EPD Ready-mix concrete – Holcim Romania

ISO 14020; ISO 14025; ISO 14040; ISO 14044; EN 15804; EN 16757; ISO 21930

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1. Programme information

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Product category rules (PCR): *CEN Standard EN 15804 served as the core PCR. PCR 2012:01 Construction Products and Construction Services Version 2.3 2028-11-15*
PCR review was conducted by: *The Technical Committee of the International EPD System. Chair: Massimo Marino. Contact via info@environdec.com*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: *Jane Anderson, ConstructionLCA Ltd*    Approved by: The International EPD® System
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.

2. Company Information

This cradle-to gate environmental product declaration is for 1m^3 of average ready-mix concrete production from the locations fully owned and operated by Holcim in Romania, as follows:

- RMX Chitila - Bucureşti, Şos. Chitilei, Nr. 423, Sector 1
- RMX Pipera - Bucureşti, Şos. Pipera, Nr. 52, Sector 2
- RMX Clinceni - Clinceni, Strada Industriilor, Nr. 6, Jud. Ilfov
- RMX Pantelimon - Pantelimon, Sos. de Centura nr.8, Jud. Ilfov
- RMX Craiova - Craiova, Str. Râului, Nr. 401, Jud. Dolj
- RMX Ploiesti - Ploieşti, Şos. Centura de Est, Nr. 48A, Jud. Prahova
- RMX Cluj - Cluj Napoca, Str. Beiuşului, Nr. 11, Jud. Cluj
- RMX Timisoara - Timişoara, Calea Moşniţei, Nr. 17, Jud. Timiş
- RMX Oradea - Oradea, Şos. Borşului, Nr. 14/C, Jud. Bihor
- RMX Sibiu - Sibiu, Str. Turda, Nr. 12, Jud. Sibiu
- RMX Tg. Mures - Târgu Mureş, Str. Băneasa, Nr. 8, Jud. Mureş
- RMX Brasov - Braşov, Str. Zizinului, Nr. 121, Jud. Braşov
- RMX Satu Mare - Satu Mare, Drumul Careiului, Nr. 146, Jud. Satu Mare

Holcim Romania is the study commissioner and EPD owner. In order to respect the principles of sustainable development, the company implemented, maintained and continuously improves an effective integrated management system, in accordance with the applicable reference standards: SR EN ISO 9001:2015, SR EN ISO 14001:2015, SR ISO 45001:2018; BES 6001:2016. Our aim is to make a positive contribution to the built environment now and for future generations, thus we commit to spearhead the transition towards low-carbon construction and be the leader in promoting a circular economy, from alternative fuels to recycling

Sustainable development
We, Holcim Romania are committed to health and safety as our overarching value, thus we conduct our business with a goal of zero harm to people. We provide high quality products and services, through our manufacturing excellence strategy. We strive to minimize our impact on the environment and in particular on the limited natural resources. We ensure that all constituent materials used within our products are responsibly sourced and used in the most appropriate and sustainable manner.

Further information regarding Holcim Romania and its sustainability strategy can be accessed from www.holcim.ro/en/sustainable-development.

3. Product Information

Concrete is a composite material obtained through the homogenization of cement, aggregates, water and additives. The commercial applications of ready-mix concrete cover a wide range of applications including; foundation, flooring, car parking, access roads, terracing, frames, stairs, lift shafts, as well as major infrastructure works and hydro-technical constructions. Ready-mix concrete is classified under the following UN CPC group 375 concrete.

Concrete

The ready-mix concrete addressed in this EPD, as described in Table 1, is manufactured in the locations fully owner and operated by Holcim in Romania, according to the following standards and norms:

- European Norm: EN206-1:2000 Concrete – Part 1: Specification, performance, production and conformity, transposed into Romanian Standard SR EN 206-1:2002/A1:2005/A2:2005/C91:2008
- Romanian Standard SR 13510:2006/C91:2008: Concrete Part 1: Specification, performance, production and conformity. National document for the application of SR EN 206-1
- CP 012/12007: Code of practice for the production of concrete

- NE 014:02: Normative for the execution of cement concrete pavements in fixed and in sliding formwork systems

The geographical scope of this EPD is European.

