ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Profil-Vertrieb GmbH/PROTEKTORWERK Florenz Maisch GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-PRO-20230284-IBI1-EN
Issue date	21.08.2023
Valid to	20.08.2028

C- and U profiles from the edificio lightweight steel construction

Protektorwerk Florenz Maisch GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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1. General Information

Protektorwerk Florenz Maisch GmbH & Co. KG

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-PRO-20230284-IBI1-EN

This declaration is based on the product category rules:

Thin walled profiles and profiled panels of metal, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

21.08.2023

Valid to

20.08.2028

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

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

C- and U profiles from the edificio lightweight steel construction

Owner of the declaration

Profil-Vertrieb GmbH/PROTEKTORWERK Florenz Maisch GmbH & Co. KG
Viktoriastraße 58
76554 Gaggenau
Germany

Declared product / declared unit

1 running metre of C- and U- profiles serie: edifico for lightweight steel construction, Conversion factors see chapter 6

Scope:

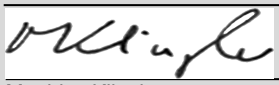
This Declaration applies for the C- and U- profiles serie: edifico manufactured by PROTEKTORWERK Florenz Maisch GmbH & Co. KG in the Gaggenau plant.

The Declaration is representative for the C- and U- profiles: C147-20, C147-20, C197-20, C97-15, C97-20, C197-15, U100-15, U101-20, U150-15,U151-20, U151-20 ediWall, U200-15, U201-20, U247-20, U251-20, U297-20, U-connecting profile for UA50, U-connecting profile for UA 100, U-connecting profile for UA75 und C97-15 (reference product, because best selling product).
The owner of the declaration 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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

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



Matthias Klingler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The C and U profiles are prefabricated, thin-walled profiles made of S320GD+Z275 or S320GD+ZM310 grade galvanized slit strip, cold-formed in the factory. Profile C97-15 was chosen as a representative product for all lightweight steel profiles in the edificio profiles series, as
it represents the best-selling product in the whole series.

Complete list of profiles:

- C147-15 (3.00 kg/m)C147-20 (3.99 kg/m), C197-20 4.46 kg/m), C97-15 (3.00 kg/m), C97-20 (3.20 kg/m), C197-15 (3.36 kg/m), U100-15 (2.05 kg/m), U101-20 (2.73 kg/m), U150-15 (2.64 kg/m),U151-20 (3.52 kg/m), U151-20 ediWall (4.46 kg/m), U200-15 (4.30 kg/m), U201-20 (4.30 kg/m), U247-20 (5.09 kg/m), U251-20 (5.13 kg/ m), U297-20 (5.87 kg/m), U-connecting profile for UA50 (1.97 kg/m), U-connecting profile for UA 100 (2.77 kg/m), U-connecting profile for UA75 (2.38 kg/m) and C97-15 (2.41 kg/m) [representative product].

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) /Regulation (EU) No. 305/2011 (CPR)/ applies. The product has a declaration of performance according to EN 1090-1/ System for assessment and verification of constancy of performance. Performance: cold-formed profiles for load-bearing purposes in all types of structures; System: 2+.

Notified body: NB 0769 - Karlsruhe Institute of Technology (KIT), Testing Institute for Steel, Wood and Stone.

Classification report: initial inspection of factory production control carried out and a certificate of conformity for factory production control 0769-CPRVAS-00436-2.

2.2 Application

C and U profiles of the edificio lightweight steel construction series are used as substructures for bearing and non-bearing wall, ceiling and roof constructions.

The static rating of bearing lightweight steel structures is regulated by Eurocode DIN EN 1993-1-3 +NA/ Eurocode 3 Part 1-3 General rules - Supplementary rules for cold-formed structural members and plates.

2.3 Technical Data

The technical specifications of the products within the scope of the EPD are listed in the following table with reference to the test methods/test standards for each specification.

