

# ENVIRONMENTAL PRODUCT DECLARATION

according to *ISO 14025* and *EN 15804+A2*

Declaration holder	Aurubis AG
Publisher	Institute for Construction and Environment (IBU)
Program holder	Institute for Construction and Environment (IBU)
Declaration number	
Date of issue	19
Valid	18.12.2029

## Iron silicate aggregates Aurubis AG



## General information

### Aurubis AG

#### Program holder

IBU – Institute for Construction and Environment Hegelplatz 1  
10117 Berlin Germany

#### Declaration number

#### This declaration is based on the product category rules:


Lightweight aggregate / bulk granulate, 01.08.2021  
(PCR tested and approved by the independent expert council (SVR))

#### Date of issue

19.12.2024

#### Valid until

December 18, 2029



Dipl.-Ing. Hans Peters  
(Chair of the Board of the Institute for Construction and Environment)



Florian Pronold  
(Managing Director of the Institute for Construction and Environment)

### Iron silicate aggregates

#### Declarant

Aurubis AG  
Hovestrass 50  
20539 Hamburg  
Germany

#### Declared product/declared unit

1 tonne of iron silicate

#### Scope

Iron silicate aggregates up to a grain size of 45 mm from the production of Aurubis AG / Peute Baustoff GmbH, Hamburg.  
The holder of the declaration is responsible for the underlying information and evidence; the IBU accepts no liability for manufacturer information, life cycle assessment data, and evidence.

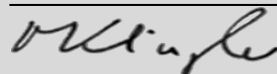
The EPD was prepared in accordance with the requirements of EN 15804+A2. In the following, the standard is referred to as *EN 15804* for simplicity.

#### Verification

The European standard EN 15804 serves as the core PCR.

Independent verification of the declaration and information in accordance with ISO 14025:2011

internal  external



Matthias Klingler, (Independent Verifier)

## Product

### Product description/product definition

Iron silicate is produced as a by-product of copper refining and recycling processes. It is an industrially manufactured mineral, comparable to natural rocks from quarries, but without the disadvantage of having to interfere massively with nature.

It consists mainly of iron silicate minerals such as fayalite and aluminum and calcium silicates. It may also contain traces of non-ferrous metals, which are mainly bound in the silicate phases and are characterized by high binding stability and low leachability.

Iron silicate rock within the scope of this EPD includes aggregates of various sizes up to 45 mm, which are produced by crushing and screening. The abbreviations "CUS" and "CUM" are commonly used in the regulatory context and in the German Substitute Building Materials Ordinance, respectively.

Iron silicate in its various forms and grain sizes is used in a range of applications, particularly in construction, as a substitute for primary building materials. It is produced as a crystalline rock with edge lengths of up to 450 mm and as amorphous granulate with a grain size of up to 6 mm. In granulate form, it is also used for blast cleaning surfaces.

Other uses of iron silicate rock: hydraulic engineering, road construction, landfill construction, cement, concrete.

Other uses of iron silicate granulate: blasting agent, road construction, landfill construction, cement, concrete.

*Regulation (EU) No. 305/2011 (CPR)* applies to the marketing of the product in the EU/EFTA (with the exception of Switzerland).

The product requires CE marking and a declaration of performance in accordance with

- *DIN EN 12620:2008-07, Aggregates for concrete,*
- *DIN EN 13043:2002-12, Aggregates for asphalt and surface treatments for roads, airfields, and other traffic areas,*
- *DIN EN 13242:2008-03, Aggregates for unbound and hydraulically bound mixtures for engineering and road construction,*
- *DIN EN 13383-1:2002-08, Stone for hydraulic engineering - Part 1: Requirements and*
- *DIN EN 13383-2:2019-12, Aggregates for hydraulic engineering - Part 2: Test methods.*

The respective national regulations apply to use.

Where applicable, the respective regulations at the place of use, in Germany, for example, the building regulations of the federal states, and the technical regulations based on these regulations, apply additionally to the use of the product.

