

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804


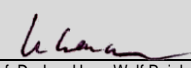
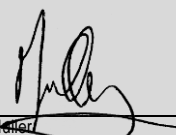
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## Profiled sheets made of steel for roof, wall and deck constructions IFBS

[www.bau-umwelt.com](http://www.bau-umwelt.com)



## 1. General Information

<p><b>IFBS</b></p> <hr/> <p><b>Programme holder</b>          IBU - Institut Bauen und Umwelt e.V.          Panoramastr. 1          10178 Berlin</p> <hr/> <p><b>Declaration number</b>          EPD-IFBS-2013211-EN</p> <hr/> <p><b>This Declaration is based on the Product Category Rules:</b>          Thin walled profiles and profiled panels of metal,          19.07.2012          (PCR tested and approved by the independent expert committee (SVA))</p> <hr/> <p><b>Issue date</b>          14.01.2013</p> <hr/> <p><b>Valid to</b>          13.01.2018</p> <hr/> <p>          Prof. Dr.-Ing. Horst J. Bossenmayer          (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p>          Prof. Dr.-Ing. Hans-Wolf Reinhardt          (Chairman of SVA)</p>	<p><b>Profiled sheets made of steel for roof, wall and deck constructions</b></p> <hr/> <p><b>Owner of the Declaration</b>          IFBS          Europark Fichtenhain A 13a          47807 Krefeld</p> <hr/> <p><b>Declared product / Declared unit</b>          1m<sup>2</sup> industrially produced trapezoidal profiles, liner-trays and folded profiles made of steel</p> <hr/> <p><b>Scope:</b>          The applicability of this document is restricted to profiled sheets made of steel produced by member companies of IFBS.          Data has been provided by 12 member companies of IFBS for the year 2011. These companies represent between 75% and 100% for the different product types of IFBS members producing steel profiles. Production volume of these companies contributes more than 90% to the German market.          The owner of the declaration shall be liable for the underlying information and evidence.</p> <hr/> <p><b>Verification</b></p> <table border="1"> <tr> <td colspan="2">The CEN Norm EN 15804 serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to ISO 14025</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p>          Olivier Müller          (Independent tester appointed by SVA)</p>	The CEN Norm EN 15804 serves as the core PCR		Independent verification of the declaration and data according to ISO 14025		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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## 2. Product

### 2.1 Product description

Prefabricated thin walled profiled sheets made of steel for load-bearing, self-supporting and non-supporting application in single- and double-layer roof, wall and ceiling structures.

The profiled sheets are made of a core of steel, which is protected against corrosion with zinc and organic coatings. The LCA is based on vertical averaging of the specific producer datasets under consideration of the respective yearly production amounts.

### 2.2 Application

Application as covering component in single- and double-layer roof and wall structures, as well as for the use as a supporting tray in single- and double-layer roof, wall and ceiling structures for mainly static loads.

The profiled sheets are used in interior and exterior application.

### 2.3 Technical Data

Technical specification for profiled sheets are given in:

- DIN 18807-1 to 3
- DIN EN 508-1
- DIN EN 1090-2

### Constructional data

Trapezoidal profile 35/207	Value	Unit
Thickness of the sheet, according DIN 18807 or DIN EN 508	0.75	mm
Height of the profile, according DIN 18807 or DIN EN 508	32-35	mm
Surface weight	6.9	kg/m <sup>2</sup>
Trapezoidal profile 135/310	Value	Unit
Thickness of the sheet, according DIN 18807 or DIN EN 508	0.75	mm
Height of the profile, according DIN 18807 or DIN EN 508	135-137	mm
Surface weight	11.3	kg/m <sup>2</sup>
Liner-tray 130/600	Value	Unit
Thickness of the sheet, according DIN 18807 or DIN EN 508	0.75	mm
Height of the profile, according DIN 18807 or DIN EN 508	130	mm
Surface weight	11.4	kg/m <sup>2</sup>
Folded profile 65/400	Value	Unit
Thickness of the sheet, according DIN 18807 or DIN EN 508	0.75	mm
Height of the profile, according DIN 18807 or DIN EN 508	65	mm
Surface weight	7.7	kg/m <sup>2</sup>

## 2.4 Placing on the market / Application rules

The placing on the market within the European Union is according to the declared use of the CE sign. The CE sign is based on harmonised European standards, e.g. DIN EN 1090, DIN EN 14782, DIN EN 14783.

