CALCESTRUZZI

S-P-01203

EPD - Environmental Product Declaration

In accordance with
ISO 14025 and EN 15804

Programme: The International EPD System,
www.environdec.com
Programme operator: EPD® International AB
Geographical scope: National (Italy)

Publication date: 2018/01/11
Version date: 2021/09/15
Valid until: 2024/06/07

i.idro DRAIN

Air content	**>15% and < 25%**
Draining capacity (aggregates size Xlarge 6-11mm)	**>1000 mm/min**
Draining capacity (aggregates size Large 2-6mm)	**>300 mm/min**

EPD Type	**Cradle-to-grave with module D (LCA stages A1 to D)**
Certification No.	**S-P-01203**
Validity	**2024/06/07**

Declaration of general information

Manufacturer information

The history of Italcementi is the history of the cement industry in Italy. The company was founded over 150 years ago in Bergamo, when the first cement was ground in a watermill in 1864. Italcementi has since become a leader in Italy, both from the industrial and market perspective. The current Italcementi industrial structure for cement production in Italy consists of six full-cycle cement plants, a site for special products and eight grinding centers. The overall industrial network boasts also a relevant presence in the concrete sector, through 124 ready-mixed concrete plants and 17 quarries for aggregates of the subsidiary company Calcestruzzi SpA. Italcementi is a market leader in Italy, both in the cement and ready-mixed concrete business. The company has actively participated in the development of the Country, by contributing to important infrastructures. With a strong vocation for innovation, Italcementi has been a partner of great engineers and architects for major works. A special relationship connects Italcementi to the world of Universal Expositions. The first experience dates back to 1867, when the Company was awarded with the silver medal at the Universal Exposition in Paris. More recently, Italcementi played an active role in Expo 2010 Shanghai, by developing i.light, the transparent cement used for the Italian Pavilion, a masterpiece among 2010's best inventions, kept as a permanent structure. Last but not least, the company was engaged in the development of a new and truly innovative material - i.active BIODYNAMIC -, allowing for the creation of the extremely complex shapes of Palazzo Italia, the iconic place of Expo 2015 Milano. Among the most recent achievements, i.lab deserves a special mention. Located at the Kilometro Rosso scientific and technologic park in Bergamo, the building hosts the Product Innovation Centre of HeidelbergCement Group, as well as the Italian Headquarter of Italcementi. It is the synthesis of the Company's commitment towards innovative and sustainable technologies and materials. Italcementi is strongly engaged in anticipating market trends and requirements, promoting the concept of sustainable construction.

Further information on HeidelbergCement, Italcementi SpA and Calcestruzzi SpA can be accessed at the official websites http://www.heidelbergcement.com/en - http://www.italcementi.it - http://www.calcestruzzi.it

Product description

i.idro DRAIN is an innovative concrete with high water drainage capacities and a compressive strength of more than 10MPa. There are two types of **i.idro DRAIN** depending on the type of cement used. White **i.idro DRAIN** is made up of white cement while Grey **i.idro DRAIN** contains grey cement.




Tests carried out according to the Standard EN 206 establishes the compressive strength of i.idro DRAIN at a minimum of 10 MPa. The use of i.idro DRAIN does not require particular performance as regards environmental exposure class and workability. There is therefore no defined exposure class nor slump class.

i.idro DRAIN combines the strength of concrete with a drainage capacity of 100 times more than that of silt and clay, thanks to a special selection of aggregate size and the choice of air entrainment agent which both increase the percentage of air content.

As demonstrated through comparative tests performed by Politecnico di Milano, the excellent drainage capacity of i.idro DRAIN equals or even exceeds that of naturally-available loose materials like sand, clay and silt, and that of traditional water-draining asphalt pavements. The European Standard, EN 12697-40:2012, describes a method to determine the in-situ relative hydraulic conductivity, at specific locations, of a road surfacing that is designed to be permeable. The test measures the ability of a surfacing to drain water achieved in-situ.

Draining capacity of i.idro DRAIN

In the case of **i.idro DRAIN**, results obtained according to the particle size distribution of aggregates used are reported in the table below.

i.idro DRAIN drainability		
Aggregates size	**Draining capacity (UNI 12697-40)**	**Classification**
X Large (2mm<15%, 6,3mm<95%)	>1000 mm/min (2.69*10-2 m/s)	VERY HIGH
Large (6,3mm<25%, 10mm<75%)	>300 mm/min (5.78*10-3 m/s)	HIGH

Source: DIIAR, Politecnico di Milano (Milan University of Science and Technology)

The high draining capacity of i.idro DRAIN promotes water drainage thus reducing surface runoff and hydroplaning effect. It also guarantees groundwater recharge (deep drainage) and is therefore particularly suitable for application within environmentally protected areas where water is to be returned to the ground.
The use of i.idro DRAIN also allows harvesting and reuse of stormwater, as this can be adequately conveyed through suitable collection systems. i.idro DRAIN do not contain oils which usually lead to contaminated stormwater. Moreover, the relatively white surface compared to traditional pavements reduces the ground temperature significantly (down to 30° C) due to the albedo effect, thus providing more comfortable conditions for pedestrians. See section on Additional Information.
The composition, structure and technical properties of i.idro DRAIN makes it suitable for pavement applications in:

- ✓ Sidewalks
- ✓ Trails
- ✓ Parking lots
- ✓ Cycle lanes
- ✓ Low-volume roadways
- ✓ Walkways and alleys
- ✓ Environmentally protected roads and areas subject to fire hazards.

