Type III Environmental Product Declaration No. 566/2023

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Concrete Dyckerhoff EKO

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Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3, A4, C1-C4 and D modules in accordance with EN 15804
(Cradle-to-Gate with options)
The year of preparing the EPD: 2023
Product standard: PN-EN 206+A2:2021-08, PN-B-06265:2022-08
Service Life: 35 years
PCR: ITB-PCR A
Declared unit: 1 m^3
Reasons for performing LCA: B2B
Representativeness: Poland, 2022

MANUFACTURER

Figure 1 The view of one of manufacturing plant

Dyckerhoff Polska Sp. z o. o. is concrete producer with plants located in Poland. Dyckerhoff Polska is part of Buzzi Unicem and belongs to the management area of the Eastern Dyckerhoff Division. Buzzi Unicem is an Italian-based corporation with plants in 13 countries and almost 10,000 employees worldwide. Dyckerhoff Polska is a recognized manufacturer of high-quality cements, ready-mix concretes and special products used in various areas of construction. The production of cement and special products takes place in the Nowiny Cement Plant, located in Nowiny near Kielce. The plant's production capacity is 1.6 million tons of cement per year. The company also has a terminal in Warsaw. Ready-mix specific concrete production for a purpose of this EPD is carried out in 3 plants located in central Poland. The life-cycle assessment was carried out according to the following standards: PN-EN 15804+A2, PN-EN ISO 14025, PN-EN ISO 14040 and the product categorization rules provided in document ITB PCR-A (latest version v 1.6.). Declared reference unit is 1 m^3 of concrete mix. All LCI data was collected by from 3 manufacturing plants between January and December 2022 (12 months) and gathered data is representative for a production technology used in 2022. LCA assessment was carried out using verified ITB algorithms dedicated to calculate the LCA. A concrete production takes place in modern, fully computer-controlled plants, guaranteeing the equality and repeatability of subsequent deliveries of concrete mix.

PRODUCTS DESCRIPTION

Ready-mixed concrete DYCKERHOFF EKO covered by this EPD is produced in strength classe C20/25, C25/30, C30/37. Concrete is specified and supplied in accordance with EN 206 with Polish amendment PN-B-06265. The product assessed is a specific 1 m^3 of mixed concrete, where the constituent technical parameters are provided in Table 1 based on specific values from 3 plants.

Table 1 Properties of Ready-mixed concrete for flooring

Strength class	Consistency class	Chloride content class	Exposure classes	Maximum nominal size of aggregate	Density kg/m^3	CEM III 42.5 N-LH/HSR/NA kg/m^3	Fly ash kg/m^3
C20/25	S3	Cl 0.40	X0	16mm	2299	230	55
C25/30	S3	Cl 0.40	X0	16mm	2323	240	95
C30/37	S3	Cl 0.40	XC3	16mm	2342	280	70

All additional technical information about the product is available on the manufacturer's website and catalogues.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 m^3 of product: C20/25, C25/30, C30/37. In order to obtain the impact results for 1 ton of concrete, the values in the Table 3 should be divided by the factor of density (approx. 2.3 ton/m^3).

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A3, A4, C1-C4+D modules in accordance with EN 15804 and ITB PCR A v1.6 (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A and EN 15804+A2. Each manufacturing plant was subjected to LCI data analysis. The values adopted for the calculations were averaged from 3 plants using a weighted average. Aloccation to products is mass based. The cement used is produced in Poland (specific EPD), and the weighted average mass of CEM III production from Table 1 was taken into account. Minimum 99.5% of impacts from the production were allocated to product covered by this declaration. Emissions allocated in cement production are assessed by ITB using EN 15804+A2 (specific EPDs). Calculations for GWP indicator are made considering gross emissions. The indicated gross value includes the CO_2 emissions from waste incineration (excluding biomass fraction of fuels).