Constructional data

Name	Value	Unit
Profile weight (representative product)	2,41	kg
Thickness of the sheet	1.5	mm
Grammage	15.53	kg/m^2
Flange height	50	mm
Bar width	97	mm

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according DIN EN 1090-1 Metal framing components for gypsum board systems - Definitions, requirements and test methods; German version EN 14195:2014.

2.4 Delivery status

The products are supplied in lengths of 400, 500 and 600 cm, as well as in fixed lengths up to 1200 cm. The profiles are delivered in bars as well as several bars bundled together.

2.5 Base materials/Ancillary materials

The profiles are manufactured from galvanized sheet steel as slit strip S320GD+Z or +ZM, t= 1.5 to 3.0 mm (nominal), according to /DIN EN 10346/ and /DIN EN 10143/ with galvanizing at least Z 275 or ZM310.

Acetone ink is used for marking the profiles. Volume, converted to 1 running metre of
profile: 0.02 ml.

During the profile manufacturing process of the profiles at PROTEKTOR, the following lubricant and cleaning agent is also used: water-based emulsion. Volume per production volume, converted to 1 running metre of profile: approx. 0,2 ml.

This product/article/at least one partial article contains substances listed in the candidate list (date: 19.01.2023) exceeding 0.1 percentage by mass: no

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture

The profiles are produced from galvanized steel slit strip by a cutting and forming process. The slit strip is continuously fed in the strip process and formed by the profiling machine. In the first step, the openings are punched, surfaces are stamped and then roll-formed. In roll forming, the material is formed into a profile in several stages with the help of rollers. The shaping is done continuously. Afterwards, the profiles are marked by inkjet. Finally, the profiles are cut to length and packed either by the bar or by the bundle.

2.7 Environment and health during manufacturing

PROTEKTORWERK Florenz Maisch GmbH & Co. KG complies with all of the requisite national guidelines relating to health and environmental protection. There are no anticipated risks to the environment or negative impact on production personnel during manufacturing the profiles.
Named measures do not go beyond legal requirements.

2.8 Product processing/Installation

C- and U- profiles of the edificio lightweight steel construction series are used as substructure for bearing and non-bearing wall, ceiling and roof constructions.
The standard structure of edificio lightweight steel wall constructions results from U-profiles for the floor connection, adjusted C-stand profiles and profiles in the U-connection/ring anchor profiles in the upper wall area to frame the C-stands. The profiles are connected to each other with self-drilling screws.

In the ceiling area, C and U profiles are usually used as wide span beams, either individually or screwed back-to-back (depending on structural requirements). U profiles are used as

supports on the walls. The profiles are cut to length using a suitable cutting tool, e.g. a crosscut hacksaw.

2.9 Packaging

The profiles are compiled in bundles using 2 polypropylene or polyethylene tapes per bundle (1.0 metre of material required per bundle). Several smaller bundles form a large bundle and are strapped using 3 - 4 tapes made of PP or PE (approx. 5.6 - 8 metres of material and 3-4 pieces of wood (1.67 g per m) required per large bundle).

All packaging materials used by PROTEKTOR are registered as recyclable materials at INTERSEROH DienstleistungsGmbH, Stollwerckstrasse 9a, 51149 Cologne. Interseroh organises and co-ordinates collection of the transport packaging in retail, industry and trade, and directs it to an environmentally-friendly recycling circuit. In its capacity as the distributing company, Protektor therefore complies with the requirements of the Packaging Directive.

2.10 Condition of use

The profiles are used as substructures for bearing and non-bearing walls, ceilings and roof structures.

The structural design of the bearing lightweight steel structures is regulated by Eurocode DIN EN 1993-1-3 / Eurocode 3 Part 1-3 General rules - Supplementary rules for cold-formed components and plates.

2.11 Environment and health during use

When used as designated, there are no known modifications of the profiles or emissions of dangerous substances into the environment.

2.12 Reference service life

The life span of lightweight structures or lightweight steel profiles of the series edificio is ≥ 50 years in accordance with the /BNB Table/. No influences on the ageing of the product when applied in accordance with the rules of technology are known.