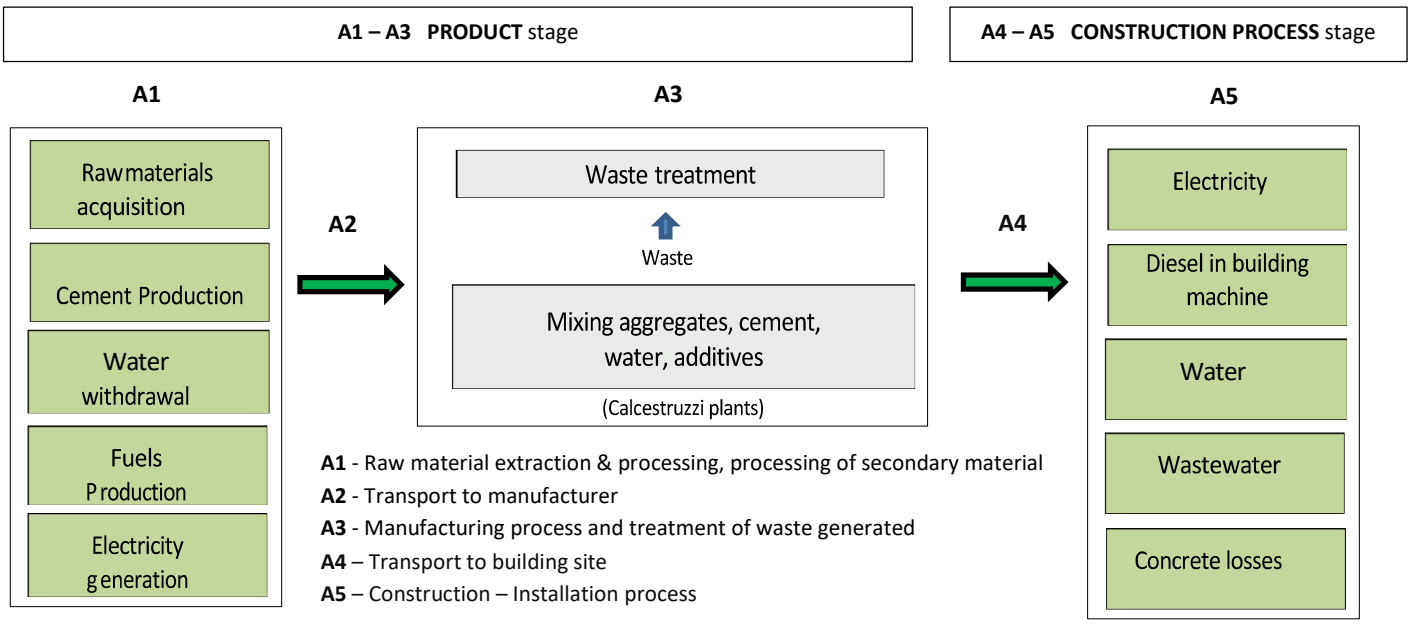
Production process

The innovative nature of i.idro DRAIN is also linked to the choice of input materials as well as the production process. In the case of aggregates, the objective to achieve specific draining capacities, requires a special selection of aggregate type which are supplied from the quarries located nearby the concrete plants of Calcestruzzi. Moreover, the composition mix is strictly respected in order to guarantee expected mechanical and draining performance.
The production mix is controlled and maintained by appropriate measuring instruments in the concrete plants.