### Application

Aggregates for road construction, landfill construction, concrete

### Technical

### Construction data

Design	Value	Unit
Raw density	3650	kg/m <sup>3</sup>
Compressive strength	160 - 317	N/mm
Thermal conductivity according to DIN 52612	2	W
Hardness according to Mohs (ES granulate only)	> 7	
Block shape EN 13383-1	LTA	Category
Water absorption EN 13383-1	WA0.5	Category
Resistance to breaking EN 13383-1	CS80	Category
Frost-thaw resistance EN 13383-1	FTA	Category
Environmentally compatible use TLW 2022	<0.05	mg
Fine particle content CUG 0/4, CUS 0/5 - 22/45 EN 13242	f1 - f10	Category
Resistance to shattering CUS0/5 - 22/45 EN 13242	SZ26	Category
Resistance to frost CUS 0/5 - 22/45 EN 13242	F	Category
Grain size distribution CUG0/4, CUS0/5 EN 13242	GF85	Category
Grain size distribution CUS5/22, CUS22/45 EN 13242	GC85/15, GTC20/17.5	Category
Fine particle content EN 13242	f1-f10	Category
Resistance to fragmentation EN 13242	SZ36	Category
Resistance to frost EN 13242	F	Category
Grain size distribution CUG 0/4, CUS 0/5 EN 13043	GA85, GTC10	Category
Grain size distribution CUS 5/22 EN 13043	Gc90/15, G20/17.5	Category
Fine particle content EN 13043	f2-f3	Category
Fragility CUS 5/22 EN 13043	C100/0	Category
Grain shape index CUS 5/22 EN 13043	SI50	Category
Flow coefficient EN 13043	ECS 38	Category
Impact resistance CUS 0/5, CUS 5/22 EN 13043	SZ22	Category
Water absorption CUS 5/22 EN 13043	Wcm 0.5	Category
Frost resistance CUS 0/5, 5/22 EN 13043	F	Category
Resistance to heat stress CUS 0/5, 5/22 EN 13043	Vsz=0.6	Category
Affinity CUS 0/5, 5/22 EN 13043	6h 70	Category
Organic impurities CUG 0/4, CUS 0/5, 5/22 EN 13043	mLPC 0.10	Category
Particle size distribution CUG 0/4, CUS 0/4 EN 12620	GF85	Category
Grain size distribution CUS 5/22, 4/16 EN 12620	GC90/15, GT17.5	Category
Fine particle content CUG 0/4 EN 12620	f3	Category
Fine particle content CUS 0/4 EN 12620	f10	Category
Fine particle content CUS 5/22, 22/45 EN 12620	f1.5	Category
Grain shape index CUS 5/22, EN 12620	SI40	Category
Grain shape index CUS 22/45 EN 12620	SI46	Category

Chloride content CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	0.02	Category
Acid-soluble sulfates CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	AS0.8	Category
Total sulfur CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	<1.0	Category
Water absorption CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	0.3	Category
Frost resistance CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	F4	Category
Organic impurities CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	<0.01	Category
Resistance to alkali-silica reaction CUG 0/4, CUS 0/4, 5/22, 22/45 EN 12620	E II-S	Category

Product performance values according to the declaration of performance in relation to its essential characteristics in accordance with

- *DIN EN 12620:2008-07, Aggregates for concrete,*
- *DIN EN 13043:2002-12, Aggregates for asphalt and surface treatments for roads, airfields, and other traffic areas,*
- *DIN EN 13242:2008-03, Aggregates for unbound and hydraulically bound mixtures for engineering and road construction,*
- *DIN EN 13383-1:2002-08, Stone for hydraulic engineering - Part 1: Requirements and*
- *DIN EN 13383-2:2019-12, Aggregates for hydraulic engineering - Part 2: Test methods.*

(with CE marking), or

Performance values of the product in relation to its characteristics according to the relevant national technical regulations at the place of use, in Germany, for example, the building regulations of the federal states (no CE marking).

#### Raw materials/auxiliary materials

Designation	Value	Unit
Iron silicate, copper smelting and refining, associated EC number: 701-480-0	100	%

EC number valid until February 2023: 266-968-3

The product/article/at least one component of the product contains substances from *the ECHA list* of substances of very high concern (SVHC) (date: June 27, 2024) above 0.1% by weight: no.

The product/article/at least one component contains other CMR substances in categories 1A or 1B that are not included in the *Candidate List* in concentrations above 0.1% by weight in at least one component: no.

Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated article within the meaning of the Biocidal Products Regulation (EU) No. 528/2012): no.

#### Reference service life

The service life of iron silicate depends on the intended use. As an additive in concrete structures in buildings, for use in hydraulic engineering and road construction, and in cement production, a reference service life of  $\geq 50$  years can be expected.

