Environmental Product Declaration of NCC Prepac

According to EN 15804:2012+A1:2013, ISO 14025, ISO 14040 and ISO 14044
Program operator: International EPD® System
EPD owner: NCC Infrastructure AB

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Reg. no. S-P-01622 | UN CPC 375 Articles of concrete, cement and plaster

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product, its production process or its supply chain.

The concrete product declared is recognized under its brand name *NCC Prepac* and is manufactured by NCC Infrastructure AB.

NCC Prepac is a ready-mixed concrete delivered in a fresh state and can be used in civil engineering applications, specifically for industry floor systems and foundations.

The product declared does not include reinforcement steel or the curing process.

EPD INFORMATION	
Declared unit:	1 m^3 (1 cubic meter) of NCC Prepac concrete (excluding reinforcement steel and curing)
RSL:	Not specified
PCR:	Construction products and construction services 2012:01 Version 2.3, 2018-11-15.
Sub-PCR:	PCR 2012:01-SUB-PCR-G Concrete and concrete elements (EN 16757:2017) of 2018-11-22.
Program operator:	The International EPD® System operated by EPD International AB Box 210 60 SE-100 31 Stockholm Sweden info@environdec.com

NCC Prepac consists of the raw materials mortar, aggregates and water, see amounts in 1 m³ (2 200 kg) of product in Table 1.

Table 1: Content declaration of 1 m³ of NCC Prepac.

Raw material	Amount	Unit
Aggregates (11/16)	1 320	kg
Mortar	440	kg
Water	440	kg
Total	2 200	kg

The mortar consists of Portland cement, very fine-grained aggregates, silica sand and a super-plasticizer.

Figure 1 illustrates the production processes included and their connections to the modules declared. The raw materials are mixed at the construction site (module A5). Because of this, modules A2 and A3 are not relevant and therefore not declared in the EPD. In module A4, the raw materials are transported to the various construction sites. At the construction site (module A5), production of ancillary material, consumables and energy utilities are included.

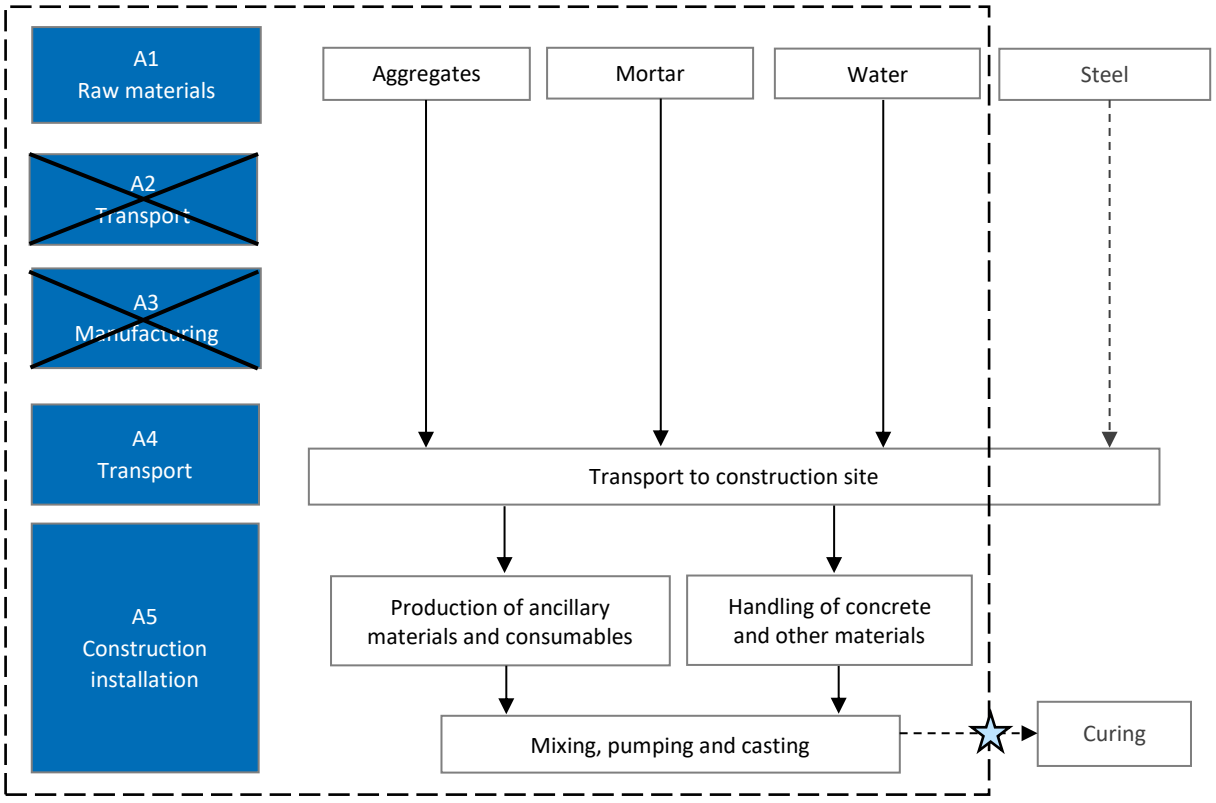

Figure 1: Production processes included. The star indicates the reference flow where the declared unit is calculated. Modules A2 and A3 are not relevant.

