ANNEX TO THE ENVIRONMENTAL PRODUCT DECLARATION EPD-BSW-20210265-CBA1-DE

Owner of the Annex	Baustahlgewebe GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Reinforcing steel coils and bars

Badische Stahlwerke GmbH

Institut Bauen und Umwelt e.V.

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General Information

Badische Stahlwerke GmbH

Programme holder
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Annex number
MBA-BSW-0001

This Annex is based on the product category rules:
Structural steels, 30/11/2017
(PCR checked and approved by the SVR)

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Dipl.-Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

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(Managing Director Institut Bauen und Umwelt e.V.))

Reinforcing steel coils and bars

Owner of the Annex
Baustahlgewebe GmbH
Friedrichstrasse 16
69412 Eberbach
Germany

Declared product / declared unit
The declared unit is 1 ton of reinforcing steel coils and bars

Scope:
This environmental product declaration applies to Baustahlgewebe GmbH concrete-reinforcing steel supplied in the form of reinforcing steel coils and bars. The wire rod for manufacturing reinforcing steel is produced by Badische Stahlwerke GmbH (steel and rolling mill) in Kehl. The wire rod is made into reinforcing steel at BDW GmbH in Kehl, HBS GmbH in Hattersheim, BBS GmbH in Dinkelscherben, BESTA GmbH in Lübbecke, Baustahlgewebe GmbH in Glaubitz and SBS GmbH in Glaubitz.

The owner of the annex shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

For specification of the calculation method see chapter "Mass balance approach (MBA)"

The Annex was created orienting towards the specifications of EN 15804+A2.

For the use of the verified annex please see https://ibu-epd.com/umgang-des-ibu-mit-massenbilanz-ansaetzen-bei-der-berechnung-einer-produkt-oekobilanz/.

Verification

The standard *EN 15804* serves as the core PCR
Independent verification of the Annex and data according to *ISO 14025:2011*
☐ internally ☒ externally

Matthias Klingler
(Independent verifier)

Product

Product description/Product definition
Reinforcing steel for reinforcing concrete

The respective national regulations apply to use of the product at the location of use, for example in Germany the building regulations of the federal states and the technical regulations based on these regulations.

Application
The products declared in this EPD are typically used to strengthen reinforced concrete components in the construction sector. The reinforcing steel is arranged in such a manner that tensile forces which occur subsequently in the reinforced concrete member can be dissipated via the reinforcing steel.

Technical Data
The product performance values in relation to its characteristics are in accordance with the relevant technical purpose (no CE labelling).

Constructional data

Name	Value	Unit
Density	7850	kg/m³
Yield strength (varies depending on the country)	> 500	MPa
Yield strength ratio Rm/Re (depending on the ductility class)	> 1.05	
Elongation under maximum force Agt (depending on the ductility class)	2.5	%

Further structural data specified in *IBU Part B* is not relevant for the products declared in this EPD.

Base materials/Ancillary materials
Fe 98.1 %, C 0.2 %, Si 0.2 %, Mn 0.8 %, further accompanying elements 0.7%.

- Does the product contain materials from the ECHA list of materials which are especially problematic for approval: Substances of Very High Concern – SVHC (Date 08/07/2021) above a mass percentage of 0.1: **no.**

Reference service life
The reference period of use for Baustahlgewebe GmbH reinforcing steel coils and bars is not specified.

LCA: Calculation rules

Declared Unit
This Environmental Product Declaration refers to a declared unit of 1 ton of reinforcing steel coils and bars produced at Baustahlgewebe GmbH.

The results are based on production data from 2019 and were weighted according to the annual quantity produced.

Declared unit

Name	Value	Unit
Declared unit	1	t
Conversion factor to 1 kg	1000	-

The products under review relate to average reinforcing steel coils and bars. Both products are produced in the electric arc furnace and subsequently the rolling mill. This is followed by a stretching unit for producing reinforcing steel coils. The LCA results for Module A for both products vary within a range of 0-7 %. There are no differences for Modules C and D.

All electricity consumed to produce the reinforcing steel coils and bars is produced from 100 % hydropower in Nordics, with 0,012 kg CO_2e/kWh, purchased with GoO.

Available Masses
10.000 tons of reinforcing steel coils and bars per year are produced with electricity from hydropower in Nordics.

System boundary
Type of EPD: Cradle to gate – with Modules C1-C4 and Module D (A1-A3 + C + D).

The LCA includes the following modules:

- Product stage with raw material supply (A1), transport (A2) and production (A3)
- Disposal stage with dismantling (C1), transport (C2), waste treatment (C3) and disposal (C4)
- Credits and loads beyond the system boundary (D, recycling potential)

All electricity consumed to produce the reinforcing steel coils and bars is produced from 100 % hydropower in Nordics, with 0,012 kg CO_2e/kWh, purchased with GoO.

Mass balance approach (MBA)
For this annex purchased green electricity (hydropower from Nordics) was allocated 100% to the production amount of 10.000 tons of reinforcing steel coils and bars.

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* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The *GaBi* background database (2021.2) was used to calculate the LCA.

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LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon
The declared product does not include biogenic carbon.

The packaging was not regarded in this EPD.

End of life (C1-C4)

Name	Value	Unit
Steel scrap collected separately	1000	kg
Recycling	950	kg
Landfilling	50	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Net steel scrap	-180	kg

This scenario contains a recycling quota of 95%. Since Baustahlgewebe GmbH buys in external scrap for production this is offset against the gross steel scrap which is recycled. This results in a net consumption of 180 kg steel scrap across the entire life cycle to produce 1 ton of reinforcing steel coils and bars.