System limits

99.0% materials and 100% energy consumption were inventoried in a factory and were included in calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all raw material used per formulation, utilized energy, and electric power consumption, direct production waste, and available emission measurements. The total of neglected input flows per module A1-A3 does not exceed the permitted maximum of 1 % of energy usage and product mass. Tires consumption for transport was not taken into account. The components with a percentage share of less than 0.1% were not included in the calculations. It is assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

Modules A1 and A2: *Raw materials supply and transport*

The A1 value was calculated based on data on specific cements assigned to the particular product listed in Table 1 and general aggregates and water. Transport of input materials to 3 production plants was inventoried. Aggregates, fly ashes comes and cement comes from national providers. Transport distances were indicated.

Module A3: *Production*

Substrates for concrete production are transported to the plant and then stored in silos. Electricity and oil are used for production. Substrates are weighed and mixed according to of the process

shown in Figure 2. The production uses specific Polish cement. Water consumption for the concrete mix by the plant was allocated in A1.

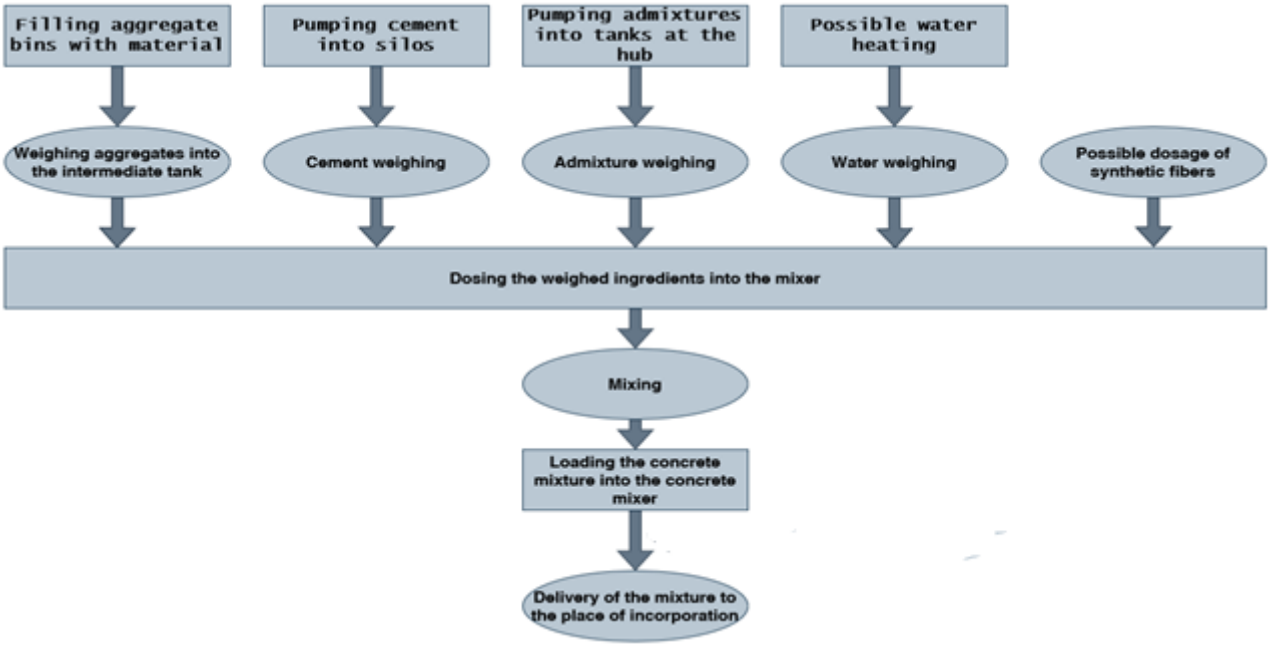

Figure 2 Manufacturing process scheme (A3)

Module A4: transport to consumer

A distance of 15 km to construction site with a concrete truck was assumed.

Modules *C and D: End-of-life (EOL)*

The concrete end-of-life process scenario is generalized from the most common methods. The product (at the end of life in building) is to be removed from an object using heavy mechanical equipment. In the adapted end-of-life scenario, the de-constructed products are transported to a crushing plant distant by 100 km on > 16t lorry EURO 5, where undergo shredding with the use of crawler gear crusher (115 kW, electric drive) – module C3. Recovered materials undergo recycling (new aggregate production, 70%) and landfilling (30%) according to the actual treatment practice of concrete wastes. Environmental impacts declared in module C4 are associated with landfill (30%). Module D presents potential credits resulting from the use of crushed concrete wastes as new aggregates for a road foundation.