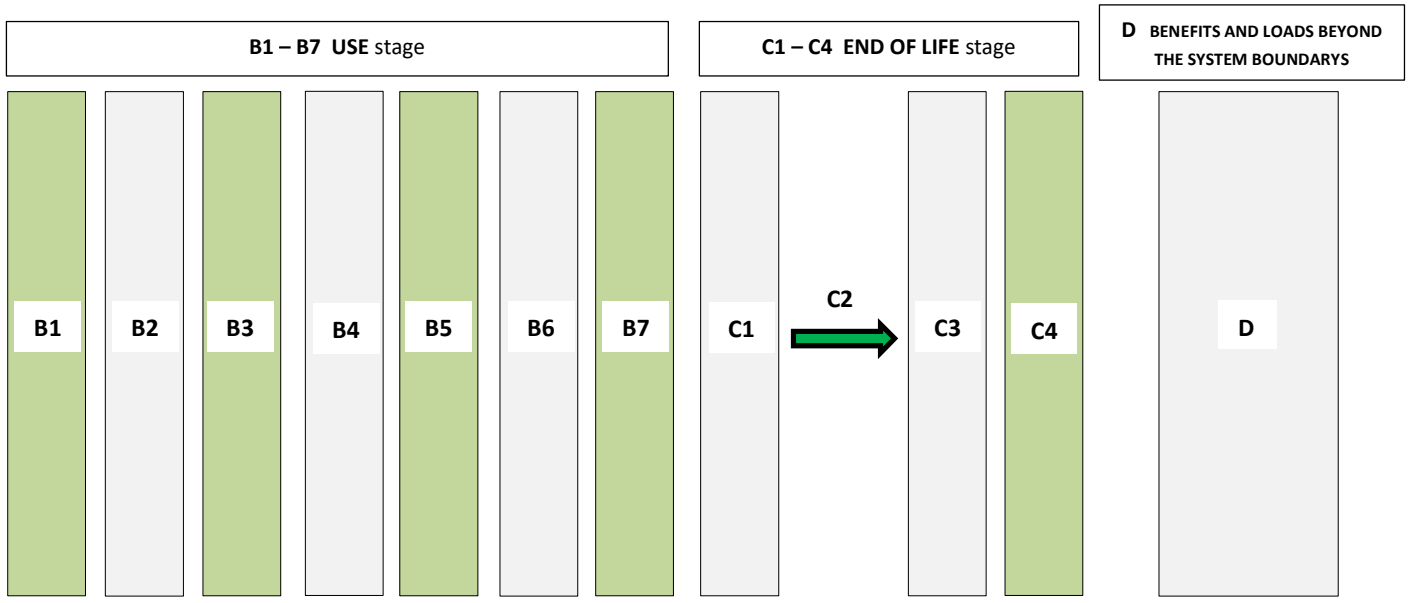
i.idro DRAIN concrete production

At Calcestruzzi plants producing i.idro DRAIN, cement supplied are stored in silos while aggregates are deposited in a dedicated open area. Additives are received and stored in cisterns and tanks protected from atmospheric agents while water is sourced from wells located in the plants. All raw materials are automatically measured according to stabilized proportion, transported through conveyor belts directly to the concrete mixer where they are all mixed together. Cement is fed through coclea, aggregates on conveyor belts while water and additives are pumped. The produced i.idro DRAIN is then delivered to the building sites in concrete mixers.
Emissions related to the production process includes air emissions from the use of fuels in onsite transportation vehicles and also dust emissions arising from the handling (transportation and mixing) of raw materials and product.

Process flow diagram



A1 - Raw material extraction & processing, processing of secondary material
A2 - Transport to manufacturer
A3 - Manufacturing process and treatment of waste generated
A4 – Transport to building site
A5 – Construction – Installation process



B1 - Use
B2 - Maintenance
B3 - Repair
B4 - Replacement
B5 - Refurbishment
B6 - Operational energy use
B7 - Operational water use

C1 - Deconstruction - Demolition
C2 - Transport
C3 - Waste processing
C4 - Disposal
D - Reuse-Recovery-Recycling potential

Composition

The overall composition of white and grey **i.idro DRAIN** and the energy input by energy source is provided below.

i.idro DRAIN material content declaration		
Material inputs	**1 m³ Grey i.idro DRAIN Composition (%)**	**1 m³ White i.idro DRAIN Composition (%)**
Grey cement	17.00	-
White cement	-	17.15
Aggregates	78.04	77.90
Water	4.88	4.83
Additives	0.04	0.11
Colour pigment	0.03	0.01
Synthetic fiber	0.01	-

Recycled materials content (ISO 14021 compliant)

The recycled materials content of white and grey **i.idro DRAIN,** ISO 14021 complaint, is provided below.

Product	Recycled pre-consumer materials	Recycled post-consumer materials
1 m³ White i.idro DRAIN	0.00 %	0.00 %
1 m³ Grey i.idro DRAIN	0.81 %	0.96 %

Energy consumption

Energy consumption in the production of i.idro DRAIN is mainly electricity associated to the movement and mixing of cement, aggregates, additives and water in the concrete plant. There is limited use of diesel for transportation onsite.

i.idro DRAIN energy use		
Energy use	**1m³ Grey i.idro DRAIN**	**1m³ White i.idro DRAIN**
Italian Grid Electricity (kWh)	3.60	6.77
Diesel (l)	0.10	0.05

EPD type and programme operator

This is an Environmental Product Declaration (EPD) compliant to a Type III environmental declaration as defined by ISO 14025:2010. The EPD is subject to the International EPD System (IES) which acts as the Programme Operator:
EPD International AB, Box 210 60; SE-100 31 Stockholm, Sweden.
E-mail: info@environdec.com.
This EPD is aligned to the Product Category Rules (PCR) for the assessment of the environmental performance of **UN CPC 375 relative to Concrete (C-PCR-003 ”Concrete and concrete elements” (EN 16757) v. 2019-12-20 to PCR 2019:14 ”Construction Products” v.1.11).**

The General Programme Instructions (version 4.0 dated 2021-03-29) of the IEC have been implemented. The EPD refers to a cradle to grave with module D boundary so as to meet the following goals:

- ✓ Provide relevant information and data for business-to-business communication.
- ✓ Investigate environmental performance related to various choices of raw materials and inform decision making on future production.

This EPD refers to the production of i.idro DRAIN during the year 2019 in Italy and applies life cycle assessment study carried out following the principles contained in the ISO 14040 series of standards and EN 15804 specific for construction products.
Calcestruzzi Spa as EPD owner has the sole ownership, liability and responsibility for this EPD.
EPDs within the same product category but from different EPD Programmes shall not be comparable.
EPDs of construction products may not be comparable if they do not comply with EN 15804. The comparison of products on the basis of their EPD is defined by the contribution they make to the environmental performance of the building. Consequently, comparison of the environmental performance of construction products using this EPD information shall be based on the product's use in and its impacts on the building and shall consider the complete life cycle of the product within the building or construction works.

The results in terms of environmental impacts, resource use and other environmental information are based on this declared unit. They are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.
The EPD Tool (GCCA tool for EPD of concrete and cement v.3.0) pre-verified against requirements of the reference cement and concrete PCR, was used in computing Life cycle impacts of i.idro DRAIN. The Tool applies specific datasets of the cement and concrete production process together with representative datasets in Ecoinvent version 3.5 to compute environmental parameters of the product under study.

Declaration of environmental parameters derived from LCA

Scope

Declared unit (as of reference PCR)	**1 m^3 i.idro DRAIN**
Temporary boundary	2019 production – Grey i.idro Drain 2018 production – White i.idro Drain
System boundary	Cradle to grave with module D (A+B+C+D) A1 - Raw material and fuel acquisition, electricity generation & distribution. A2 - Transport to plant. A3 - Manufacturing processes at plant, treatment of waste manufacturing processes. A4 - Transport to construction site A5 - Construction process B1 - Use C1 - Deconstruction - Demolition C2 - Transport C3 - Waste processing C4 - Disposal D - Reuse - Recovery - Recycling potential

Parameters describing core environmental impacts

The following information on environmental impacts is expressed with the impact category parameters of LCIA using characterization factors.