LCA: Results

Important:
EP fresh water: This indicator was implemented in co-ordination with the characterisation module (EUTREND model, Strujis et al., 2009b, as in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml) calculated as "kg P eq".

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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
X	X	X	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 ton reinforcing steel bars and coils

Core Indicator	Core Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	Global warming potential - total	[kg CO_2-Eq.]	2.93E+2	2.23E+0	1.27E-1	0.00E+0	7.36E-1	3.49E+2
GWP-fossil	Global warming potential - fossil fuels	[kg CO_2-Eq.]	2.92E+2	2.85E+0	1.26E-1	0.00E+0	7.56E-1	3.49E+2
GWP-biogenic	Global warming potential - biogenic	[kg CO_2-Eq.]	3.93E+0	-7.59E-1	-1.50E-4	0.00E+0	-2.20E-2	-6.09E-1
GWP-luluc	GWP from land use and land use change	[kg CO_2-Eq.]	1.09E-1	1.38E-1	1.03E-3	0.00E+0	2.22E-3	8.21E-3
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	7.69E-13	1.05E-14	2.49E-17	0.00E+0	2.94E-15	-1.63E-12
AP	Acidification potential of land and water	[kg SO_2-Eq.]						
AP	Acidification potential, accumulated exceedance	[mol H^+-Eq.]	1.00E+0	1.10E-2	1.28E-4	0.00E+0	5.39E-3	9.65E-1
EP-freshwater	Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg P-Eq.]	1.03E-4	5.10E-5	3.74E-7	0.00E+0	1.27E-6	6.04E-5
EP-marine	Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	1.97E-1	2.13E-3	3.95E-5	0.00E+0	1.40E-3	2.00E-1
EP-terrestrial	Eutrophication, accumulated exceedance	[mol N-Eq.]	2.16E+0	2.78E-2	4.71E-4	0.00E+0	1.54E-2	2.17E+0
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	6.62E-1	8.35E-3	1.10E-4	0.00E+0	4.24E-3	6.70E-1
ADPE	Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	9.50E-5	1.41E-6	1.12E-8	0.00E+0	7.13E-8	-7.47E-6
ADPF	Abiotic depletion potential for fossil resources	[MJ]	3.07E+3	2.41E+2	1.68E+0	0.00E+0	1.00E+1	2.55E+3
WDP	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m^3 world-Eq deprived]	2.77E+1	2.08E-1	1.17E-3	0.00E+0	8.11E-2	-7.18E+0

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

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RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 ton reinforcing steel bars and coils

Indicator	Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	2.17E+3	1.53E+1	9.65E-2	0.00E+0	1.35E+0	-3.25E+2
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	Total use of renewable primary energy resources	[MJ]	2.17E+3	1.53E+1	9.65E-2	0.00E+0	1.35E+0	-3.25E+2
PENRE	Non-renewable primary energy as energy carrier	[MJ]	3.07E+3	2.41E+2	1.68E+0	0.00E+0	1.00E+1	2.58E+3
PENRM	Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	Total use of non-renewable primary energy resources	[MJ]	3.07E+3	2.41E+2	1.68E+0	0.00E+0	1.00E+1	2.58E+3
SM	Use of secondary material	[kg]	1.13E+3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.79E+2
RSF	Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	Use of net fresh water	[m³]	3.84E+0	1.72E-2	1.11E-4	0.00E+0	2.48E-3	2.35E-1

Caption	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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 ton reinforcing steel bars and coils

Indicator	Indicator	Unit	A1-A3	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	5.65E-7	1.30E-8	8.87E-11	0.00E+0	1.07E-9	-3.12E-7
NHWD	Non-hazardous waste disposed	[kg]	1.83E+0	3.87E-2	2.64E-4	0.00E+0	5.00E+1	5.05E+0
RWD	Radioactive waste disposed	[kg]	4.20E-2	1.19E-3	3.05E-6	0.00E+0	1.05E-4	-4.19E-2
CRU	Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0	9.50E+2	0.00E+0	0.00E+0
MER	Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption	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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: [declared unit and product]

Indicator	Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PM	Potential incidence of disease due to PM emissions	[Disease Incidence]	ND	ND	ND	ND	ND	ND
IRP	Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND
ETP-fw	Potential comparative toxic unit for ecosystems	[CTUe]	ND	ND	ND	ND	ND	ND
HTP-c	Potential comparative toxic unit for humans - cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
HTP-nc	Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
SQP	Potential soil quality index	[-]	ND	ND	ND	ND	ND	ND

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.
This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Disclaimer 3 – Mass Balance Approach in the sense of a virtual allocation is not allowed within EN15804+A2. The underlaying calculation is oriented on the EN15804 but uses allocation methods described in the chapter “Mass balance approach (MBA)”. IBU cannot guarantee that this document will be accepted as evidence by third parties.

Additional and optional impact categories in accordance with *EN 15804+A2* are not declared as this is not required by *IBU Part A*.

All electricity consumed for the production of reinforcing steel bars and coils is produced from 100% hydropower in Nordics.

References

Standards

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Annex — Core rules for the product category of construction products.

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

GaBi
GaBi Software System and Databases for Life Cycle Engineering, Sphera Solution GmbH, Leinfelden-Echterdingen, 2021

IBU 2021
Institut Bauen und Umwelt e.V.: General Instructions for the Annex programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021
www.ibu-epd.com

IBU Part A
PCR - Part A: Product Category Rules for Building-Related Products and Services, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report in accordance with EN 15804+A2: 2019, Version 1.2, Institut Bauen und Umwelt e.V., www.bau-umwelt.com

IBU Part B
PCR – Part B: Requirements of the EPD for Structural Steel, Version 1.6, Institut Bauen und Umwelt e.V., www.bau-umwelt.com

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