## LCA: Calculation rules

### declared unit

The declared unit is 1 ton of iron silicate. Conversion to m<sup>3</sup> can be performed using the specified bulk density.

### Declared unit and mass reference

Design	Value	Unit
Declared unit	1000	kg
Bulk density (average value)	20	kg/m
Bulk density	365	kg/m

The value given as bulk density is an average value that may vary slightly depending on the grain size.

The LCA results are based on an average value of iron silicate of various grain sizes. The average value was calculated from all grain sizes produced by the manufacturer. The results are therefore subject to a certain degree of variability, as production data may vary slightly depending on the grain size produced.

### System boundary

Type of EPD: Cradle to factory gate with modules C1–C4 and module D (A1–A3, C, and D).

### Module A1 to A3:

Module A1–A3 covers the processing of iron silicate, a by-product of copper production. Expenses for the provision of raw materials are allocated 100% to copper production. Modules A1–A3 cover all internal transport and energy flows for plant operations. The processed iron silicate is sold as bulk material without packaging.

### Modules C1 to C4:

Whether and in what form dismantling takes place depends on the intended use of the iron silicate. For module C1, dismantling is carried out by a diesel-powered

Hydraulic excavators calculated. Module C2 takes into account a truck transport (diesel, Euro 6) over 50 km to the waste treatment site.

Expenses for breaking up the iron silicate in the event of material processing are included in Module C3/1. Module C2 takes into account truck transport over a distance of 50 km to the waste treatment site (diesel, Euro 6, payload 40 t, 50% capacity utilization).

Two scenarios are declared for waste treatment:

- 100% processing (C3; C4): Representative loads for construction waste processing, breaking up of iron silicate and its use as bulk granulate or gravel
- 100% landfill (C3/1; C4/1): Landfilling of iron silicate

### Module D:

Since the unprocessed iron silicate enters the system as a by-product of copper production free of charge, no recycling potential is attributed to Module D. This approach follows the guidelines set out in *PCR Part A, Chapter 5.5.6*.

### Geographical representativeness

Country or region in which the declared product system is manufactured and, where applicable, used and treated at the end of its life: Germany

### Comparability

In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared have been prepared in accordance with *EN 15804* and the building context or product-specific performance characteristics have been taken into account. All background data was taken from the *Sphera* MLC databases, version CUP 2023.2. The life cycle assessment was calculated using the LCA FE software from *Sphera*.

## LCA: Scenarios and further technical information

### Characteristic product properties of biogenic carbon

The product does not contain any biogenic carbon. As the product is delivered without packaging, no biogenic carbon is declared for the packaging either.

### Information on the description of the biogenic carbon content at the factory gate

Designation	Value	Unit
Biogenic carbon in the product	-	kg C
Biogenic carbon in the associated packaging	-	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

The following technical information forms the basis for the declared modules and can be used to develop specific scenarios in the context of a building assessment

are used.

### End of life (C1–C4)

Two scenarios are declared for waste treatment:

- 100% recycling (C3; C4): Representative loads for construction waste recycling, 3% losses are taken into account in the data set.
- 100% landfill (C3/1; C4/1): Landfilling of iron silicate

Designation	Value	Unit
Separately collected Waste type Construction waste	1000	kg
Collected as mixed construction waste	-	kg
For reuse	-	kg
For recycling (C3)	1000	kg
For energy recovery	-	kg
For landfill (C4/1)	1000	kg

## LCA: Results

The following information on environmental impacts is determined using the characterization factors according to EF 3.1, which correspond to EN 15804+A2.

### SPECIFICATION OF SYSTEM BOUNDARIES (X= INCLUDED IN LIFE CYCLE ASSESSMENT; MND= MODULE OR INDICATOR NOT DECLARED; MNR= MODULE NOT RELEVANT)

Production stage			Stage of construction of the building		Stage of use							Disposal stage				Credits and debits outside the system boundary
Raw material supply	Transport	Manufacturing	Transport from the manufacturer to	Assembly	Use/application	Maintenance	Repair	Replacement	Renewal	Energy consumption for operating the	Water consumption for operating the	Demolition/dismantling	Transport	Waste treatment	Disposal	Potential for reuse, recovery, or recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