Table 2 End-of-life scenario for the Ready-mixed concrete for flooring

Material	Material recovery	Recycling	Landfilling
concrete	100%	70%	30%

Electricity at end-of-life (module C) has been modelled using an average Polish electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.04.2022 – 01.02.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by DYCKERHOFF Sp. z o.o. and verified during data audit. No data collected is older than five years and no generic

datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The background data for the processes come from the following resources database Ecoinvent v.3.9.1 (sand, gravel, water, flyash, admixes). The data for CEM III is based on existing EPD. Specific (LCI) data quality analysis was a part of the input data verification. Where no background data was available, data gaps were complemented by manufacturer information and literature research.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method

Additional information

Polish electricity (Eocinvent v 3.9.1 supplemented by actual national KOBiZE data) emission factor used is 0.702 kg CO_2/kWh. As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

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+A2 and the building context, respectively the product-specific characteristics of performance, are considered. In practice, this means that concrete may be compared in a specific application with the selected usage scenario.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m^3 of Ready-mixed concrete for flooring produced in Europe. The following life cycle modules (Table 3) were included in the analysis. The following tables 4-7 show the environmental impacts of the life cycle of selected modules (A1-A4, C1-C4+D).

Table 3 System boundaries for the environmental characteristic of the product.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

Table 4 Life cycle assessment (LCA) results for Ready-mixed specific concrete C20/25 for flooring manufactured by Dyckerhoff – environmental impacts of (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential (gross)	eq. kg CO_2	1.28E+02	5.38E+01	1.93E+00	1.84E+02	3.83E-01	6.98E+00	1.92E+01	2.69E+01	7.34E+00	-1.61E+01
Greenhouse potential - fossil	eq. kg CO_2	1.27E+02	5.36E+01	1.90E+00	1.83E+02	3.81E-01	6.85E+00	1.91E+01	2.68E+01	7.26E+00	-1.61E+01
Greenhouse potential - biogenic	eq. kg CO_2	7.23E-01	1.83E-01	5.24E-02	9.59E-01	1.30E-03	2.00E-01	6.53E-02	9.15E-02	7.33E-02	-9.66E-04
Global warming potential - land use and land use change	eq. kg CO_2	1.25E-02	2.10E-02	5.97E-04	3.42E-02	1.50E-04	2.40E-03	7.50E-03	1.05E-02	7.36E-03	-7.38E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	7.20E-06	1.24E-05	8.61E-08	1.97E-05	8.83E-08	1.40E-07	4.42E-06	6.19E-06	2.21E-06	-3.03E-06
Soil and water acidification potential	eq. mol H+	2.95E-01	2.18E-01	2.00E-02	5.32E-01	1.55E-03	7.60E-02	7.76E-02	1.09E-01	6.13E-02	-6.76E-01
Eutrophication potential - freshwater	eq. kg P	3.18E-02	3.60E-03	3.13E-03	3.85E-02	2.56E-05	1.30E-02	1.29E-03	1.80E-03	2.11E-03	-2.45E-02
Eutrophication potential - seawater	eq. kg N	1.04E-01	6.57E-02	3.33E-03	1.73E-01	4.67E-04	1.10E-02	2.34E-02	3.28E-02	2.11E-02	-6.01E-02
Eutrophication potential - terrestrial	eq. mol N	5.76E-01	7.16E-01	2.55E-02	1.32E+00	5.10E-03	9.30E-02	2.55E-01	3.58E-01	2.30E-01	-8.07E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.63E-01	2.19E-01	7.13E-03	3.90E-01	1.56E-03	2.60E-02	7.82E-02	1.10E-01	6.65E-02	-1.94E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.92E-02	1.90E-04	8.19E-06	3.94E-02	1.35E-06	3.34E-05	6.78E-05	9.49E-05	2.46E-05	-4.80E-03
Abiotic depletion potential - fossil fuels	MJ	9.84E+02	7.96E+02	3.09E+01	1.81E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.68E+02	-5.66E+02
Water deprivation potential	eq. m^3	3.91E+01	3.68E+00	6.68E-01	4.35E+01	2.62E-02	2.40E+00	1.31E+00	1.84E+00	9.75E-01	-4.19E+01