Until the ending of the coexisting period of EN 1090, the placing on the market within Germany is still possible according to the label of signify compliance (German Ü-Zeichen) and the special national regulations and requirements, e. g. DIN 18807.

The use can be load bearing, self-supported or non supported. The usage is declared according to the listed standards.

- DIN 18807-1 to 3: Trapezoidal sheeting in building, trapezoidal steel sheeting
- DIN EN 1090-1&2: Execution of steel structures and aluminium structures
- DIN EN 14782: Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements
- DIN EN 14783: Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements
- German General Technical Approvals for folded profiles of the respective manufacturers of the represented manufacturer.

## 2.5 Delivery status

The profiled sheets will be ordered project-related, produced with the ordered length and delivered project- and object-related.

Order and delivery unit: square metre [m<sup>2</sup>]

## 2.6 Base materials / Ancillary materials

No REACH materials included.

### Steel according DIN EN 10169:

S 280 GD to S 320 GD

### Metallic coating according DIN EN 10346:

Zinc Z 275, coating 275 g/m<sup>2</sup>. The zinc layer has a content of at least 99 weight percent zinc an typical thickness of 20 µm.

### Organic coating according DIN EN 12944-1 (DIN 55634):

Polyester (SP), coil coating, 25 µm on the application side and max.15 µm on the back side.

## 2.7 Manufacture

Trapezoidal profiles, liner-trays or folded profiles are profiled in continuously operating rollformer. The profiles are profiled in a cold forming process.

The rollforming process starts on the winch. The profile type is related to a defined number of rolls, the higher the profiles the higher the number of rolls. The profiling process runs inside out, starting in the middle. The process ends in the cutting and stacking zone.

The protection foil will be added adhesive in the beginning of the rollforming process.



Pic. 1: Rollforming of a trapezoidal sheet

## 2.8 Environment and health during manufacturing

No measures relating to safety, health and environment protecting during the manufacturing process extending beyond national guidelines are known.

## 2.9 Product processing/Installation

The profiled sheets will be dropped of at the intended location on the application site manually or with the aid of lifting equipment or cranes. Prior to the installation the protective film must be removed.

The mounting of the profiled sheets to the substructure and the interconnection with fasteners must refer to the national approval Z-14.1-4 or relevant European technical approvals. The required holes for mounting either pre-drilled or the connecting elements intersect the wellbore during the setting process using drillbits.

Also cartridge-fired pins can be used for the attachment to the supporting substructure. The use of cartridge-fired pins is specified by the manufacturer setting device. The attachment is made by sintering of the bolt with the substructure.

Careful planning limit cuts and sheers on the construction site to a minimum. For technical correct construction site cuts sheers, electric metal sheers, nibbler, special stitch, circular or chain saws or oscillating multi-cutter has to be used. The used blades must be suitable for the use, working without spark or heat. If cuts have to be done with angle grinder or plasma cutters the coil coated surface has to be protected against injury. At risk of corrosion (e. g. outdoor areas), a post-treatment of the cut surfaces is required.

For use in a airtight and heat-insulating building envelope sealant strips according to DIN 18542 and insulation made of polyurethane or mineral wool are in use. There are appropriate EPDs available published by the different manufacturer of insulation and sealant strips.

The IFBS guidelines for lightweight metal construction has to be observed during the design and execution process ([www.ifbs.de](http://www.ifbs.de)).

## 2.10 Packaging

Transport and delivery runs on packaging racks made of wood. The packages will be foiled to avoid damage and dirt. The edges will be contributed with slides made of metal, plastics or wood.

The packages can be handled with stacker or cranes. Packaging materials shall be collected separately for recycling.

## 2.11 Condition of use

The substantial composition during the use phase refers to the composition during the manufacture.

## 2.12 Environment and health during use

The loss of zinc refers to the local micro climate conditions. The division into categories is according to DIN EN 12944-2 and depends on surface depending loss of mass.

Adverse effects emanating from profile sheets of steel are not known.

## 2.13 Reference service life

Thin walled profiled sheets made of steel with the use in lightweight metal constructions must withstand a term of protection of at least 15 years minimum. The term of protection is the period until first slight renewals in the surface are needed, only if there is no need of frequently inspections and service.

The term of protection depends on the location, weather conditions and the quality of the coating.

Thin walled profiled sheets made of steel exhibit an estimated service life of 40 – 45 years. This declaration depends on Life Cycle Assessment and relies on the use conditions.

