Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC: 2021 for:

*Ductile & Grey Iron Products

(Manhole Cover, Channel Gratings and Pipe Fittings)

from

Global Castings Pvt. Ltd.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
Licensee:	EPD India
EPD registration number:	EPD-IES-0016507
Version date:	2024-10-15
Validity date:	2029-10-14

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com

** EPD of multiple products based on the weighted average result of product group (Manhole cover, Channel grating and pipe fittings)*

General information

Programme information

Programme:	The International EPD® System, Indian Regional Hub	
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden	EPD India, a licensee of the International EPD® System 422, Midas, Sahar Plaza Mumbai, India- 400059
Website:	www.environdec.com, www.envirodecindia.com	
E-mail:	info@environdec.com, info@environdecindia.com	

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules: PCR 2019:14. Construction Products, Version 1.3.2
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact
Life Cycle Assessment (LCA)
LCA accountability: Global Castings Pvt. Ltd.
LCA and EPD developer: Dr. Rajesh Kumar Singh Thinkstep Sustainability Solutions Pvt. Ltd., a Sphera Company
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒EPD verification by individual verifier Third party verifier: Prabodha Acharya, Independent verifier, Mumbai, India. 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 registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Global Castings Pvt. Ltd.

Contact: Saurav Shah [saurav@globalcastings.in]

Description of the organization:

Global Castings Pvt. Ltd., established in 2010, is a fully mechanized ductile iron foundry with an annual capacity of 36,000 metric tonnes. Equipped with advanced machinery, including high-pressure lines from Italy and China, the company produces high-quality castings for municipal, water works, agricultural, and industrial markets. With a skilled workforce and stringent quality assurance, Global Castings exports to prestigious markets worldwide. They aim to provide complete casting solutions, competitive pricing, and excellent service to build long-term business relationships.

Product-related or management system-related certifications: The Global Castings Pvt. Ltd. facilities are ISO 9001,14001 and 45001 certified.

Name and location of production site(s):

Mouza: Kamnara/Mirzapur, Dewandighi, Palitpur road, Burdwan,

West Bengal: 713102,

India

Phone: +91 8420000563

Product information

Product name: Average ductile and grey iron manhole cover, channel gratings and pipe fittings.

Product identification: Global Castings ductile and grey iron manhole cover, channel gratings and pipe fittings.

Product description: The product included in the EPD is weighted average of manhole cover, channel grating and pipe fittings produced from ductile and grey iron based on the production volume. The manhole cover and channel grating are framed removable lids lodged over manholes and drains respectively.

- Manhole cover: The manhole covers and Frames are made from the ductile and grey iron cast iron via the sand-casting process KD100-26E (600X600X100 double triangular D400 frame and cover), 61 KG, ductile iron EN 1563 grade 500/7
- Channel grating: The manhole covers and Frames are made from the ductile and grey iron cast iron via the sand-casting process grate 010712846 C250 498X222, 6.2 KG, ductile iron EN 1563 grade 500/7
- Iron Pipe Fittings: The manhole covers and Frames are made from the ductile and grey iron cast iron via the sand-casting process DMB845 (8 " AND 45 ° BEND, 20.87 KG), ductile iron ASTM 536 grade 70-50-5

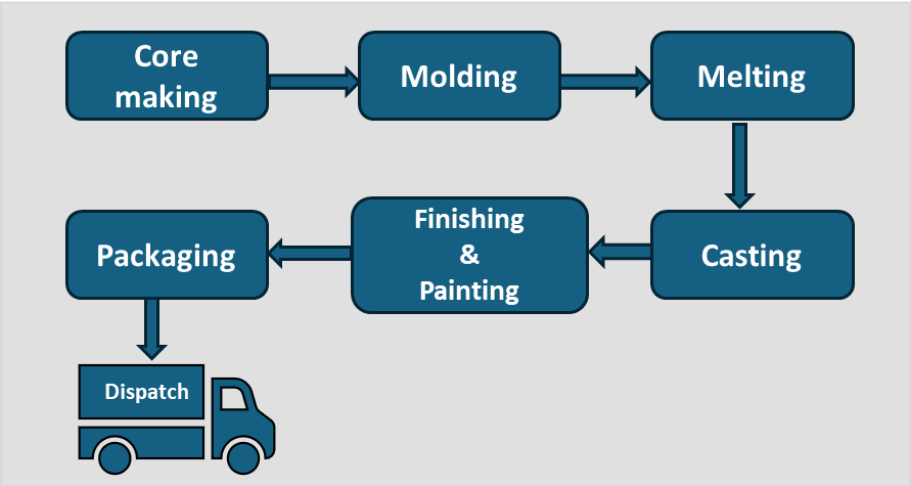
UN CPC code: 412.