Table 5 Life cycle assessment (LCA) results for Ready-mixed concrete C20/25 for flooring manufactured by Dyckerhoff – additional impacts indicators (DU: 1 m^3)

Indicator	Unit	A1-A3	A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 6 Life cycle assessment (LCA) results for Ready-mixed concrete C20/25 for flooring manufactured by Dyckerhoff - the resource use (DU: 1 m3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.24E+01	1.14E+01	2.07E+00	4.59E+01	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of renewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	7.84E+01	1.14E+01	2.08E+00	9.19E+01	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.01E+03	7.96E+02	2.79E+01	1.83E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	0.00E+00	-5.66E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.76E+01	0.00E+00	0.00E+00	6.76E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.08E+03	7.96E+02	3.12E+01	1.90E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.81E+02	-5.66E+02
Consumption of secondary materials	kg	7.85E+01	2.67E-01	2.91E-03	7.88E+01	1.90E-03	1.06E-02	9.51E-02	1.33E-01	0.00E+00	1.66E+03
Consumption of renew. secondary fuels	MJ	2.25E-03	2.94E-03	1.50E-05	5.20E-03	2.09E-05	5.91E-05	1.05E-03	1.47E-03	0.00E+00	-2.08E-02
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	2.24E-02	2.24E-02	0.00E+00	9.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	1.91E+00	1.00E-01	2.77E-02	2.04E+00	7.12E-04	3.15E-02	3.57E-02	5.00E-02	2.62E-02	-1.03E+00

Table 7 Life cycle assessment (LCA) results for Ready-mixed concrete C20/25 for flooring manufactured by Dyckerhoff – waste categories (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	1.03E+00	8.93E-01	1.69E-03	1.92E+00	6.35E-03	1.20E-03	3.18E-01	4.46E-01	2.64E-04	-3.95E+00
Non-hazardous waste	kg	9.05E+01	1.59E+01	2.15E-01	1.07E+02	1.13E-01	6.24E-02	5.65E+00	7.91E+00	6.92E+02	-1.10E+02
Radioactive waste	kg	4.18E-04	5.94E-05	4.31E-05	5.20E-04	4.23E-07	8.70E-05	2.12E-05	2.97E-05	1.02E-03	-1.49E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	5.93E-03	2.46E-03	2.10E-01	2.18E-01	1.75E-05	1.20E-04	8.78E-04	1.23E-03	0.00E+00	-7.66E-03
Materials for energy recovery	kg	1.53E-05	1.99E-05	2.65E-07	3.55E-05	1.42E-07	1.05E-06	7.10E-06	9.95E-06	0.00E+00	-7.11E-04
Exported Energy	MJ	9.46E+00	0.00E+00	8.71E-02	9.55E+00	0.00E+00	3.46E-01	0.00E+00	0.00E+00	0.00E+00	-1.54E+00