2.13 Extraordinary effects

Fire

Information on the fire performance according to *EN 13501:1* or established national standards. According to *EN 13501:1*:

- The classes of building products regarding their fire performance are predefined as: A1, A2, B, C, D, E, and F;
- The classes of flaming droplets/particles are pre-defined as: d0, d1, or d2;
- The classes for smoke density are pre-defined as: s1, s2, or s3

Fire protection

Name	Value
Building material class / EN 13501	A1
Burning droplets	A1 (thus d0)
Smoke gas development	A1 (thus s1)

Water

Despite galvanizing, unforeseeable and longer impact by moisture can trigger a corrosion process (surface corrosion) caused by electrochemical decomposition of the zinc plating.

Mechanical destruction

Mechanical destruction of the profiles leads to deformation of the cross-section and can cause damage to the zinc plating.

2.14 Re-use phase

Dry lining profiles are connected purely mechanically with other building materials and structures. They are therefore easily de-constructed. Profiles made from galvanized steel sheet or slit strip can be recycled infinitely.

2.15 Disposal

The possible disposal channels must be indicated.
The waste code in accordance with the European Waste Index must be described.

2.16 Further information

www.protektor.de

3. LCA: Calculation rules

3.1 Declared Unit

Declared unit and mass reference

Name	Value	Unit
Conversion factor to 1 kg	0,414	
Declared unit	0.1555	m^2
Declared unit	1	rm
linear density	2.414	kg/rm

Explanation of the selection of the reference product:

The profiles are produced in various product variants, which differ mainly in the profile height, delivery length and thus in the weight of one running meter, as well as the packaging.

As a reference product, the C97-15 profile was selected, as it is the most widely used/sold product. For all types of profiles, the same statements apply to applicable standards, production, transport and recycling. The selected reference profile also covers the profiles that are also offered in identical product widths.

3.2 System boundary

Type of EPD: cradle to gate with options

The following modules were considered for calculating the LCA:

- A1: Raw material supply and processing
- A2: Transport and delivery of the base material
- A3: Production process
- A4: Transporting the profiles to the construction site
- A5: Handling waste from product packaging
- C1: De-construction/ demolition
- C2: Transport
- C3: Waste processing
- C4: Landfilling
- D: Re-use, recovery and/or recycling potential

3.3 Estimates and assumptions

Wherever available, primary data was used for all production processes. Generic data was used for production of the materials used. Assumptions were made for Modules A4 (Transport to the construction site), A5 (Handling waste from product packaging), C4 (Landfilling) and D (Re-use, recovery and/or recycling potential).The profiles are used throughout Europe with the result that an average transport distance of 400 km and average capacity of 80 % is assumed weighted by frequency. For the transport to the disposal site (C2) a distance of 100 km is assumed with an average utilization rate of 80%.

The profiles are connected exclusively mechanically to other construction materials which enable clean segregation of materials during demolition or de-construction. Accordingly, a recycling rate of 90 % can be assumed for the profiles. Landfilling is assumed for the remaining 10 % steel scrap.

3.4 Cut-off criteria

No cut-off criteria in terms of the primary data supplied by the manufacturer are used. Therefore even the smallest volumes of input materials (less than five per cent by mass) being taken into account using generic data in the LCA. The manufacture of the machinery, equipment and other infrastructure required for the production of the products under consideration, as well as the installation (B modules) and removal (module C1) of the products, were not taken into account in the assessment and were therefore subject to the cut-off rule. Furthermore, module C3 is excluded due to missing data.

3.5 Background data

The GaBi 10, SP 2022.2 (comprehensive analysis) software system developed by sphera was used for analysing the LCA and/or life cycle of profiles. The data sets contained herein are either industrial data (e.g. worldsteel) or from sphera.

3.6 Data quality

A generic average data set was taken for the lubricating oils and greases used. For the
production of galvanized steel sheet, an aggregated generic data set is used for galvanized steel sheet. Corresponding data sets were available for all other preliminary products used. The data quality can be regarded as high due to the average data set for various oils. The age of the background data used (2018-2021) from industry and sphera is less than 6 years and can be
considered representative for the period under consideration.