Geographical scope: Global.

The technical specifications of the ductile and grey iron manhole cover, channel gratings and pipe fittings have been mentioned down below:

Manhole cover			
Product	**Grade**	**Width**	**Length**
KD100-26E	500/7	100 to 1000 mm	100 to 1000 mm
Channel Gratings			
Product	**Grade**	**Width**	**Length**
GRATE 010712846	500/7	50 to 500	300 to 1000
Pipe Fittings			
Product	**Grade**	**Size**	**Bend**
DMB845	70-50-5	4” to 48”	11.25° to 90°

Manufacturing process:



The manhole cover, channel grating, and pipe fittings are usually made using the casting process, typically sand-casting techniques. Materials required for manufacturing are mold and molten metals, which are cast to manufacture manhole covers, channel grating and pipe fittings. Metal and other materials are melted in the furnace process, and a mold of sand is prepared; From furnace process, the final molten metal is casted into the mold of the required product and shape, and the manhole cover, channel grating and pipe fitting are manufactured. After finishing the products are packed and transported for commercial use.

Applications:

- Manhole cover: Compliant with EN 124-2 standard, designed for use in areas with heavy traffic such as roadways and parking lots.
- Channel grating: Compliant with EN 1433 standard, it is designed for use in areas with moderate traffic, such as car parks and pedestrian zones while assisting in surface water runoff.
- Iron Pipe Fittings: Ductile iron pipe fitting complies with AWWA standards and is designed for use in water supply and distribution systems.

KD100-26E (600X600X100 DOUBLE TRIANGULAR D400 FRAME AND COVER), 61 KG, DUCTILE IRON EN 1563 GRADE 500/7

GRATE 010712846 C250 498X222, 6.2 KG, DUCTILE IRON EN 1563 GRADE 500/7

DMB845 (8 " AND 45 ° BEND, 20.87 KG), DUCTILE IRON ASTM 536 GARDE 70-50-5

600 DIA X 190 D400 SELF LOCK GRATE AND FRAME - WEIGHT 84 KG

LCA information

Declared unit: 1 kg of average Ductile and Grey Iron Manhole cover, Channel Grating and Pipe Fittings.

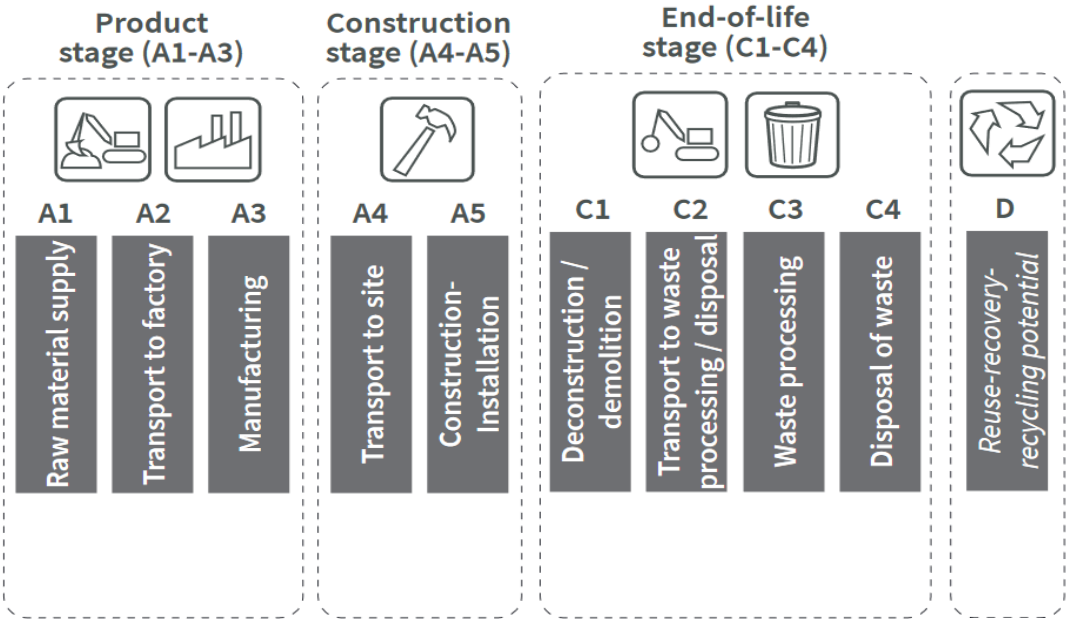
Reference service life: Not Applicable.