Table 8 Life cycle assessment (LCA) results for Ready-mixed specific concrete C25/30 for flooring manufactured by Dyckerhoff – environmental impacts of (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential (gross)	eq. kg CO_2	1.33E+02	5.38E+01	1.93E+00	1.89E+02	3.83E-01	6.98E+00	1.92E+01	2.69E+01	7.34E+00	-1.61E+01
Greenhouse potential - fossil	eq. kg CO_2	1.33E+02	5.36E+01	1.90E+00	1.88E+02	3.81E-01	6.85E+00	1.91E+01	2.68E+01	7.26E+00	-1.61E+01
Greenhouse potential - biogenic	eq. kg CO_2	7.85E-01	1.83E-01	5.24E-02	1.02E+00	1.30E-03	2.00E-01	6.53E-02	9.15E-02	7.33E-02	-9.66E-04
Global warming potential - land use and land use change	eq. kg CO_2	1.30E-02	2.10E-02	5.97E-04	3.47E-02	1.50E-04	2.40E-03	7.50E-03	1.05E-02	7.36E-03	-7.38E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	7.51E-06	1.24E-05	8.61E-08	2.00E-05	8.83E-08	1.40E-07	4.42E-06	6.19E-06	2.21E-06	-3.03E-06
Soil and water acidification potential	eq. mol H+	3.07E-01	2.18E-01	2.00E-02	5.44E-01	1.55E-03	7.60E-02	7.76E-02	1.09E-01	6.13E-02	-6.76E-01
Eutrophication potential - freshwater	eq. kg P	3.34E-02	3.60E-03	3.13E-03	4.01E-02	2.56E-05	1.30E-02	1.29E-03	1.80E-03	2.11E-03	-2.45E-02
Eutrophication potential - seawater	eq. kg N	1.07E-01	6.57E-02	3.33E-03	1.76E-01	4.67E-04	1.10E-02	2.34E-02	3.28E-02	2.11E-02	-6.01E-02
Eutrophication potential - terrestrial	eq. mol N	6.02E-01	7.16E-01	2.55E-02	1.34E+00	5.10E-03	9.30E-02	2.55E-01	3.58E-01	2.30E-01	-8.07E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.72E-01	2.19E-01	7.13E-03	3.99E-01	1.56E-03	2.60E-02	7.82E-02	1.10E-01	6.65E-02	-1.94E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	4.09E-02	1.90E-04	8.19E-06	4.11E-02	1.35E-06	3.34E-05	6.78E-05	9.49E-05	2.46E-05	-4.80E-03
Abiotic depletion potential - fossil fuels	MJ	1.03E+03	7.96E+02	3.09E+01	1.85E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.68E+02	-5.66E+02
Water deprivation potential	eq. m^3	3.92E+01	3.68E+00	6.68E-01	4.36E+01	2.62E-02	2.40E+00	1.31E+00	1.84E+00	9.75E-01	-4.19E+01

Table 9 Life cycle assessment (LCA) results for Ready-mixed concrete C25/30 for flooring manufactured by Dyckerhoff – additional impacts indicators (DU: 1 m^3)

Indicator	Unit	A1-A3	A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 10 Life cycle assessment (LCA) results for Ready-mixed concrete C25/30 for flooring manufactured by Dyckerhoff - the resource use (DU: 1 m3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.25E+01	1.14E+01	2.07E+00	4.59E+01	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of renewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	8.05E+01	1.14E+01	2.08E+00	9.40E+01	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.06E+03	7.96E+02	2.79E+01	1.88E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	0.00E+00	-5.66E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.76E+01	0.00E+00	0.00E+00	6.76E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.12E+03	7.96E+02	3.12E+01	1.95E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.81E+02	-5.66E+02
Consumption of secondary materials	kg	8.19E+01	2.67E-01	2.91E-03	8.22E+01	1.90E-03	1.06E-02	9.51E-02	1.33E-01	0.00E+00	1.66E+03
Consumption of renew. secondary fuels	MJ	2.62E-03	2.94E-03	1.50E-05	5.57E-03	2.09E-05	5.91E-05	1.05E-03	1.47E-03	0.00E+00	-2.08E-02
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	2.24E-02	2.24E-02	0.00E+00	9.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	1.94E+00	1.00E-01	2.77E-02	2.07E+00	7.12E-04	3.15E-02	3.57E-02	5.00E-02	2.62E-02	-1.03E+00