At the construction site, the aggregates are first placed on the ground. The reinforcement steel is then placed on the ground together with the aggregates. The reinforcement steel is not included in this EPD. This is partly because the amount of steel differs depending on product application, but also because it facilitates the comparison with EPDs of similar products (ready-mixed concretes) which normally do not include reinforcement steel.

Mortar and water are then mixed and pumped on the aggregates to create a concrete matrix which represent the product declared. The curing process occurring after the product is shaped in its matrix is not included. The reason to omit this process is to facilitate comparisons with similar products (which normally do not include the curing process).

Excluding steel and curing influence both the declared unit and the defined reference flow in the flow diagram (i.e. where the declared unit is calculated and results are assessed). The declared unit is 1 m³ of NCC Prepac and its reference flow is after the product has been mixed, pumped and cast at the construction site but before it is cured, depicted in Figure 1 with a star.

The technical specifications of NCC Prepac is found in Table 2.

Table 2: Technical specifications for NCC Prepac

Parameter	Value	Unit	Test method
Nominal compression strength	>45	MPa	SS EN 13892-2*
Target stength	50	MPa	SS EN 13892-2*
Thermal conductivity	Not evaluated	-	-
Tensile Strength	>7	MPa	SS EN 13892-2*
Modulus of Elasticity	Not evaluated	-	-
Typical shrinkage	Not evaluated	-	-

*For NCC Prepac, excluding the reinforcement steel.

If changes occur affecting any content or result in the EPD, it will be revised and reissued. NCC Prepac will be produced for NCC Infrastructure and NCC Building, approximately 1 500 tonnes annually. The production process and its product are in accordance with given permits and applicable legislation.

The product declared is classified according to the United Nations Central Product Classification (UN CPC) 375; Articles of concrete, cement and plaster. It follows the technical standard SS EN 206:2013+A1:2016. NCC Prepac does not contain any substances listed on the Candidate List of Substances of Very High Concern of very high concern (SVHC).

1. Declared unit and reference flow

The declared unit is "1 m^3 of NCC Prepac". The reference flow is calculated after the product has been mixed, pumped and cast at the construction site but before it is cured. Figure 1 presents the production process where the reference flow is defined.

The density of NCC Prepac is 2 200 kg/m^3.

2. System boundary

The EPD type is a "cradle-to-gate with options". The declared modules are A1, A4 and A5, see Figure 2. The raw materials are all mixed at the construction site where they are installed. Thus, modules A2 and A3 are not relevant.

The construction installation occurs at various locations in Sweden.

All input data that NCC Infrastructure AB has influence over are site specific data for the years 2018 and 2019.

Other product life cycles related to this cycle is managed through the polluter pays principle defining the exact boundary settings between life cycles depending on the willingness to pay for the material.

3. Assumptions and approximations

The main assumptions and approximations are:

- Carbonation is not accounted for in the EPD. Carbonation is a chemical reaction, a natural process by which carbon dioxide in the ambient air reacts with hydration products. This is a natural process which occurs during the life cycle of concrete.
- The scenarios presented for module A4 and A5 are the most realistic and representative for the given product applications.

Upstream	Core		Downstream													Other environmental information
Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	NR	NR	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 2: Modules of the product life cycle included in the EPD (X = declared module; MND = module not declared, NR = module not relevant).

- The aggregates in NCC Prepac are approximated with the products declared in the EPDs *Environmental Product Declaration for aggregates from the mobile crushing plant in Bjurholm* (11/16) and *Environmental Product Declaration for aggregates from the stationary crushing plant Ramnaslätt* (0/2).
- The average transport distances for module A4 are estimated to 50 km for the aggregates and 500 km for the mortar. Water is withdrawn at the construction site.
- The following processes are not included in the scope of the study:
  - Reinforcement steel used in the product.
  - The curing process at the construction site.
- The volume of reinforcement steel has been replaced by concrete mixture, i.e. the product

declared is equivalent to 1 m^3 of NCC Prepac containing no steel.

4. Allocation

In the construction installation process there are no co-products produced. No allocation has been made in the primary data and the applied software model does not contain any foreground allocation.