Time representativeness: The collection of foreground data refers to April 2023 - March 2024.

Database(s) and LCA software used:
The background data has been taken from the latest available Sphera Managed LCA Content 2024.1

Description of system boundaries:
The system boundary: It includes cradle to gate stage with additional modules A1-A3, A4, A5, C1–C4, and module D.

Reference package used:
EN 15804 reference package based on EF 3.1.



- *Module A1 to A3:*

The product stage includes provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage. Scrap inputs in module A1-A3 are treated as 'burden free'. In the End-of-life phase the net scrap approach has been applied towards the metal recycling benefit in module D. The electricity for the manufacturing process has been sourced from Indian electricity grid mix. The composition considered in the Electricity grid mix dataset is Electricity from lignite - 11.65%, Electricity from hard coal - 62.18%, Electricity from natural gas - 4.63%, Electricity from hydro - 9.25%, Electricity from wind - 3.33%. The GHG-GWP impact for electricity used for manufacturing is 1.01 kg CO2 eq./kWh.

- *Module A4:*

This module includes the transportation of final product to the construction site.

- *Module A5:*

The installation stage includes the treatment of packaging materials used. The plastic used in packaging is landfilled, the wooden pallets and plywood are incinerated, whereas the steel straps are recycled and landfilled accordingly.

- *Module C1 to C4:*

Within this EPD, the modules C1-C4 are included. These modules consider the transportation of the dismantled components to their End of Life (EoL) destination (C2), There is no waste processing here in module C3. While the disposal is considered in C4. Generally, 88% of the steel product is considered for recycling and 12% is landfilled. Net scrap approach has been applied and the benefit from metal recycling has been accounted in the module D

- *Module D:*

Module D includes all the declared benefits and loads from net flows leaving the product system that has not been allocated as co-products and that has passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

Potential environmental benefits are given for the net steel scrap that is produced at the end of a final product's life.
Net scrap = Amount of steel recycled at EoL – Scrap input from previous product life cycles.
The amount of steel for avoided production (0.30 kg/kg) is calculated by the difference between scrap recycled (0.88 kg/kg) and scrap input to production (0.58 kg/kg).

Data quality assessment and declaration:

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of Product	Collected data	EPD owner	April 2023 - March 2024	Primary data	15%
Generation of electricity used in manufacturing	Database	Sphera MLC 2024.1	2023	Primary data	39%
Transport of raw materials to the manufacturing site	Database	Sphera MLC 2024.1	2022	Primary data	1%
Production of packaging	Database	Sphera MLC 2024.1	April 2023 - March 2024	Primary data	0.25%
Total share of primary data, of GWP-GHG results for A1-A3					**54.50**

Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that does not capture all relevant aspects of data quality. The indicator is not comparable across product categories.

Cut-off criteria:
The environmental impact of the product studied has been assessed by considering all significant processes, materials, and emissions. Excluded flows are assumed to have a negligible impact,contributing less than 5% to the cumulative impact assessment categories. The production of capital equipment, facilities, and infrastructure required for manufacture has not been considered.

Data quality and sources:
Data quality is compliant with ISO 14025:2006. All primary data were collected for April 23 – March 24. All background data come from the Sphera Managed LCA Content 2024.1 databases.