Plant	Standards / Norms	Read-mix concrete type	
		Regular ready-mixed concrete	Road ready-mixed concrete
RMX Chitila	SR EN 206+A1:2017; CP 012/1-2007; NE 014:02	C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50;C45/55; C50/60; C60/75	BcR 3,5;BcR 4; BcR 4,5; BcR 5
RMX Pipera		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50;C45/55;C50/60; C60/75	BcR 3,5;BcR 4; BcR 4,5; BcR 5
RMX Clinceni		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50;C45/55; C50/60; C60/75	BcR 3,5;BcR 4; BcR 4,5; BcR 5
RMX Pantelimon		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50;C45/55;C50/60; C60/75	BcR 3,5;BcR 4; BcR 4,5; BcR 5
RMX Craiova		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50	BcR 3,5;BcR 4; BcR 4,5; BcR 5
RMX Ploiesti		C8/10;C12/15;C16/20; C20/25;C25/30;C30/37; C35/45; C40/50	BcR 3,5;BcR 4; BcR 4,5
RMX Cluj		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45; C40/50;C45/55	BcR3.5;BcR4; BcR4.5; BcR5
RMX Timisoara		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37; C35/45; C40/50	BcR3.5; BcR4; BcR 4,5
RMX Oradea		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45;C40/50	BcR 3,5; BcR 4 ; BcR 4,5;BcR 5
RMX Sibiu		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45	BcR 3,5; BcR 4 ; BcR 4,5;BcR 5

Plant	Standards / Norms	Read-mix concrete type	
		Regular ready-mixed concrete	Road ready-mixed concrete
RMX Tg. Mures		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45;C40/50	BcR 4;BcR 4,5; BcR5
RMX Brasov		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45;C40/50; C45/55; C 50/60	BcR3,5;BcR 4; BcR 4,5;BcR 5
RMX Satu Mare		C8/10;C12/15;C16/20;C20/25; C25/30;C30/37;C35/45	BcR4; BcR4.5; BcR5

Table 1: Product Identification and Usage

3.1 Technical Specification of Product

Holcim are EN 206 complaint (compression strengths and exposure classes), so technical characteristics are given by the European Standard transposed into Romanian legislative norms (included in Table 1 above). The different compressive strengths of concrete combined with exposure classes represent different categories of usage. The functional characteristic are linked with commercial applications of the ready-mix concrete, that covers a wide range: from foundation, flooring, car parking, access roads, terracing, frames, stairs, lift shafts, to major infrastructure works, hydro-technical constructions, etc.

Product specific technical and functional characteristics are available via the Holcim web-site.

3.2 Content Declaration

The composition of the average product modelled in this project is obtained from the total raw material usages supplied by the sites. No substances that are listed in the 'Candidate List of Substances of very high concern for authorisation' are contained in the average aggregate.

The density of the resulting average ready-mix concrete is 2,329 kg/m^3.

Material	Percentage
Aggregates	77.5%
Cement	14.9%
Water	7.5%
Additives	0.1%

Table 2: Average ready-mix composition

3.3 Manufacturing Process

The main steps in ready-mix concrete production are as follows, and illustrated in Figure 1:

- Raw material supply and storage
- Raw material preparation
- Mixing

The main steps in aggregate production are illustrated in the Figure 1.