5. Cut-offs

The cut-off criteria are 1% of the renewable and non-renewable primary energy usage, 1% of the total mass input of the manufacture process. This is fulfilled for the declared product since no cut-off can be identified based on the data collected.

No data gaps have been identified in the data collection process.

Modules A2 and A3 are omitted from the EPD since they are identified as not relevant.

6. Software and database

A software model was generated with the GaBi 8 Professional Software. The software model is a mathematical algorithm, which covers potential input and output flows for material and energy for the considered scenarios.

The current LCA model is based on site- supplier-specific data and/or available public EPDs. Where EPDs are not available, datasets from thinkstep´s database are used. Datasets used in the LCA modelling are presented in the background report.

7. Data quality

Overall the data quality can be described as good based on its representativeness, completeness, reliability and consistency.

The primary data collection is done thoroughly, all relevant flows are considered and collected for the years 2018 and 2019. As the product currently (January 2020) is in its late product development stage there might be changes in for example product recipes affecting the data collected. This impacts the data quality. However, annual checks will be conducted to identify potential changes affecting the results declared in the EPD or other related information in the EPD.

8. Comparability

EPDs of construction products may not be comparable if they do not comply with EN 15804. Neither may EPD within the same product category from different programs be comparable.

A comparison of EPDs is only possible if all the datasets to be compared are created according to ISO 14025 and EN 15804, and the building context, particularly the product-specific characteristics of performance, is taken into account.

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

The results of the life cycle assessment of 1 m^3 of NCC Prepac in Table 3 (potential environmental impact), Table 4 (resource use) and Table 5 (output flows and waste categories).

Table 3: Results of the LCA – Potential environmental impact for 1 cubic meter ($1m^3$) of NCC Prepac.

Potential environmental impact		Modules			
Parameter	Unit	A1-A3*	A4	A5	A1-A5**
Global warming potential (GWP_{100})	kg CO_2 eq	168	18	34	221
Ozone depletion potential (ODP)	kg CFC 11 eq	1.4E-06	2.8E-15	2.1E-09	1.4E-06
Acidification potential of land and water (AP)	kg SO_2 eq	0.21	0.01	0.27	0.50
Eutrophication potential (EP)	kg PO_4^{3-} eq	0.08	2.9E-03	0.06	0.14
Photochemical ozone creation potential (POCP)	kg C_2H_2 eq	0.03	5.4E-05	0.04	0.07
Depletion of abiotic resources (elements) (ADPE)	kg Sb eq	1.2E-05	1.2E-06	3.4E-06	1.7E-05
Depletion of abiotic resources (fossil) (ADPF)	MJ net calorific value	777	233	439	1449

*A2 and A3 are not relevant, see reason in the section “Description of the product”. The formulation A1-A3 is kept for consistency reasons.

**Additional information

Table 4: Results of the LCA - Resource use for 1 cubic meter (1m³) of NCC Prepac.

Use of resources		Modules			
Parameter	Unit	A1-A3*	A4	A5	A1-A5**
Use of renewable primary energy (PERE)	MJ, net calorific value	280	14	128	423
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	280	14	128	423
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	811	234	443	1488
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0	0	0	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	811	234	443	1488
Use of secondary material (SM)	kg	36	0	2.0E-03	36
Use of renewable secondary fuels (RSF)	MJ, net calorific value	130	0	0	130
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	188	0	0	188
Use of net fresh water (FW)	m^3	0.50	0.02	0.14	0.66

*A2 and A3 are not relevant, see reason in the section “Description of the product”. The formulation A1-A3 is kept for consistency reasons.

**Additional information

Table 5: Results of the LCA - Output flows and waste categories for 1 cubic meter (1m³) of NCC Prepac.

Waste		Modules			
Parameter	Unit	A1-A3*	A4	**A5**	**A1-A5**
Hazardous waste disposed (HWD)	kg	0.75	1.3E-05	1.5E-04	0.75
Non-hazardous waste disposed (NHWD)	kg	0.62	0.02	0.58	1.2
Radioactive waste disposed (RWD)	kg	3.2E-04	0	7.4E-08	3.2E-04

*A2 and A3 are not relevant, see reason in the section “Description of the product”. The formulation A1-A3 is kept for consistency reasons.

**Additional information

ADDITIONAL ENVIRONMENTAL INFORMATION

For more explanatory material and more information visit https://www.ncc.group/sustainability/

VERIFICATION DETAILS

Table 6: Verification details

CEN standard EN 15804 served as the core PCR	
PCR:	PCR 2012:01 Construction products and Construction services, Version 2.3 of 2018-11-15 PCR 2012:01-SUB-PCR-G Concrete and concrete elements (EN 16757:2017) of 2018-11-22
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com.
Independent verification of the declaration and data, according to ISO 14025:	□ EPD process certification (Internal) ☒ EPD verification (External)
Third party verifier:	Carl-Otto Nevén (carlotto.neven@bredband.net)
Accredited or approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:	☒ Yes □ No

REFERENCES

Background report
Background report for Environmental Product Declaration – NCC Prepac. NCC Infrastructure AB.