3.7 Period under review

2021 was selected as the period of review. All internal data was collated for this period.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Germany

3.9 Allocation

No co-products arise during the manufacture of profiles which is why no allocations were necessary. Credits are awarded for both recycling the steel profiles and for thermal and energetic recovery during incineration of packaging materials and these are declared in Module D.

3.10 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. Only background data from the GaBi 10 software (SP 2022.2) are included in this LCA.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The content of biogenic carbon in the product is less than 5% and is therefore not indicated separately. The product packaging consists of plastics (PP and PE) without biogenic content and woods with max. 1% (based on the total mass of the product respectively 82% within the packaging) content.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.00688	kg C

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0002	l/100km
Transport distance	400	km
Capacity utilisation (including empty runs)	80	%

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site	0.002	kg

Currently, no primary data is available on installation, which is why no information is available here, for example on the fuel, electricity, etc. required, and this is not taken into account in the calculation. The installation phase therefore only includes the environmental impact of disposal of the product packaging.

Reference service life

Name	Value	Unit
Life Span (according to BBSR)	50	a

End of life (C1-C4)

Name	Value	Unit
Collected separately steel	2.414	kg
Recycling	2.173	kg
Landfilling	0.241	kg

Transport to waste disposal (C2)

Name	Value	Unit
Litres of fuel	0.0002	l/ 100km
Transport distance	100	km
Capacity utilisation (including empty runs)	80	%

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

Module D includes energy recoveries from the incineration processes (i.e., electricity and steam from packaging incineration) and material credits for product recycling. These credits are based on German average data for electrical and thermal energy and steel production.

5. LCA: Results

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	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 rm reference product: C97-15

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	5.78E+00	4.8E-02	1.22E-02	6.08E-02	2.79E-03	0	1.45E-02	0	3.5E-03	-3.76E+00
GWP-fossil	kg CO_2 eq	5.78E+00	4.81E-02	1.4E-02	6.1E-02	6.99E-04	0	1.46E-02	0	3.6E-03	-3.76E+00
GWP-biogenic	kg CO_2 eq	6.95E-03	-4.73E-04	-1.82E-03	-6.01E-04	2.1E-03	0	-1.43E-04	0	-1.07E-04	2.47E-03
GWP-luluc	kg CO_2 eq	1.5E-03	3.26E-04	1.71E-06	4.14E-04	4.71E-09	0	9.88E-05	0	6.65E-06	-7.79E-05
ODP	kg CFC11 eq	5.22E-12	4.75E-15	7.76E-15	6.03E-15	1.87E-16	0	1.44E-15	0	8.46E-15	-1.1E-14
AP	mol H^+ eq	1.45E-02	5.3E-05	1.63E-05	6.81E-05	3.66E-07	0	1.61E-05	0	2.55E-05	-8.09E-03
EP-freshwater	kg P eq	4.52E-06	1.73E-07	3.47E-09	2.19E-07	4.46E-11	0	5.24E-08	0	6.1E-09	-6.84E-07
EP-marine	kg N eq	3.38E-03	1.68E-05	5.63E-06	2.18E-05	1.12E-07	0	5.1E-06	0	6.53E-06	-1.42E-03
EP-terrestrial	mol N eq	3.64E-02	2.02E-04	6.11E-05	2.62E-04	1.74E-06	0	6.13E-05	0	7.18E-05	-1.25E-02
POCP	kg NMVOC eq	1.07E-02	4.55E-05	1.59E-05	5.85E-05	3.07E-07	0	1.38E-05	0	1.98E-05	-5.77E-03
ADPE	kg Sb eq	1.83E-05	4.88E-09	5.07E-10	6.19E-09	4.56E-12	0	1.48E-09	0	3.69E-10	-9.38E-06
ADPF	MJ	5.39E+01	6.36E-01	2.29E-01	8.06E-01	5.16E-04	0	1.92E-01	0	4.72E-02	-3.46E+01
WDP	m^3 world eq deprived	-4.38E-02	5.42E-04	9.66E-05	6.87E-04	2.81E-04	0	1.64E-04	0	3.95E-04	-6.99E-01