### RESULTS OF THE ECOLOGICAL ASSESSMENT – ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 ton of iron silicate

Indicator	Unit	A1-A3	C1	C	C3	C3/1	C4	C4/1	D	D/1
Total GWP	kg CO <sub>2</sub> -eq.	4.28E+00	2.64E-01	3.9E+00	2.57E+00	0	0	1.49E+01	0	0
GWP fossil	kg CO <sub>2</sub> -eq.	4.24E+00	2.62E-01	3.86E+00	2.55E+00	0	0	1.48E+01	0	0
GWP biogenic	kg CO <sub>2</sub> -eq.	1.51E-02	9.64E-04	1.1E-02	9.39E-03	0	0	0	0	0
GWP-luluc	kg CO <sub>2</sub> -eq.	2.47E-02	1.58E-03	2.34E-02	1.25E-02	0	0	4.67E-02	0	0
ODP	kg CFC11 equivalent	1.06E-12	6.53E-14	9.67E-13	7.79E-12	0	0	3.86E-11	0	0
AP	mol H <sup>+</sup> -eq.	2.38E-02	3.62E-03	3.43E-03	1.3E-02	0	0	1.07E-01	0	0
EP-freshwater	kg P-eq.	9.75E-06	6.23E-07	9.24E-06	6.74E-06	0	0	3.03E-05	0	0
EP-marine	kg N-eq.	1.17E-02	1.65E-03	1.01E-03	6.06E-03	0	0	2.75E-02	0	0
EP-terrestrial	mol N-eq.	1.29E-01	1.81E-02	1.28E-02	6.68E-02	0	0	3.03E-01	0	0
POCP	kg NMVOC-eq.	3.11E-02	4.92E-03	2.91E-03	1.63E-02	0	0	8.31E-02	0	0
ADPE	kg Sb-eq.	3.09E-07	1.91E-08	2.84E-07	2.77E-06	0	0	6.96E-07	0	0
ADPF	MJ	5.75E+01	3.6E+00	5.33E+01	4.98E+01	0	0	2	0	0
WDP	m <sup>3</sup> global equivalent removed	2.3E-02	1.39E-03	2.06E-02	4.52E-01	0	0	1.65E+00	0	0

GWP = Global Warming Potential; ODP= Ozone Depletion Potential; AP = Acidification Potential of Soil and Water; EP= Eutrophication Potential; POCP= Potential for the Formation of Tropospheric Ozone; ADPE= Potential for the Depletion of Abiotic Resources – Non-Fossil Resources (ADP – Substances); ADPF = Abiotic Resource Depletion Potential – fossil fuels (ADP – fossil energy sources); WDP = Water Withdrawal Potential (users)

### RESULTS OF THE LIFE CYCLE ASSESSMENT – INDICATORS DESCRIBING RESOURCE USE according to EN 15804+A2: 1 Tonnes of iron silicate

Indicator	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	4.48E+00	2.41E-01	3.57E+00	5.48E+00	0	0	3.27E+01	0	0
PERM	MJ	0	0	0	0	0	0	0	0	0
PERT	MJ	4.48E+00	2.41E-01	3.57E+00	5.48E+00	0	0	3.27E+01	0	0
PENRE	MJ	5.76E+01	3.6E+00	5.34E+01	4.98E+01	0	0	2	0	0
PENRM	MJ	0	0	0	0	0	0	0	0	0
PENRT	MJ	5.76E+01	3.6E+00	5.34E+01	4.98E+01	0	0	2	0	0
SM	kg	0	0	0	0	0	0	0	9.7E+02	0
RSF	MJ	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0
FW	m <sup>3</sup>	3.75E-03	2.15E-04	3.18E-03	1.32E-02	0	0	5.05E-02	0	0

====PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy for material use; PERT = Renewable primary energy for material use; PENRE = Renewable primary energy as energy carrier; PENRM = Renewable primary energy for material use; PENRT = Renewable primary energy for material use; Total renewable primary energy; SM = Use of secondary materials; RSF = Renewable secondary fuels; NRSF = Non-renewable secondary fuels; FW = Net use of freshwater resources; SM = Use of secondary materials; RSF = Renewable secondary fuels; NRSF = Non-renewable secondary fuels; FW = Net use of freshwater resources

### RESULTS OF THE LIFE CYCLE ASSESSMENT – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 ton of iron silicate

Indicator	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	9.6E-11	6.07E-12	9E-11	4.28E-18	0	0	4.31E-09	0	0
NHWD	kg	9.02E-03	5.39E-04	7.99E-03	1.4E-02	0	0	1	0	0
RWD	kg	7.63E-05	4.74E-06	7.02E-05	4.08E-04	0	0	2.25E-03	0	0
CRU	kg	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	1E+03	0	0	0	0	0