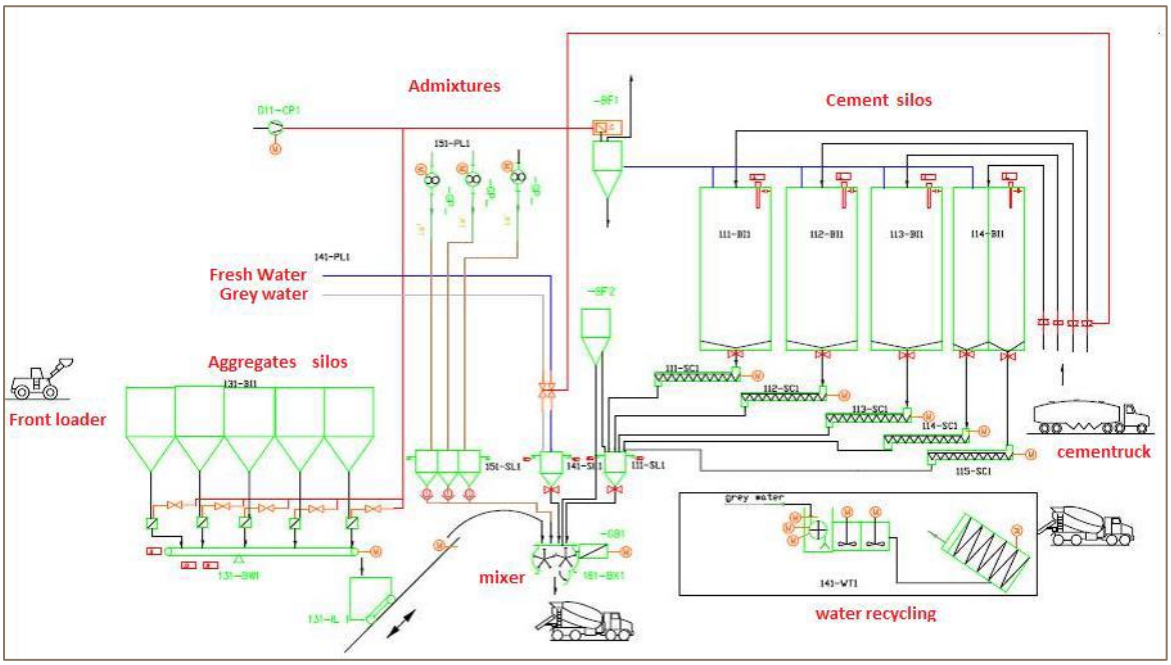

Figure 1: Ready-mix concrete process flow

3.3.1 Raw material supply, storage and preparation

Raw materials are supplied from, received and stored in dedicated storage facilities. All aggregates and cement are supplied by Holcim sites in Romania. The process flow of production of Holcim cement and aggregates is communicated in the accompanying LCA reports for average aggregates and average grey cement. Aggregates are transferred from storage facilities towards bunkers by a front loader.

3.3.2 Mixing

Concrete batches are mixed according to batching recipe with the concrete constitutions having been weighted by size and types according to the recipe via the weighting hoppers. The ingredients are blended in a mechanical mixer. Energy for the concrete production is supplied by diesel fuel and electricity. The water recycling system from the Holcim plants allows separation of water and aggregates (resulting from the return of fresh concrete and from the washing of ready-mix trucks) for further reutilization within the production process.

3.4 Additional information

The production of ready-mix concrete is subject to Romanian and European legislation, which addressed all relevant environmental aspects like dust emissions, noise, energy consumption, water and waste management, etc.

More information about ready-mixed concrete environmental stewardship and occupational health and safety aspects are detailed within the SDS (Safety Data Sheet) made publicly available on Holcim Romania portal: https://www.holcim.ro/ro/produse-si-servicii/produse. The SDS has been developed by Holcim Romania in compliance with the requirements of Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

4. LCA Information

4.1 Goal of Study

The goal of this study was to generate an environmental profile of average ready-mix concrete produced and delivered from the locations fully owned and operated by Holcim Romania, to better understand the associated lifecycle environmental impacts and to allow a Type III EPD to be generated and made public via the International EPD System.