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)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 rm reference product: C97-15

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3.73E+00	4.4E-02	2.52E-02	5.59E-02	1.2E-04	0	1.33E-02	0	7.08E-03	2.17E+00
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	3.73E+00	4.4E-02	2.52E-02	5.59E-02	1.2E-04	0	1.33E-02	0	7.08E-03	2.17E+00
PENRE	MJ	5.43E+01	6.38E-01	2.29E-01	8.09E-01	5.16E-04	0	1.93E-01	0	4.72E-02	-3.46E+01
PENRM	MJ	0	0	4.61E-02	0	4.61E-02	0	0	0	0	0
PENRT	MJ	5.43E+01	6.38E-01	2.75E-01	8.09E-01	4.66E-02	0	1.93E-01	0	4.72E-02	-3.46E+01
SM	kg	0	0	0	0	0	0	0	0	0	2.17
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.45E-03	5.09E-05	3.32E-05	6.46E-05	6.6E-06	0	1.54E-05	0	1.2E-05	-1.58E-02

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 rm reference product: C97-15

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	4.63E-09	3.38E-12	1.66E-11	4.28E-12	4.97E-14	0	1.02E-12	0	2.43E-12	-2.7E-10
NHWD	kg	7.61E-02	1.04E-04	5.99E-05	1.32E-04	1.78E-05	0	3.15E-05	0	2.42E-01	5.24E-01
RWD	kg	4.27E-04	1.18E-06	1.89E-05	1.5E-06	3.06E-08	0	3.59E-07	0	5.25E-07	3.05E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	6.56E-04	2.17E+00	0	2.17E+00	0	0
MER	kg	0	0	0	0	1.38E-03	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	-4.49E-03

EET	MJ	0	0	0	0	0	0	0	0	0	-8.03E-03

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:
1 rm reference product: C97-15

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.93E-07	3.7E-10	3.88E-10	4.72E-10	1.86E-12	0	1.12E-10	0	3.14E-10	-1.14E-07
IR	kBq U235 eq	3.93E-02	1.79E-04	1.47E-03	2.27E-04	5.02E-06	0	5.41E-05	0	5.82E-05	8.46E-02
ETP-fw	CTUe	1.08E+01	4.5E-01	5.88E-02	5.71E-01	2.29E-04	0	1.36E-01	0	2.67E-02	-2.14E+00
HTP-c	CTUh	7.46E-09	9.28E-12	1.35E-12	1.18E-11	1.74E-14	0	2.81E-12	0	4.03E-12	-1.54E-09
HTP-nc	CTUh	6.72E-08	5.02E-10	7.88E-11	6.37E-10	5.93E-13	0	1.52E-10	0	4.47E-10	-5.08E-08
SQP	SQP	3.23E+00	2.69E-01	5E-01	3.41E-01	1.53E-04	0	8.14E-02	0	9.81E-03	2.67E-01

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, 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 as there is limited experience with the indicator.

6. LCA: Interpretation

In order to interpret the results of the LCA, both the aggregate indicators of the Life Cycle Inventory Analysis and the estimated impact were analysed in a dominance analysis.

The greatest share of energy requirements accounting for 54 MJ is attributed to production
(A1-A3), whereby production of the raw materials (A1), especially galvanized steel sheet with its very energy-intensive production process is of relevance. Transporting raw materials and profiles accounted for 3 % of energy expenses (A2 & A4).

Approx. 12 % of energy requirements within production was required for manufacturing the
packaging materials polypropylene and polyethylene (A3); the remaining energy requirements in category A3 are distributed across electricity and compressed air in-house at PROTEKTORWERK. Approx. 35 MJ can be entered as credits for recycling the steel profiles and incinerating the packaging material.