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
GWP-tot	kg CO_2 eq	4.13E2	4.98E0	1.99E1	-1.19E1	-
GWP-fos	kg CO_2 eq	4.12E2	4.97E0	1.99E1	-1.19E1	-
GWP-bio	kg CO_2 eq	1.47E-1	1.75E-3	8.99E-3	0.00	-
GWP-luc	kg CO_2 eq	1.22E-1	1.89E-3	7.35E-3	0.00	-
ODP	kg CFC-11 eq	2.08E-5	9.03E-7	1.98E-6	0.00	-
POCP	Kg NMVOC eq.	1.25E0	1.48E-2	1.12E-1	0.00	-
AP	mol H+ eq.	1.69E-1	1.20E-3	8.84E-3	0.00	-
EP-fw	kg PO_4^{3-} eq.	5.50E-2	3.92E-4	2.88E-3	0.00	-
EP-fw*	kg P eq	3.98E-3	3.28E-5	7.59E-4	0.00	-
EP-mar	kg N eq.	3.38E0	2.96E-2	4.06E-1	0.00	-
EP-ter	mol N eq.	8.82E-1	1.16E-2	1.11E-1	0.00	-
ADPE	kg Sb eq	4.45E-4	1.48E-5	2.04E-5	0.00	-
ADPF	Mj eq	2.47E3	7.37E1	1.85E2	0.00	-
WDP	m^3	3.60E3	5.20E-1	1.06E2	0.00	-

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-tot	kg CO_2 eq	8.99E0	1.24E1	-2.98E0	0.00	-3.09E1
GWP-fos	kg CO_2 eq	8.99E0	1.24E1	-3.02E0	0.00	-3.08E1
GWP-bio	kg CO_2 eq	1.6E-3	6.9E-3	2.1E-2	0.00	-7.09E-2
GWP-luc	kg CO_2 eq	1.13E-3	6.48E-3	1.6E-2	0.00	-3.64E-2
ODP	kg CFC-11 eq	1.62E-6	2.09E-6	4.04E-7	0.00	-3.69E-6
POCP	Kg NMVOC eq.	9.42E-2	4.77E-2	4.28E-2	0.00	-2.34E-1
AP	mol H+ eq.	1.23E-3	4.35E-3	1.02E-2	0.00	-2.59E-2
EP-fw	kg PO_4^{3-} eq.	4.02E-4	1.42E-3	3.32E-3	0.00	-8.45E-3
EP-fw*	kg P eq	3.34E-5	1.07E-4	2.31E-4	0.00	-5.65E-4
EP-mar	kg N eq.	4.44E-1	1.19E-1	7.98E-2	0.00	-6.65E-1
EP-ter	mol N eq.	1.22E-1	4.01E-2	2.25E-2	0.00	-1.82E-1
ADPE	kg Sb eq	2.66E-6	3.4E-5	4.98E-6	0.00	-2.15E-4
ADPF	Mj eq	1.29E2	1.77E2	6.98E1	0.00	-3.79E2
WDP	m^3	7.67E-1	1.42E0	1.16E0	0.00	-3.13E1

• **GWP-tot** (Global Warming Potential total) • **GWP-fos** (Global Warming Potential fossil fuels) • **GWP-bio** (Global Warming Potential biogenic) • **GWP-luc** (Global Warming Potential land use and land use change) • **ODP** (Depletion potential of the stratospheric ozone layer) •**AP** (Acidification potential,Accumulated Exceedance) • **EP-fw** (Eutrophication potential, fraction of nutrients reaching freshwater end compartment) • **EP-fw*** (Eutrophication potential, fraction of nutrients reaching freshwater end compartment*) • **EP-mar** (Eutrophication potential, fraction of nutrients reaching marine end compartment) • **EP-ter** (Eutrophication potential, Accumulated Exceedance) • **POCP** (Formation potential of tropospheric ozone) • **ADPE** (Abiotic depletion potential for non- fossil resources) • **ADPF** (Abiotic depletion for fossil resources potential) • **WDP** (Water (user) deprivation potential, deprivation weighted water consumption)

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
GWP-tot	kg CO_2 eq	2.96E2	4.85E0	1.67E1	-5.99E0	-
GWP-fos	kg CO_2 eq	2.95E2	4.85E0	1.67E1	-5.99E0	-
GWP-bio	kg CO_2 eq	1.19E-1	1.71E-3	8.13E-3	0.00	-
GWP-luc	kg CO_2 eq	7.76E-2	1.84E-3	5.99E-3	0.00	-
ODP	kg CFC-11 eq	1.29E-5	8.81E-7	1.74E-6	0.00	-
AP	mol H+ eq.	7.78E-1	1.44E-2	9.79E-2	0.00	-
EP-fw	kg PO_4^{3-} eq.	6.96E-2	1.17E-3	5.85E-3	0.00	-
EP-fw*	kg P eq	2.27E-2	3.82E-4	1.91E-3	0.00	-
EP-mar	kg N eq.	1.71E-3	3.20E-5	6.91E-4	0.00	-
EP-ter	mol N eq.	2.31E0	2.89E-2	3.74E-1	0.00	-
POCP	Kg NMVOC eq.	6.02E-1	1.13E-2	1.02E-1	0.00	-
ADPE	kg Sb eq	3.14E-4	1.45E-5	1.64E-5	0.00	-
ADPF	Mj eq	1.21E3	7.18E1	1.47E2	0.00	-
WDP	m^3	1.03E4	5.07E-1	3.08E2	0.00	-