Table 11 Life cycle assessment (LCA) results for Ready-mixed concrete C25/30 for flooring manufactured by Dyckerhoff – waste categories (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	1.04E+00	8.93E-01	1.69E-03	1.94E+00	6.35E-03	1.20E-03	3.18E-01	4.46E-01	2.64E-04	-3.95E+00
Non-hazardous waste	kg	1.48E+02	1.59E+01	2.15E-01	1.64E+02	1.13E-01	6.24E-02	5.65E+00	7.91E+00	6.92E+02	-1.10E+02
Radioactive waste	kg	4.19E-04	5.94E-05	4.31E-05	5.21E-04	4.23E-07	8.70E-05	2.12E-05	2.97E-05	1.02E-03	-1.49E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.29E-03	2.46E-03	2.10E-01	2.19E-01	1.75E-05	1.20E-04	8.78E-04	1.23E-03	0.00E+00	-7.66E-03
Materials for energy recovery	kg	1.56E-05	1.99E-05	2.65E-07	3.58E-05	1.42E-07	1.05E-06	7.10E-06	9.95E-06	0.00E+00	-7.11E-04
Exported Energy	MJ	1.31E+01	0.00E+00	8.71E-02	1.32E+01	0.00E+00	3.46E-01	0.00E+00	0.00E+00	0.00E+00	-1.54E+00

Table 12 Life cycle assessment (LCA) results for Ready-mixed specific concrete C30/37 for flooring manufactured by Dyckerhoff – environmental impacts of (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential (gross)	eq. kg CO_2	1.57E+02	5.38E+01	1.93E+00	2.13E+02	3.83E-01	6.98E+00	1.92E+01	2.69E+01	7.34E+00	-1.61E+01
Greenhouse potential - fossil	eq. kg CO_2	1.56E+02	5.36E+01	1.90E+00	2.12E+02	3.81E-01	6.85E+00	1.91E+01	2.68E+01	7.26E+00	-1.61E+01
Greenhouse potential - biogenic	eq. kg CO_2	8.47E-01	1.83E-01	5.24E-02	1.08E+00	1.30E-03	2.00E-01	6.53E-02	9.15E-02	7.33E-02	-9.66E-04
Global warming potential - land use and land use change	eq. kg CO_2	1.45E-02	2.10E-02	5.97E-04	3.62E-02	1.50E-04	2.40E-03	7.50E-03	1.05E-02	7.36E-03	-7.38E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	8.78E-06	1.24E-05	8.61E-08	2.13E-05	8.83E-08	1.40E-07	4.42E-06	6.19E-06	2.21E-06	-3.03E-06
Soil and water acidification potential	eq. mol H+	3.56E-01	2.18E-01	2.00E-02	5.93E-01	1.55E-03	7.60E-02	7.76E-02	1.09E-01	6.13E-02	-6.76E-01
Eutrophication potential - freshwater	eq. kg P	3.85E-02	3.60E-03	3.13E-03	4.53E-02	2.56E-05	1.30E-02	1.29E-03	1.80E-03	2.11E-03	-2.45E-02
Eutrophication potential - seawater	eq. kg N	1.39E-01	6.57E-02	3.33E-03	2.08E-01	4.67E-04	1.10E-02	2.34E-02	3.28E-02	2.11E-02	-6.01E-02
Eutrophication potential - terrestrial	eq. mol N	6.70E-01	7.16E-01	2.55E-02	1.41E+00	5.10E-03	9.30E-02	2.55E-01	3.58E-01	2.30E-01	-8.07E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.94E-01	2.19E-01	7.13E-03	4.20E-01	1.56E-03	2.60E-02	7.82E-02	1.10E-01	6.65E-02	-1.94E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	4.77E-02	1.90E-04	8.19E-06	4.79E-02	1.35E-06	3.34E-05	6.78E-05	9.49E-05	2.46E-05	-4.80E-03
Abiotic depletion potential - fossil fuels	MJ	1.23E+03	7.96E+02	3.09E+01	2.05E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.68E+02	-5.66E+02
Water deprivation potential	eq. m^3	4.27E+01	3.68E+00	6.68E-01	4.70E+01	2.62E-02	2.40E+00	1.31E+00	1.84E+00	9.75E-01	-4.19E+01

Table 13 Life cycle assessment (LCA) results for Ready-mixed concrete C30/37 for flooring manufactured by Dyckerhoff – additional impacts indicators (DU: 1 m^3)