4.2 Declared Unit

The declared unit of the EPD is 1m^3 of average ready-mix concrete produced and delivered from the locations fully owned and operated by Holcim Romania. This EPD is established for the weighted average product of theses manufacturing plants. The average is based on the volume of ready-mix concrete produced at each plant.

4.3 System Boundary

System boundaries determine the unit processes to be included in the LCA study and which data as “input” and/or “output” to/from the system can be omitted.

This EPD covers the cradle to gate stage (A1 to A3), because other life cycle stages are dependent on particular scenarios and are better developed for specific building or construction works.

System boundaries are according to the modular approach and the cradle to gate stage is divided into the upstream (A1) and core (A2 and A3) phases, as outlined in Figure 2. Life cycle stage that are not covered by the EPD are indicated as MND (Module Not Declared).

Upstream	Core		Downstream												Other environmental information
Product Stage			Construction process stage		Use Stage							End of Life stage			Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 2: Modules included in the ready-mix concrete LCA: A1 (Raw material supply), A2 (Transport), A3 (Manufacturing)

4.4 Data sources and quality

The geographical system boundary of the LCA is Romania. All processes (including energy mix) are valid for the production sites in Romania. The thirteen ready-mix concrete plants account for 100% of total ready-mix concrete produced by Holcim in Romania.

All material flows of the processes are based on company and site-specific data gathered for one year of operation, for the period 1st January 2018 – 31st December 2018.

Modelling of the life cycle of Holcim Romania ready-mix concrete was performed using SimaPro8 LCA software from PRé. All relevant background LCI datasets are taken from the ecoinvent database v3.4 (cut-off) released in 2017.

All aggregates and cement are supplied by Holcim sites in Romania and the following manufacturer specific EPD have been used for these two raw materials;

- EPD Average Aggregates – Holcim Romania: S-P-00528
- EPD Grey Cements – Holcim Romania: S-P-000527

The foreground data has been collected on site and validated based on mass balances. The background data is based on reviewed data from life cycle inventories. As all datasets are validated, the data quality for the entire study can be judged as very good.

4.5 Allocation

The foreground data has been collected on site and validated based on mass balances. The All allocation is performed according to the basic rules from EN15804:2012+A1:2013. As no co-products are produced, the flow of materials and energy and also the associated release of substances and energy into the environment is therefore related exclusively to the ready-mix concrete produced.

All data is included based on measured data for each plant. To ensure high representativeness for calculation of the ready-mix concrete this specific data has been weighted based on the production volume of each plant, as follows:

Plant	Percentage
Brasov	7.7%
Chitila	13.1%
Clinceni	8%
Pantelimon	10.2%
Pipera	15.8%
Craiova	4.1%
Ploiesti	3.6%
Sibiu	9.1%
Timisoara	11.6%
Tg Mures	3.1%
Satu Mare	3.8%
Cluj	5.4%
Oradea	4.8%
Total production	100%

Table 3 Holcim Romania - Ready-mix Concrete Production (Percentage / Plant) 2018

4.6 Cut-off Criteria and assumptions

The cut-off criteria adopted is as stated in EN 15804:2012+A1:2013. Where there is insufficient data or data gaps for a unit process, the cut-off criteria is 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass. The exception is if they have any of the following, in which case they have to be included:

- Significant effects of or energy use in their extraction, use or disposal
- Are classed as hazardous waste

For the foreground process of ready-mix concrete production, no cut-off has been necessary. All raw materials and associated transport to the plant, process energy and water use are included.

In addition to the above, during the LCA a number of assumptions were made, which have been documented below for transparency:

- For each plant, total site production data for all concrete types produced at the plants has been modelled for mass of total concrete produced – no distinction has been made between the different types of concrete in terms of energy usage. The resulting data is for an average concrete produced from the sites.
- No packaging is associated with the final product, the concrete is delivered in bulk.
- A proxy has been used for the admixture, which is less then 0.1% by mass of the concrete.
- No production waste is associated with the ready-mix production.