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-tot	kg CO_2 eq	8.99E0	1.21E1	1.08E0	7.68E-5	-3.01E1
GWP-fos	kg CO_2 eq	8.99E0	1.21E1	1.05E0	7.68E-5	-3,00E1
GWP-bio	kg CO_2 eq	1.6E-3	6.73E-3	2.04E-2	5.08E-8	-6.92E-2
GWP-luc	kg CO_2 eq	1.13E-3	6.32E-3	1.56E-2	4.12E-8	-3.55E-2
ODP	kg CFC-11 eq	1.62E-6	2.04E-6	3.94E-7	2.5E-11	-3.60E-6
AP	mol H+ eq.	9.42E-2	4.65E-2	4.17E-2	7.36E-7	-2.29E-1
EP-fw	kg PO_4^{3-} eq.	1.23E-3	4.24E-3	9.94E-3	2.76E-8	-2.53E-2
EP-fw*	kg P eq	4.02E-4	1.38E-3	3.24E-3	9,00E-09	-8.24E-3
EP-mar	kg N eq.	3.34E-5	1.05E-4	2.25E-4	8.5E-10	-5.51E-4
EP-ter	mol N eq.	4.44E-1	1.16E-1	7.78E-2	2.64E-6	-6.48E-1
POCP	Kg NMVOC eq.	1.22E-1	3.91E-2	2.19E-2	7.74E-7	-1.77E-1
ADPE	kg Sb eq	2.66E-6	3.31E-5	4.85E-6	8.37E-11	-2.09E-4
ADPF	Mj eq	1.29E2	1.72E2	6.80E1	2.11E-3	-3.69E2
WDP	m^3	7.67E-1	1.38E0	1.13E0	1.03E-4	-3.05E1

• **GWP-tot** (Global Warming Potential total) • **GWP-fos** (Global Warming Potential fossil fuels) • **GWP-bio** (Global Warming Potential biogenic) • **GWP-luc** (Global Warming Potential land use and land use change) • **ODP** (Depletion potential of the stratospheric ozone layer) •**AP** (Acidification potential,Accumulated Exceedance) • **EP-fw** (Eutrophication potential, fraction of nutrients reaching freshwater end compartment) • **EP-fw*** (Eutrophication potential, fraction of nutrients reaching freshwater end compartment*) • **EP-mar** (Eutrophication potential, fraction of nutrients reaching marine end compartment) • **EP-ter** (Eutrophication potential, Accumulated Exceedance) • **POCP** (Formation potential of tropospheric ozone) • **ADPE** (Abiotic depletion potential for non- fossil resources) • **ADPF** (Abiotic depletion for fossil resources potential) • **WDP** (Water (user) deprivation potential, deprivation weighted water consumption)

Parameters describing additional environmental impacts

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
GWP GHG	kg CO_2 eq	4.13E2	4.98E0	1.99E1	-1.19E1	-
PM	Disease incidence	1.17E-5	3.15E-7	1.98E-6	0.00	-
IRP	kBq U235 eq.	2.72E4	3.76E2	1.93E3	0.00	-
ETP	CTUe	1.70E2	1.22E1	9.64E0	0.00	-
HTPC	CTUh	1.61E-6	3.59E-8	2.35E-7	0.00	-
HTPNC	CTUh	1.60E-5	7.22E-7	1.31E-6	0.00	-
SQP	dimensionless	2.16E3	7.71E1	1.08E2	0.00	-

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
GWP GHG	kg CO_2 eq	8.99E0	1.24E1	-2.98E0	0.00	-3.09E1
PM	Disease incidence	6.08E2	9.69E2	8.91E2	0.00	-2.69E3
IRP	kBq U235 eq.	1.76E0	2.66E1	1.74E0	0.00	-3.31E1
ETP	CTUe	6.36E-8	1.26E-7	6.91E-8	0.00	-5.28E-7
HTPC	CTUh	2.46E-7	1.69E-6	3.18E-7	0.00	-4.01E-6
HTPNC	CTUh	7.71E0	1.88E2	6.78E1	0.00	-4.61E2
SQP	dimensionless	2.45E-6	8.49E-7	3.82E-7	0.00	-2.59E-6

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
GWP GHG	kg CO_2 eq	2.96E2	4.85E0	1.67E1	-5.99E0	-
PM	Disease incidence	8.00E-6	3.07E-7	1.87E-6	0.00	-
IRP	kBq U235 eq.	1.47E4	3.66E2	1.55E3	0.00	-
ETP	CTUe	1.01E2	1.19E1	7.53E0	0.00	-
HTPC	CTUh	1.13E-6	3.50E-8	2.20E-7	0.00	-
HTPNC	CTUh	1.45E-5	7.04E-7	1.26E-6	0.00	-
SQP	dimensionless	1.19E3	7.51E1	7.83E1	0.00	-

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
GWP GHG	kg CO_2 eq	8.99E0	1.21E1	1.08E0	7.68E-5	-3.01E1
PM	Disease incidence	2.45E-6	8.27E-7	3.73E-7	1.37E-11	-2.53E-6
IRP	kBq U235 eq.	6.08E2	9.45E2	8.69E2	9.88E-3	-2.63E3
ETP	CTUe	1.76E0	2.6E1	1.70E0	4.04E-5	-3.23E1
HTPC	CTUh	6.36E-8	1.23E-7	6.73E-8	6.72E-13	-5.15E-7
HTPNC	CTUh	2.46E-7	1.65E-6	3.10E-7	4.3E-12	-3.91E-6
SQP	dimensionless	7.71E0	1.83E2	6.61E1	3.99E-3	-4.50E2

• **GWP GHG** (Global Warming Potential GHG) • **PM** (Potential incidence of disease due to PM emissions) • **IRP** (Potential Human exposure efficiency relative to U235) • **ETP** (Potential Comparative Toxic Unit for ecosystems) • **HTPC** (Potential Comparative Toxic Unit for humans - cancer) • **HTPNC** (Potential Comparative Toxic Unit for humans - non-cancer) • **SQP** (Potential soil quality index)

Parameters describing resource use

The following environmental parameters apply data based on the LCI. They describe the use of renewable and non-renewable material resources, renewable and non- renewable primary energy, water use and electricity use during manufacturing.