Indicator	Unit	A1-A3	A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 14 Life cycle assessment (LCA) results for Ready-mixed concrete C30/37 for flooring manufactured by Dyckerhoff - the resource use (DU: 1 m3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.29E+01	1.14E+01	2.07E+00	4.64E+01	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of renewable primary energy resources used as raw materials	MJ	5.60E+01	0.00E+00	0.00E+00	5.60E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	8.89E+01	1.14E+01	2.08E+00	1.02E+02	8.12E-02	8.60E+00	4.07E+00	5.70E+00	2.95E+00	-6.50E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.24E+03	7.96E+02	2.79E+01	2.06E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	0.00E+00	-5.66E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.01E+02	0.00E+00	0.00E+00	1.01E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.34E+03	7.96E+02	3.12E+01	2.17E+03	5.66E+00	1.16E+02	2.84E+02	3.97E+02	1.81E+02	-5.66E+02
Consumption of secondary materials	kg	9.55E+01	2.67E-01	2.91E-03	9.58E+01	1.90E-03	1.06E-02	9.51E-02	1.33E-01	0.00E+00	1.66E+03
Consumption of renew. secondary fuels	MJ	2.41E-03	2.94E-03	1.50E-05	5.36E-03	2.09E-05	5.91E-05	1.05E-03	1.47E-03	0.00E+00	-2.08E-02
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	2.24E-02	2.24E-02	0.00E+00	9.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	2.15E+00	1.00E-01	2.77E-02	2.28E+00	7.12E-04	3.15E-02	3.57E-02	5.00E-02	2.62E-02	-1.03E+00

Table 15 Life cycle assessment (LCA) results for Ready-mixed concrete C30/37 for flooring manufactured by Dyckerhoff – waste categories (DU: 1 m^3)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	1.40E+00	8.93E-01	1.69E-03	2.29E+00	6.35E-03	1.20E-03	3.18E-01	4.46E-01	2.64E-04	-3.95E+00
Non-hazardous waste	kg	1.13E+02	1.59E+01	2.15E-01	1.30E+02	1.13E-01	6.24E-02	5.65E+00	7.91E+00	6.92E+02	-1.10E+02
Radioactive waste	kg	4.40E-04	5.94E-05	4.31E-05	5.43E-04	4.23E-07	8.70E-05	2.12E-05	2.97E-05	1.02E-03	-1.49E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.16E-03	2.46E-03	2.10E-01	2.19E-01	1.75E-05	1.20E-04	8.78E-04	1.23E-03	0.00E+00	-7.66E-03
Materials for energy recovery	kg	1.57E-05	1.99E-05	2.65E-07	3.59E-05	1.42E-07	1.05E-06	7.10E-06	9.95E-06	0.00E+00	-7.11E-04
Exported Energy	MJ	1.29E+01	0.00E+00	8.71E-02	1.30E+01	0.00E+00	3.46E-01	0.00E+00	0.00E+00	0.00E+00	-1.54E+00

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) [x] external [ ] internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCI and verification: Michał Chwedaczuk, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: Note: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products (2023)
- PN-EN 206+A2:2021-08: Concrete. Specification, performance, production and conformity
- PN-B-06265:2022-08: Beton - Wymagania, właściwości użytkowe, produkcja i zgodność - Krajowe uzupełnienie PN-EN 206+A2:2021-08
- PN-EN 197-1:2012: Cement - part 1: Composition. specifications and conformity criteria for common cements
- PN-EN ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
- PN-EN 15804+A2:2020-03 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- PN-EN 16908:2017-02 Cement and building lime. Environmental product declarations. Product category rules complementary to EN 158044.
- PN-EN ISO 14040:2009 Environmental management - Life cycle assessment - Principles and frame-work
- ECRA (European Cement Research Academy) – Background report "TR-ECRA 0181/2014 Environmental Product Declarations for representative European cements "
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- PN-B-19707:2013-10: Cement - Cement specjalny - Skład, wymagania i kryteria zgodności
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2021
- Ecoinvent.org

Instytut Techniki Budowlanej

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Data: 2024.03.14 14:10:35 CET

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Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 566/2023
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Concrete DYCKERHOFF EKO

Manufacturer:

Dyckerhoff Polska Sp. z o.o.

ul. Zakładowa 3, 26-052 Nowiny, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 6th December 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, December 2023