4.7 Comparability

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.

5. Environmental Performance

The environmental impacts are declared and reported using the parameters and units shown in the Tables below. Baseline characterisation factors are taken from CML – IA version 4.1 (dated October 2012).

The impact categories presented in the following table refer to 1m^3 of average ready-mix concrete produced from the locations fully owned and operated by Holcim in Romania.

Parameter	Unit	A1-A3
Parameters describing environmental impacts		
Global Warming Potential (GWP)	Kg CO2 equiv.	201
Ozone Depletion Potential (ODP)	Kg CFC 11	5.94E-06
Acidification Potential for Soil and Water (AP)	kg SO2 equiv.	0.223
Eutrophication Potential (EP)	kg (PO4)3-equiv.	0.141
Formation potential of tropospheric Ozone (POCP)	kg C2H4 equiv.	0.0210
Abiotic Depletion Potential (ADPE)	kg Sb equiv.	5.47E-05
Abiotic Depletion Potential (ADPF)	MJ, net calorific	811
Parameters describing resource use, primary energy		
Use of renewable primary energy excluding renewable primary energy used as raw materials (PERE)	MJ	104.1
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0
Total use of renewable primary energy resources (PERT)	MJ	104.1
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1029
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0
Total use of non-renewable primary energy resources (PENRT)	MJ	1029

Reading tip:
5.94E-06= 5.94 x 1^{-6} = 0,00000594

Parameters describing resource use, secondary materials and fuels, use of water		
Use of secondary material (SM)	kg	30.4
Use of renewable secondary fuels (RSF)	MJ	0.124
Use of non-renewable secondary fuels (NRSF)	MJ	0.179
Net use of fresh water (FW)	m^3	4.99
Other environmental information describing waste categories		
Hazardous waste disposed (HWD)	kg	0.00732
Non-hazardous waste disposed (NHWD)	kg	190
Radioactive waste disposed (RWD)	kg	0.006725
Other environmental Information describing output flows		
Components for re-use (CRU)	kg	0
Materials for recycling (MRF)	kg	0.154
Materials for energy recovery (MER)	kg	0
Exported Energy (EE)	MJ per energy carrier	0

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

6. Range of Results

This EPD provides the results for the average (representative) product. The production of all concrete has been modelled from the thirteen sites and then combined on a volume weighted average of production to calculate the results for the average product.

For the majority of sites, the difference in indicator results for the average concrete product produced at each site compared to the representative (average) product is within 10% for the environmental impact indicator categories. A small number of sites have a difference in indicator results of slightly higher than 10% for the environmental impact indicator categories.

7. Interpretation

The following table provides an identification of the most significant contributors to parameters describing environmental impacts.

Parameter	Most significant contributor
Global Warming Potential (GWP)	Dominated by the supply of raw materials, primarily the cement.
Ozone Depletion Potential (ODP)	Dominated by the supply of raw materials, namely cement, and the use of fossil fuels (diesel) for transportation.
Acidification Potential for Soil and Water (AP)	Dominated by the supply of raw materials, namely cement, and the use of fossil fuels (diesel) for transportation.
Eutrophication Potential (EP)	Dominated by the supply of raw materials, primarily the cement and to a lesser extent aggregates and the and the use of fossil fuels (diesel) for transportation.
Formation potential of tropospheric Ozone (POCP)	Dominated by the supply of raw materials, namely cement and to a lesser extent admixture, and the use of fossil fuels (diesel) for transportation.
Abiotic Depletion Potential (ADPE)	Dominated by the supply of raw materials and transportation of materials.
Abiotic Depletion Potential (ADPF)	Dominated by the use of fossil fuels for the production of the raw materials and transportation of materials.
Hazardous waste disposed (HWD)	Generated from electricity production in Romania.
Non-hazardous waste disposed (NHWD)	Generated from electricity production in Romania.
Radioactive waste disposed (RWD)	Generated from electricity production in Romania.