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
PERE	Mj	2.24E2	9.66E-1	1.38E1	0.00	-
PERM	Mj	0.00	0.00	0.00	0.00	-
PERT	Mj	2.24E2	9.66E-1	1.38E1	0.00	-
PENRE	Mj	2.99E3	7.96E1	2.19E2	0.00	-
PENRM	Mj	0.00	0.00	0.00	0.00	-
PENRT	Mj	2.99E3	7.96E1	2.19E2	0.00	-
SM	kg	0.00	0.00	0.00	0.00	-
RSF	Mj	0.00	0.00	0.00	0.00	-
NSRF	Mj	0.00	0.00	0.00	0.00	-
NFW	m³	7.90E1	1.52E-2	2.47E0	0.00	-

For white **i.idro DRAIN** the parameters Use of secondary material, Use of renewable secondary fuels and Use of non-renewable secondary fuels are zero. The very nature and color of white **i.idro DRAIN** prevents the use of secondary materials or fuels which bring in impurities.

1 m³ White i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	Mj	7.59E-1	3.60E0	9.07E0	0.00	-1.94E1
PERM	Mj	0.00	0.00	0.00	0.00	0.00
PERT	Mj	7.59E-1	3.60E0	9.07E0	0.00	-1.94E1
PENRE	Mj	1.38E2	1.93E2	8.84E1	0.00	-4.30E2
PENRM	Mj	0.00	0.00	0.00	0.00	0.00
PENRT	Mj	1.38E2	1.93E2	8.84E1	0.00	-4.30E2
SM	kg	0.00	0.00	0.00	0.00	0.00
RSF	Mj	0.00	0.00	0.00	0.00	0.00
NSRF	Mj	0.00	0.00	0.00	0.00	0.00
NFW	m³	1.99E-2	4.25E-2	4.72E-2	0.00	-7.66E-1

PERE (Use of renewable primary energy excluding renewable primary energy resources used as raw materials) • **PERM** (Use of renewable primary energy resources used as raw materials) • **PERT** (Total use of renewable primary energy resources) • **PENRE** (Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials) • **PENRM** (Use of non-renewable primary energy resources used as raw materials) • **PENRT** (Total use of non-renewable primary energy resources) • **SM** (Use of secondary materials) • **RSF** (Use of renewable secondary fuels) • **NRSF** (Use of non-renewable secondary fuels) • **NFW** (Net use of fresh water)

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
PERE	Mj	1.14E2	9.42E-1	1.05E1	0.00	-
PERM	Mj	0.00	0.00	0.00	0.00	-
PERT	Mj	1.14E2	9.42E-1	1.05E1	0.00	-
PENRE	Mj	1.47E3	7.76E1	1.73E2	0.00	-
PENRM	Mj	0.00	0.00	0.00	0.00	-
PENRT	Mj	1.47E3	7.76E1	1.73E2	0.00	-
SM	kg	3.91E1	0.00	0.00	0.00	-
RSF	Mj	2.57E1	0.00	0.00	0.00	-
NSRF	Mj	4.69E1	0.00	0.00	0.00	-
NFW	m³	2.26E2	1.48E-2	6.88E0	0.00	-

1 m³ Grey i.idro DRAIN						
Environmental Impacts	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	Mj	7.59E-1	3.51E0	8.84E0	5.55E-5	-1.89E1
PERM	Mj	0.00	0.00	0.00	0.00	0.00
PERT	Mj	7.59E-1	3.51E0	8.84E0	5.55E-5	-1.89E1
PENRE	Mj	1.38E2	1.88E2	8.62E1	2.27E-3	-4.20E2
PENRM	Mj	0.00	0.00	0.00	0.00	0.00
PENRT	Mj	1.38E2	1.88E2	8.62E1	2.27E-3	-4.20E2
SM	kg	0.00	0.00	0.00	0.00	0.00
RSF	Mj	0.00	0.00	0.00	0.00	0.00
NSRF	Mj	0.00	0.00	0.00	0.00	0.00
NFW	m³	1.99E-2	4.14E-2	4.6E-2	2.41E-6	-7.47E-1

PERE (Use of renewable primary energy excluding renewable primary energy resources used as raw materials) • **PERM** (Use of renewable primary energy resources used as raw materials) • **PERT** (Total use of renewable primary energy resources) • **PENRE** (Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials) • **PENRM** (Use of non-renewable primary energy resources used as raw materials) • **PENRT** (Total use of non-renewable primary energy resources) • **SM** (Use of secondary materials) • **RSF** (Use of renewable secondary fuels) • **NRSF** (Use of non-renewable secondary fuels) • **NFW** (Net use of fresh water)

Other environmental information describing different waste categories and output flows

The following environmental parameters apply data based on the LCI. They describe the Waste Flows (Hazardous, Non-hazardous and Radioactive waste disposed) and the Output flows (Components for re-use, Materials for recycling, Materials for energy recovery and Exported energy) for declared unit of i.idro DRAIN.