EPD (NCC), Aggregates in Bjurholm
Environmental Product Declaration for aggregates from the mobile crushing plant in Bjurholm, Version of 2017-11-06.

EPD (NCC), Aggregates in Ramnaslätt
Environmental Product Declaration for aggregates from the stationary crushing plant in Ramnaslätt, Version of 2017-11-06.

EN 15804
EN 15804:2012+A1:2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

GaBi 8
Thinkstep (2019). GaBi Professional 8. https://www.thinkstep.com/software/gabi-software.

GPI
General Programme Instructions for the international EPD® system, Version 3.01, of 2019-09-18.

ISO 14025
EN ISO 14025:2014-02: Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

ISO 14040
EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework.

ISO 14044
EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines.

PCR
Product Category Rules PCR 2012:01. Construction products and construction ser-vices. Version 2.3 of 2018-11-15.

SS-EN 13892-2
SS-EN 13892-2. Methods of test for screed materials – Part 2: Determination of flexural and compressive Strength.

Sub-PCR
Product Category Rules PCR 2012:01-SUB-PCR-G Concrete and concrete elements (EN 16757:2017) of 2018-11-22.

The International EPD® system
The International EPD® System, EPD International Ltd., Stockholm Sweden, http://www.environdec.com/

UN CPC
United Nations Statistics Division (2015). Central Product Classification. Version 2.1. https://unstats.un.org/unsd/classifications/unsdclassifications/cpcv21.pdf.

ABOUT THE EPD

This environmental product declaration (EPD) describes, from a life cycle perspective, the environmental impact of NCC Prepac manufactured by NCC Infrastructure AB.

The EPD is drawn up in accordance with Product Category Rules (PCR) 2012:01 for Construction products and construction services and the SUB-PCR-G Concrete and concrete elements (EN 16757:2017). The program operator is the International EPD® System (see www.environdec.com for more information).

The aim of this EPD is that it should provide objective and reliable information on the environmental impact of the production of NCC Prepac by NCC Infrastructure AB. The EPD document shall support NCC in marketing and in business-to-business communication.

This EPD is developed by NCC. It is certified by Carl-Otto Nevén and the certification is valid for five years (after which it can be revised and reissued). NCC Infrastructure AB is the declaration owner. An annual surveillance follow-up during the validity period will be implemented and agreed between the EPD owner and the verifier to evaluate if the content corresponds to the current situation. If any information is affected, the EPD shall be revised. The revision process is led by the LCA practitioner.

NCC is one of the leading construction and property development companies in the Nordic region, with sales of SEK 57 billion and approximately 16 500 employees in 2018. With the Nordic region as its home market, NCC is active throughout the value chain – developing commercial properties and constructing housing, offices, industrial facilities and public buildings, roads, civil engineering structures and other types of infrastructure. NCC also offers input materials used in construction and accounts for paving and road services.

NCC's vision is to renew our industry and provide superior sustainable solutions. NCC aims to be the leading society builder of sustainable environments and will proactively develop new businesses in line with this.

NCC works to reduce both our own and our customers' environmental impact and continues to further refine our offerings with additional products and solutions for sustainability. In terms of the environment, this entails that NCC, at every step of the supply chain, is to offer resource and energy-efficient products and solutions to help our customers reduce their environmental impact and to operate more sustainably. NCC has an ISO 14001 certificate.

NCC's sustainability work is based on a holistic approach with all three dimensions of sustainability – social, environmental and economical. In NCC's sustainability framework, our focus areas with regards to sustainability are defined; Climate and Energy, Materials & Waste, Social Inclusion, Health & Safety, Compliance and Portfolio Performance. Our sustainability strategy includes the aim of being both a leader and a pioneer in these areas.

NCC reports on its sustainability progress each year and the report has been included in NCC's Annual Report since 2010. NCC applies Global Reporting Initiative (GRI) Standards, the voluntary guidelines of the GRI for the reporting of sustainability information. In addition to GRI, NCC also reports the Group's emission of greenhouse gases to the CDP each year. NCC is a member in BSCI (Business Social Compliance Initiative), which is the broadest business-driven platform for the improvement of social compliance in the global supply chain, and has been a member of the UN Global Compact since 2010. The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with 10 defined and universally accepted principles in the areas of human rights, labour, environment and anti-corruption.

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