The environmental impact is outlined in the impact categories above. Despite a recycling rate of 90 %, the credits in all impact categories are lower than the environmental impact by production of this volume of steel profiles. The credits in particular are lower as environmental impact ensues even during recycling of the steel which in turn reduces the credit.

An exception to this is the impact category water use, as this results in higher credits (module D).

The greatest share of Global Warming Potential (GWP) - total is accounted for by production,
where the energy intensive production of galvanized steel sheet (A1, 98 %) is the main factor. Pit coal is largely used as an energy carrier for energy- intensive steel production which has a strong impact on the GWP. Furthermore, a negative contribution of GWP from recycling (D) is noticeable. This credit is due to recycling of steel profiles and emissions avoided for primary production of steel. Incineration of the packaging materials results in another credit. This is justified by the heat and electricity production, which replaces their supply from fossil fuels.

The Acidification Potential (AP) as well as the Eutrophication Potential (EP) are caused by steel production on the one hand and by the credit awarded for avoiding primary production of steel on the other.

In the case of the Photochemical Ozone Creation Potential (POCP), production of inputs is the
main cause (A1 approx. 99 %).Recycling of the steel results in a reduction in the burden (D).

The Abiotic Depletion Potential non-fossil Resources (ADPE) is primarily determined by the requirements of ores for manufacturing the steel.

The Abiotic Depletion Potential Fossil Fuels (ADPF) is primarily determined by the fossil energy carriers required during steel manufacturing. Pit coal in particular is the main driver (approx. 75 % of steel production).

For Water Use, a negative overall contribution results (A1 to C4) due to a negative
contribution in the steel production process. However, due to uncertainties in the background data, this result is not suitable for deriving product and process optimization potential.

The different ceiling profiles differ in the amount of galvanized steel sheet used and in the
amount of packaging material required per running metre. For all profiles, the deviations from the reference profile in the impact assessment results depend mainly on the quantity of galvanized steel sheet used. Since the percentage changes in the individual impact categories are identical, only the GWP total (sum A1-C4) is shown as a proxy:

	C 97-15	C 147-15	C197-15	U 100-15	C 97-20	C 197-20	U 150-15	U 200-15	C 147-20	U 151-20	U 151-20 ediWall	U 201-20	U-connecting profile for UA100	U-connecting profile for UA75	U-connecting profile for UA 50	U 101-20	U 247-20	U 297-20	U 251-20
[kg/lfm]	2.41	3.00	3.36	2.05	3.20	4.46	2.64	3.23	3.99	3.52	4.46	4.30	2.77	2.38	1.97	2.73	5.09	5.87	5.14
GWP - total [kg CO_2-eq.]	5.93E+00	7.37E+00	8.24E+00	5.03E+00	7.86E+00	1.09E+01	6.47E+00	7.92E+00	9.79E+00	8.63E+00	1.09E+01	1.06E+01	6.80E+00	5.84E+00	4.84E+00	6.71E+00	1.25E+01	1.44E+01	1.26E+01
GWP - total [%]	100%	124%	139%	85%	133%	185%	109%	134%	165%	146%	185%	178%	115%	99%	82%	113%	211%	243%	213%

7. Requisite evidence

7.1 Requirements for profiles

Light steel structures are designed individually in accordance with Eurocode DIN EN 1993-1-3 / Eurocode 3 Part 1-3 General rules - Supplementary rules for cold-formed components and plates.

The profiles are produced according to WPK in accordance with DIN EN 1090-1.

7.2 Sound protection and fire safety

Dry lining systems featuring profiles were tested in terms of sound protection and fire safety accordance with the specifications outlined in the Building Regulation List as per European and German standards. Tests were performed by recognised test institutes. These are in detail, MFPA Leipzig GmbH, MPA Braunschweig, EMPA in Dübendorf, Switzerland, and ITA-Ingenieurgesellschaft für technische Akustik mbH, Wiesbaden, Peutz in Molenhoek, Netherlands.

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