Concluding, a significant contribution to the overall environmental impacts comes from the production of cement. Further details regarding the environmental impact of this raw material can be accessed from the Holcim EPD for cement. Another contribution is related to the production of aggregates. Further details regarding the environmental impact of this raw material can be accessed from the Holcim EPD for Aggregates. The transportation of raw materials for ready-mix production though the use of diesel fuel and electricity necessary for the manufacturing stage are also contributors to the environmental impact.

8. Differences Versus Previous Versions

The table below reports the differences in indicator results compared to the previously published version of this EPD.

Environmental Indicator	Previous Version (2012 production data)	Current version (2018 production data)	Percentage Change (%)
Global Warming Potential (GWP)	271	201	-26
Ozone Depletion Potential (ODP)	8.36E-09	5.94E-06	70953
Acidification Potential for Soil and Water (AP)	0.781	0.223	-71
Eutrophication Potential (EP)	0.0782	0.141	80
Formation potential of tropospheric Ozone (POCP)	0.0566	0.021	-63
Abiotic Depletion Potential (ADPE)	7.60E-04	5.47E-05	-93
Abiotic Depletion Potential (ADPF)	1440	811	-44

The main reason for the change in indicator results is updated production data and to a lesser extent differences in generic datasets.

9. Other Environmental Information

Holcim Romania, being aware of its responsibility as cement, concrete and aggregate manufacturer towards the environment, and in particular on the limited natural resources has implemented as part of integrated management system, an environmental management system. Thus, all the activities that could have a significant impact on the environment are kept under control. Also, we ensure that the constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development, Circular Economy and of Environmental Stewardship as a standard business practice in our operations. Moreover, we encourage the adoption of the responsible sourcing practices throughout our supply chain.

In this sense, we measure, monitor, assess and continuously improve our environmental performance. We prevent environmental pollution by implementing in our operations the best available technology and by maintaining and operating our installations in optimum ways. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business. Holcim is promoting in Romania the reduction, recycling and recovering of waste and the optimization of water consumption in all processes.

Nevertheless, we develop and launch innovative products and solutions with enhanced environmental or social performance.

More information regarding our environmental and responsibly sourcing objectives and activities are available on http://www.holcim.ro/en/sustainable-development.html

10. References

Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, BS EN 15804:2012+A1:2013. BSI Standards Limited.

PCR 2012:01 Construction products and construction services version 2.3, The International EPD System.

Sub-PCR to PCR 2012:01 (v2.3) PCR 2012:01- sub-PCR-G, Concrete and Concrete Elements (EN 16757:2017), The International EPD System.

Life-cycle assessment software and database:

- SimaPro8 LCA software from PRé.
- ECOINVENT database v3.4 - released in 2017, contains life cycle inventory datasets
- CML-IA database version 4.1 – released in 2012, The **C**entrum voor **M**ilieuwetenschappen **L**eiden **I**mpact **A**ssessment (CML-IA), contains characterisation factors for life cycle impact assessment (LCIA)

ISO 14020:2000 Environmental labels and declarations — General principles

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

ISO 14044:2006+A1:2018. Environmental management – life cycle assessment – requirements and guidelines, International Organisation for Standardisation (ISO), Geneva.

ISO 14040:2008. Environmental management – Life cycle assessment – principles and framework, International Organisation for Standardisation (ISO), Geneva.

ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

EN 16757:2017 Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and concrete elements. BSI Standards Limited.

European Norm: EN 206-12000 Concrete – Part 1: Specification, performance, production and conformity, transposed into Romanian Standard SR EN 206-1:2002/A1:2005/A2:2005/C91:2008.

Romanian Standard SR 13510:2006/C91:2008; Concrete – Part 1: Specification, performance, production and conformity. National document for the application of SR EN 206-1.

CP 012/1-2007: Code of practice for the production of concrete.

NE 014:2002: Romanian Normative for production of concrete for roads

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)