196-2:2013
EN 196-2:2013, Test methods for cement – Part 2: Chemical analysis of cement

EN 206:2013+A1:2016
EN 206:2013+A1:2016, Concrete – Part 1: Specification, performance, production and conformity

EN 480-1:2014
EN 480-1:2014, Admixtures for concrete, mortar and grout – Test methods – Part 1: Reference concrete and reference mortar for testing

EN 480-2:2006
EN 480-2:2006, Admixtures for concrete, mortar and grout – Test methods – Part 2: Determination of setting time

EN 480-4:2005
EN 480-4:2005, Admixtures for concrete, mortar and grout – Test methods – Part 4: Determination of bleeding of concrete

EN 480-5:2005
EN 480-5:2005, Admixtures for concrete, mortar and grout – Test methods – Part 5: Determination of capillary absorption

EN 480-6:2005
EN 480-6:2005, Admixtures for concrete, mortar and grout – Test methods – Part 6: Infra red analysis

EN 480-8:2012
EN 480-8:2012, Admixtures for concrete, mortar and grout – Test methods – Part 8: Determination of the conventional dry material content

EN 480-10:2009
EN 480-10:2009, Admixtures for concrete, mortar and grout – Test methods – Part 10: Determination of water-soluble chloride content

EN 480-11:2005
EN 480-11:2005, Admixtures for concrete, mortar and grout – Test methods - Part 11: Determination of air void characteristics in hardened concrete

EN 480-12:2005
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EN 934-1:2008
EN 934-1:2008, Admixtures for concrete, mortar and grout – Part 1: Common requirements

EN 934-2:2009+A1:2012
EN 934-2:2009+A1:2012, Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling

EN 934-5:2007
EN 934-5:2007, Admixtures for concrete, mortar and grout – Part 5: Admixtures for sprayed concrete – Definitions, requirements, conformity, marking and labelling

EN 934-6:2019
EN 934-6:2019, Admixtures for concrete, mortar and grout – Part 6: Sampling, assessment and verification of the constancy of performance

EN 12350-2:2019
EN 12350-2:2019, Testing fresh concrete – Part 2: Slump test

EN 12350-5:2019
EN 12350-5:2019, Testing fresh concrete – Part 5: Flow table test

EN 12350-7:2019
EN 12350-7:2019, Testing fresh concrete – Part 7: Air content – Pressure methods

EN 12390-3:2019
EN 12390-3:2019, Testing hardened concrete – Part 3: Compressive strength of test specimens

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EN 14487-1:2005, Sprayed concrete – Part 1: Definitions, specifications and conformity

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

EU Biocidal Products Regulation (No. 528/2012)
The EU Biocidal Products Regulation (No. 528/2012) Guidance document for ASD industries (January 2016)

EWC/AVV waste code
Directive governing introduction of the European Waste Catalogue
http://www.ngs-mbh.de/zs/eak.html

GaBi 10 software & documentation
Data base for Life Cycle Engineering LBP, University of Stuttgart and Sphera, documentation of GaBi 10 data sets http://documentation.gabi-software.com/, 2020

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ISO 758:1976
ISO 758:1976, Liquid chemical products for industrial purposes; Determination of density at 20 °C

ISO 4316:1977
ISO 4316:1977, Surface active agents; Determination of the pH value of aqueous solutions; Potentiometric method

PCR Part A
Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, Version 1.1, Institut Bauen und Umwelt e.V., 2021-01

PCR Part B
Product Category Rules for Construction Products, Part B: Requirements on the EPD for concrete admixtures, 2017-11

REACH Regulation
Regulation (EU) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

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