1 m³ White i.idro DRAIN						
Waste	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
HWD	kg	1.58E-2	0.00	0.00	0.00	-
NHWD	kg	7.47E0	0.00	0.00	0.00	-
RWD	kg	-	-	-	-	-

1 m³ White i.idro DRAIN						
Waste	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	0.00	0.00	0.00	0.00	0.00
NHWD	kg	0.00	0.00	0.00	0.00	0.00
RWD	kg	-	-	-	-	-

1 m³ Grey i.idro DRAIN						
Waste	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
HWD	kg	1.97E-2	0.00	0.00	0.00	-
NHWD	kg	5.58E-1	0.00	0.00	0.00	-
RWD	kg	-	-	-	-	-

1 m³ Grey i.idro DRAIN						
Waste	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	0.00	0.00	0.00	0.00	0.00
NHWD	kg	0.00	0.00	0.00	0.00	0.00
RWD	kg	-	-	-	-	-

• **HWD** (Hazardous waste disposed) • **NHWD** (Non-hazardous waste disposed) • **RWD** (Radioactive waste disposed)

1 m³ White i.idro DRAIN						
Output flow	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
CRU	kg	0.00	0.00	0.00	0.00	-
MFR	kg	1.78E2	0.00	0.00	0.00	-
MER	kg	0.00	0.00	0.00	0.00	-
EE	Mj	0.00	0.00	0.00	0.00	-

1 m³ White i.idro DRAIN						
Output flow	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
CRU	kg	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	2.00E3	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00
EE	Mj	0.00	0.00	0.00	0.00	0.00

1 m³ Grey i.idro DRAIN						
Output flow	**Units**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**
CRU	kg	0.00	0.00	0.00	0.00	-
MFR	kg	3.78E1	0.00	0.00	0.00	-
MER	kg	0.00	0.00	0.00	0.00	-
EE	Mj	0.00	0.00	0.00	0.00	-

1 m³ Grey i.idro DRAIN						
Output flow	**Units**	**C1**	**C2**	**C3**	**C4**	**D**
CRU	kg	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	1.95E3	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00
EE	Mj	0.00	0.00	0.00	0.00	0.00

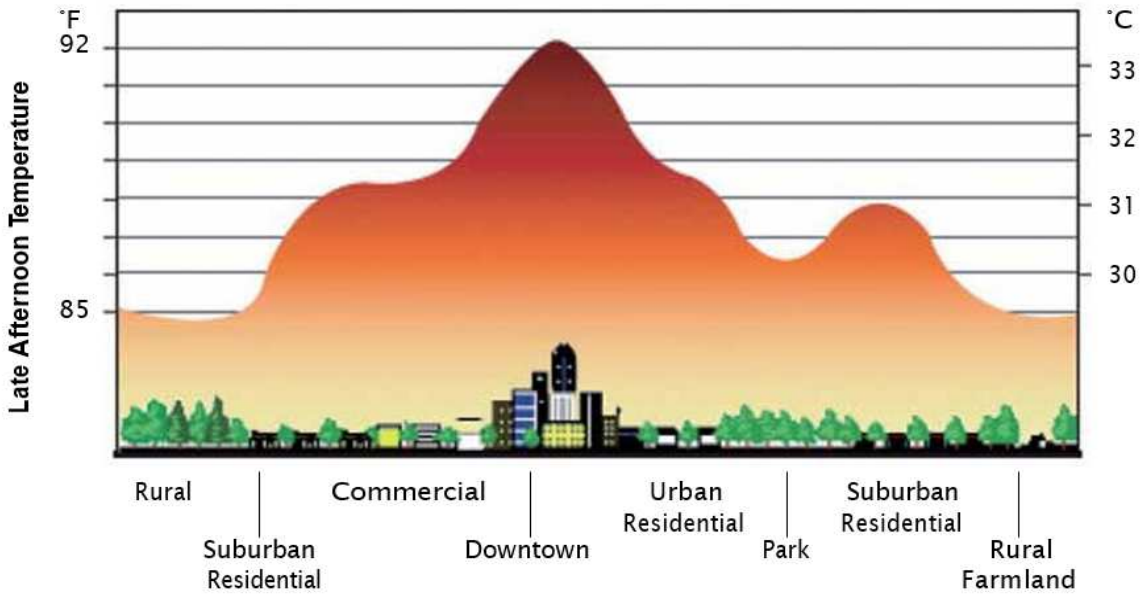
• **CRU** (Components for re-use) • **MFR** (Materials for recycling) • **MER** (Materials for energy recovery) • **EE** (Exported energy)

Additional information

The results above refer not only to the volume of concrete produced but also to its draining capacity. i.idro DRAIN delivers, alongside a resistant surface, a draining capacity which ranges from 300 mm/min to 1000 mm/ min . Draining capacities of concrete not used for draining purposes will normally fall under the 10 mm/min mark. The primary advantage of permeable pavements is the storm water management aspects together with the control of runoff and the reduction of imperviousness. By encouraging water from storms to recharge the ground- water table, i.idro DRAIN pavements have a profound effect on localized ecosystems. Use of permeable pavements by designers is encouraged by the Leadership in Energy and Environmental Design (LEED®) Green Building Rating System™ which awards credits for Stormwater Management. This credit is meant to minimize impervious surfaces and to encourage the natural processes of infiltration. The use of i.idro DRAIN, therefore, aides in obtaining LEED credits on both stormwater quantity and quality control.

Pavements made up of i.idro DRAIN are capable of reducing the heat Island effect in urban areas. The heat island effect is due to the replacement of open land and vegetation with buildings, roads, and other infrastructure which have low Solar reflectance indices (SRI). This causes urban regions to become warmer than their rural surroundings, forming an "island" of higher temperatures in the landscape.