MER	kg	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0

HWD= Hazardous waste sent to landfill; NHWD= Non-hazardous waste disposed of; RWD= Radioactive waste disposed of; CRU= Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy – electrical; EET = Exported energy – thermal

### RESULTS OF THE LIFE CYCLE ASSESSMENT – additional impact categories according to EN 15804+A2-optional: 1 ton of iron silicate

Indicator	Unit	A1-A3	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Cases of illness	4.78E-07	1.93E-07	2.46E-08	2.51E-07	0	0	1.31E-06	0	0
IR	kBq U235 equivalent	8.2E-03	5.08E-04	7.52E-03	4.29E-02	0	0	2.56E-01	0	0
ETP-fw	CTUe	4.19E+01	2.63E+00	3.89E+01	3.58E+01	0	0	1.08E+02	0	0
HTP-c	CTUh	8.51E-10	5.23E-11	7.75E-10	7.83E-10	0	0	1.68E-08	0	0
HTP-nc	CTUh	4.77E-08	2.23E-09	3.25E-08	2.73E-08	0	0	1.77E-06	0	0
SQP	SQP	2E+01	1.28E+00	1.9E+01	1.26E+01	0	0	5.04E+01	0	0

PM= Potential occurrence of diseases due to fine dust emissions; IR= Potential effect of human exposure to U235; ETP-fw = Potential toxicity comparison unit for ecosystems; HTP-c = Potential toxicity comparison unit for humans (carcinogenic effect); HTP-nc = Potential toxicity comparison unit for humans (non-carcinogenic effect); SQP = Potential soil quality index

Restriction note 1 – applies to the indicator "Potential effect of human exposure to U235".

This effect category mainly deals with the possible effect of low-dose ionizing radiation on human health in the nuclear fuel cycle. It does not take into account effects attributable to possible nuclear accidents and occupational exposure, nor does it take into account the disposal of radioactive waste in underground facilities. The potential ionizing radiation emitted by the ground, radon, and some building materials is also not measured by this indicator.

Restriction note 2 – applies to the indicators: "Potential for abiotic resource depletion – non-fossil resources," "Potential for abiotic resource depletion – fossil fuels," "Water withdrawal potential (user)," "Potential toxicity unit for ecosystems," "Potential toxicity unit for humans – carcinogenic effect," "Potential toxicity comparison unit for humans – non-carcinogenic effect," "Potential soil quality index."

The results of this environmental impact indicator must be used with caution, as there is a high degree of uncertainty surrounding these results or there is only limited experience with the indicator.

## References

### Standards

**EN**  
DIN EN 12620:2008-07 Aggregates for concrete.

**EN**  
DIN EN 13043:2002-12, Aggregates for asphalt and surface treatments for roads, airfields, and other traffic areas.

**EN**  
DIN EN 13242:2008-03, Aggregates for unbound and hydraulically bound mixtures for engineering and road construction.

**EN 13383**  
DIN EN 13383-1:2002-08, Armouring units for water protection and water control - Part 1: Requirements and  
DIN EN 13383-2:2019-12, Stone for hydraulic engineering - Part 2: Test methods.

**EN**  
DIN EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works – Environmental product declarations – Basic rules for the product category construction products.

**ISO 14025**  
DIN EN ISO 14025:2011, Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

**Regulation (EU) No. 305/2011 (CPR)**

Regulation (EU) No. 305/2011 (CPR/ BauPVO) - Construction products, European Commission, 2011.

### Further reading ECHA/

**Candidate List**  
ECHA list of substances of very high concern that are candidates for authorization. European Chemicals Agency (ECHA), 2024.

**PCR - Part A**  
Product category rules for building-related products and services - Part A: Calculation rules for the life cycle assessment and requirements for the project report according to EN EN 15804+A2:2019, Version 1.3, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2022.

**PCR - Part B**  
Product category rules for building-related products and services – Part B: Requirements for EPDs for lightweight aggregates/granules, Version 31.5.2023, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2023.

**Sphera**  
Sphera's LCA FE software system and MLC databases (formerly GaBi), LBP, University of Stuttgart and Sphera, Leinfelden-Echterdingen, data set documentation available online at: <https://lcadatabase.sphera.com/>

**Publisher**

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