Allocation:
This study employs mass allocation to address the production of main product and its co-products. This method assigns environmental impacts based on the mass of the main product and its co-products. The flow of materials and energy and the associated release of substances and energy into the environment is related

exclusively to the ductile & grey iron manhole cover, channel grating & pipe fittings produced. The mass allocation (molten metal & slag) has been applied in the furnace process. Any allocation performed in the background processes is according to the PCR.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results)

	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	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	IN			GLO	GLO	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	54.50%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<1%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

(X- declared modules and ND- Module not declared).

Content information

Product components	Weight, %	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Fe	92.45-93.6	58	-
C	3.4-3.8	-	-
Si	2.4-2.6	-	-
Mn	0.3-0.6	-	-
P	0.08	-	-
S	0.02	-	-
Cu	0.15-0.4	-	-
Mg	0.035-0.055	-	-
TOTAL	**100%**	**58%**	
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
PE Film	5.99E-04	0.06%	0.00E+00
Wooden Pallet	1.24E-02	1.24%	4.96E-03
Corrugated box	3.61E-04	0.04%	1.44E-04
Steel Strap	7.36E-03	0.74%	0.00E+00
Plywood	8.86E-04	0.09%	3.55E-04
Plastic pallet	5.53E-03	0.55%	0.00E+00
TOTAL	**2.71E-02**	**2.71%**	**5.46E-03**

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

Results of the environmental performance indicators

The environmental performance of the functional unit of 1 kg of average ductile and grey iron manhole cover, channel grating and pipe fittings

reported below using the parameters and units as specified in PCR 2019:14 v1.3.2.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The scenarios included are currently in use and are representative for one of the most probable alternatives.

Mandatory impact category indicators according to EN 15804+A2:2019

Environmental Impacts for 1 kg of average ductile & grey iron manhole cover, channel grating and pipe fittings									
Impact indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	**kg CO_2 eq.**	2.96E+00	1.02E-02	6.33E-06	0.00E+00	5.10E-03	0.00E+00	1.80E-03	-6.25E-01
GWP-biogenic	**kg CO_2 eq.**	-2.37E-02	1.28E-06	6.88E-05	0.00E+00	3.30E-06	0.00E+00	2.36E-02	3.69E-03
GWP-luluc	**kg CO_2 eq.**	2.67E-03	2.30E-07	2.15E-09	0.00E+00	1.15E-07	0.00E+00	1.08E-05	-8.33E-05
GWP-total	**kg CO_2 eq.**	2.99E+00	1.02E-02	7.52E-05	0.00E+00	5.11E-03	0.00E+00	2.55E-02	-6.22E-01
ODP	**kg CFC -11 eq.**	7.92E-12	1.93E-16	1.66E-17	0.00E+00	9.65E-17	0.00E+00	4.84E-15	8.40E-13
AP	**Mole of H+ eq.**	2.47E-02	5.68E-05	3.29E-08	0.00E+00	2.84E-05	0.00E+00	1.28E-05	-1.53E-03
EP-freshwater	**kg P eq.**	2.00E-06	1.55E-09	9.32E-10	0.00E+00	7.77E-10	0.00E+00	4.08E-09	-1.46E-07
EP-marine	**kg N eq.**	3.31E-03	2.76E-05	8.80E-09	0.00E+00	1.38E-05	0.00E+00	3.28E-06	-2.46E-04
EP-terrestrial	**Mole of N eq.**	3.63E-02	3.03E-04	1.08E-07	0.00E+00	1.51E-04	0.00E+00	3.62E-05	-2.20E-03
POCP	**kg NMVOC eq.**	1.04E-02	5.54E-05	2.53E-08	0.00E+00	2.77E-05	0.00E+00	1.00E-05	-9.98E-04
ADP-minerals & metals*	**kg Sb eq.**	1.79E-06	1.20E-10	2.32E-13	0.00E+00	5.99E-11	0.00E+00	1.16E-10	-3.54E-06
ADP-fossil*	**MJ**	3.41E+01	1.33E-01	8.90E-05	0.00E+00	6.65E-02	0.00E+00	2.37E-02	-6.22E+00
WDP*	**m^3 world equiv.**	3.19E-01	1.25E-05	7.60E-06	0.00E+00	6.23E-06	0.00E+00	2.06E-04	-4.22E-02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	2.98E+00	1.01E-02	6.29E-06	0.00E+00	5.07E-03	0.00E+00	1.79E-03	-6.23E-01

*Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator. We discourage the use of the results of modules A1-A3 without considering the results of module C.