Heat island effect



The effect of i.idro DRAIN on the heat island effect can be seen by the results of tests carried out by Istituto Giordano according to ASTM E903, ASTM E 1980, ASTM C 1371 and AST G173 which show SRI values of more than 29.

Reflectance index of i.idro DRAIN pavements		
Pavement type	SRI (initial)	SRI 3 years aged
Grey i.idro DRAIN	33.4	30.4
White i.idro DRAIN	46.7	NA

Source: Istituto Giordano Spa – Optics Laboratory

Moreover, the LEED awards credits to paving materials with a three-year aged SRI value of at least 28, in order to minimize effects on microclimates and human and wildlife habitats by reducing heat islands.
The use onsite of i.dro DRAIN involves the addition of water and application on a surface through vibrating road pavers or manually resorting to special building site equipment. During this operation no toxic emissions occur and no safety risks for the operators are involved. The safety data sheet of i.idro DRAIN, is published on the website of Calcestruzzi: www.calcestruzzi.it
No substance in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" exceeds 0.1 weight-% of i.idro DRAIN.
The production of i.idro DRAIN is in line with our Sustainability Policies which advocate designing products suitable for sustainable construction. Moreover, blended cements are being promoted to reduce the use of clinker and thus to further curb environmental impacts in concretes. In particular, research focuses on the use of renewable and reusable raw materials and the development of specialty admixtures and special additions for concrete, also through investigations and experiments based on nano and biotechnologies applied to the construction materials sector.

In addition, unconventional products in portfolio of Italcementi and Calcestruzzi, such as TX Active®, i.light®, are able to provide added technological and functional value to traditional products.
In particular, research focuses on the use of renew- able and reusable raw materials and the development of specialty admixtures and special additions for concrete, also through investigations and experiments based on nano and biotechnologies applied to the construction materials sector. In addition, unconventional products in portfolio of Italcementi and Calcestruzzi, such as TX Active®, i.light®, are able to provide added technological and functional value to traditional products. More information on Sustainable development at Italcementi and Calcestruzzi, Sustainability Policies and related activities can be accessed at the official website: http://www.heidelbergcement.com/en/responsibility
Calcestruzzi SpA is certified according ISO 9001:2015 since 1996.
In line with HeidelbergCement Group sustainability policies and strategy, Rezzato (BS), Calusco d'Adda (BG), Colleferro (RM), Matera, Samatzai (CA), Ravenna, Novi Ligure (AL), Cagnano Amiterno (AQ), Tavernola Bergamasca (BG) and Guardiaregia (CB) plants of Italcementi SpA and Italsacci SpA, providing cement used in i.idro DRAIN, are all certified according to ISO 14001:2015 since 2004 and ISO 9001:2015 since 1995 (except Novi Ligure not certified to ISO 14001); furthermore Calusco d'Adda and Samatzai plants are certified to ISO 45001:2018.

Changes versus previous version

The principal differences versus previously published version depends from:

- System boundary in compliance with EN 15804:2012 + A2: 2019;
- Concrete plants and cement plants involved in **i.idro DRAIN** production;
- Raw materials utilized in **i.idro DRAIN** composition, especially cement type;
- Use of secondary materials and renewable secondary fuels in cement production;
- Waste disposed from cement and concrete production;
- Changes occurred in the more recent versions of the Ecoinvent and in the reference documentation (e.g. GPI, PCR,…)

References

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations
ISO 14040:2006	Environmental management - Life cycle assessment - Principles and Framework
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and Guidelines
GPI	General Programme Instructions of IES www.environdec.com (Version 4.0)
EN 15804:2019+A2:2019	Sustainability of construction works - Environmental product declarations – Core rules for the product category of construction products
PCR for concrete	www.environdec.com - PRODUCT CATEGORY RULES (PCR) for Product Group "Concrete", UN CPC 375- C-PCR-003 "Concrete and concrete elements" (EN 16757) v. 2019-12-20 to PCR 2019:14" Construction Products" v.1.11
Verification report	Environmental Product Declaration Verification Report for **i.idro DRAIN**, Calcestruzzi SpA (date: 2021/09/16)

Demonstration of verification

CEN standard EN 15804 serves as the Core Product Category Rules (PCR).
Programme: EPD® The international EPD® System
PCR: UN CPC 375 - C-PCR-003 "Concrete and concrete elements" (EN 16757) v. 2019-12-20 to PCR 2019:14 "Construction Products" v.1.11
PCR Moderator: Martin Erlandson, IVL Swedish Environmental Research Institute, martin.erlandson@ivl.se.
PCR Comitee: IVL Svedish Environmental Research Institute Secretariat of the International EPD® System
Independent verification of the declaration and data, according to ISO 14025:2010 [X] EPD Process Certification (Internal) [ ] EPD Verification (External)
EPD Registration No.: S-P-01203
Date of Certification: 2018/01/11
Version date: 2021/09/15
Validity: 2024/06/07
Third part Independent Verifier: Certiquality Srl (Number of accreditation: 003H rev.15)
Accredited by: Accredia

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Glossary

Ozone layer depletion 20a	Destructive effects on the stratospheric ozone layer over a time horizon of 20 years.
Acidification	Increase of soil and water acidity.
Eutrophication	Excessive levels of macronutrients in the environment caused by emissions of nutrients to air, water and soil.
Photochemical oxidation	Oxidizing of volatile compounds in the presence of nitrogen oxides (NOx) which frees ozone in the low atmosphere.
Abiotic depletion	Extraction of minerals and fossil fuels due to inputs in the system.

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