Resource use indicators according to EN 15804+A2:2019

Resource Use for 1 kg of average ductile & grey iron manhole cover, channel grating and pipe fittings									
Impact indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	4.92E+00	2.74E-04	5.20E-01	0.00E+00	1.37E-04	0.00E+00	3.44E-02	-1.21E-05
PERM	MJ	1.26E-01	0.00E+00	-1.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	5.44E+00	2.74E-04	4.84E-06	0.00E+00	1.37E-04	0.00E+00	3.44E-02	-1.21E-05
PENRE	MJ	3.16E+01	1.33E-01	2.53E+00	0.00E+00	6.65E-02	0.00E+00	2.37E-02	-6.22E+00
PENRM	MJ	8.08E-03	0.00E+00	-8.08E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.40E+01	1.33E-01	1.71E-05	0.00E+00	6.65E-02	0.00E+00	1.97E-01	-2.02E-03
SM	kg	5.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	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
NRSF	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
FW	m^3	1.09E-02	3.84E-07	1.81E-07	0.00E+00	1.92E-07	0.00E+00	5.23E-05	-1.56E-05
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Output flows & Waste Indicators according to EN 15804+A2:2019

Waste Flow for 1 kg of average ductile & grey iron manhole cover, channel grating and pipe fittings									
Impact indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	8.63E-09	1.69E-12	1.01E-14	0.00E+00	8.45E-13	0.00E+00	4.91E-11	-1.15E-11
NHWD	kg	1.73E-02	2.04E-06	1.38E-06	0.00E+00	1.02E-06	0.00E+00	1.00E+00	1.83E-05
RWD	kg	3.58E-04	1.67E-08	9.22E-10	0.00E+00	8.33E-09	0.00E+00	2.07E-06	-3.68E-09
CRU	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
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.80E-01	0.00E+00	0.00E+00
MER	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
EEE	MJ	0.00E+00	0.00E+00	9.76E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	1.76E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, CRU = Components for re-use, MFR = Materials for Recycling, MER = Materials for Energy Recovery, EEE = Exported electrical energy, EET = Exported thermal energy.								

Additional environmental performance indicators according to EN 15804+A2:2019

Additional Environmental Impacts for 1 kg of average ductile & grey iron manhole cover, channel grating and pipe fittings									
Impact indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Particulate matter	Disease incidences	3.94E-07	2.42E-10	7.77E-14	0.00E+00	1.21E-10	0.00E+00	1.33E-09	-9.75E-12
Ionising radiation, human health	kBq U235 eq.	3.10E-02	1.51E-06	1.46E-07	0.00E+00	7.53E-07	0.00E+00	2.39E-04	3.09E-06
Ecotoxicity, freshwater	CTUe	1.70E+01	5.99E-02	7.37E-06	0.00E+00	3.00E-02	0.00E+00	1.31E-01	-3.19E-04
Human toxicity, cancer	CTUh	5.34E-10	9.49E-13	7.38E-16	0.00E+00	4.74E-13	0.00E+00	2.69E-12	5.62E-14
Human toxicity, non-cancer	CTUh	1.56E-08	1.97E-11	3.91E-14	0.00E+00	9.87E-12	0.00E+00	1.04E-10	9.04E-14
Land Use	Pt	5.11E+00	1.59E-04	5.44E-06	0.00E+00	7.93E-05	0.00E+00	5.44E-02	-7.50E-05

References

- General Programme Instructions of the International EPD® System. Version 4.0.
- PCR 2019:14. Construction Products, Version 1.3.2
- Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; CEN/TR 15941:2010
- EN 15804: EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines.
- LCA FE: LCA FE Software System and Database for Life Cycle Engineering, Sphera Solution Inc, 2024.(https://sphera.com/solutions/product-stewardship/life-cycle-assessment-software-and-data/managed-lca-content/