## 2.14 Extraordinary effects

### Fire

Thin walled profiled sheets made of steel correlate to building material class A1, non-flammable according to DIN EN 13501-1.

### Fire protection

Name	Value
Building material class according DIN EN 13501	A1

### Water

No risks for the environment and living organisms are known under unforeseeable water effects.

### Mechanical destruction

No risks for the environment and living organisms are known under unforeseeable mechanical destruction.

## 2.15 Re-use phase

Thin walled profiled sheets made of steel can be collected and recycled after the phase of use.

## 2.16 Disposal

The disposal code for thin walled profiled sheets made of steel, protected with zinc coatings refer to the German List of Wastes Ordinance (/AVV/) and European waste Index (EWC):

17 04 05 – Iron and steel

## 2.17 Further information

Please find further technical information about products, static calculation, engineering and execution in the IFBS guidelines for lightweight metal construction.

[www.ifbs.de](http://www.ifbs.de).

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The declared unit is 1 m<sup>2</sup> of steel profile or steel profiled panel with the technical characteristics declared in 2.3. Averaging was done vertically based on the specific datasets under consideration of the yearly production amounts in square meter.

#### Declared unit

Trapezoidal profile 35/207	Value	Unit
Declared unit	1	m <sup>2</sup>
Surface weight	6.9	kg/m <sup>2</sup>
Conversion factor to 1 kg	1/6.9	-
Trapezoidal profile 135/310	Value	Unit
Declared unit	1	m <sup>2</sup>
Surface weight	11.3	kg/m <sup>2</sup>
Conversion factor to 1 kg	1/11.3	-
Liner-tray 130/600	Value	Unit
Declared unit	1	m <sup>2</sup>
Surface weight	11.4	kg/m <sup>2</sup>
Conversion factor to 1 kg	1/11.4	-
Folded profile 65/400	Value	Unit
Declared unit	1	m <sup>2</sup>
Surface weight	7.7	kg/m <sup>2</sup>
Conversion factor to 1 kg	1/7.7	-

### 3.2 System boundary

Type of EPD: cradle to gate with options

Production stage (modules A1-A3) includes processes that provide materials and energy input for the system, manufacturing and transport processes up to the factory gate, as well as waste processing.

For the end of life a collection rate of 90% is assumed. This means after use stage and demolishment, 10% of construction steel products is considered as lost, 90% of construction steel products is recollected.

The 10% lost product is modelled with landfilling. The 90% recollected steel is modelled with a credit given as if it was re-melted in an Electric Arc Furnace secondary steel plant and substituted by the same amount of steel which is produced in a Blast Furnace primary steel plant (worldsteel LCA methodology).

### 3.3 Estimates and assumptions

For the end of life a collection rate of 90% is assumed (see 3.2). The recycling potential is modelled using the WORLDSTEEL LCI-methodology.

### 3.4 Cut-off criteria

In this study, all available data from production are considered, i.e. all raw materials used, utilised thermal energy and electric power consumption. Thus material and energy flows contributing less than 1% of mass or energy are considered Transport expenditure for all considered raw materials are included.

### 3.5 Background data

All relevant background datasets are taken from the GaBi 5 software database. The steel data set represents steel of the German market under consideration of the main technologies, the specific characteristics and import statistics.

### 3.6 Data quality

The data quality can be described as good. The primary data collection has been done thoroughly, all relevant flows are considered. Technological, geographical and temporal representativeness is given.

### 3.7 Period under review

Period under review is 2011.

### 3.8 Allocation

Estimations regarding recycling are described in chapter 3.2. Specific information on allocation within the background data is given in the GaBi datasets documentation. In most cases the assessed production sites use the same assembly line to produce different product types (not declared in this EPD). The allocation of material and energy to produce the declared product was determined by the participants during the data collection process based on the yearly production amounts in square meter (m<sup>2</sup>).

### 3.9 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.

## 4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules.

### End of life (C1-C4)

Name	Value	Unit
Recycling	90	%
Landfilling	10	%

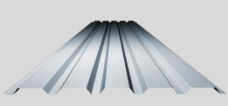
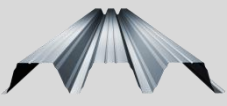

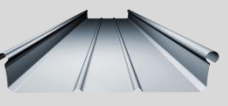


## 5. LCA: Results

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES	
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement <sup>(1)</sup>	Refurbishment <sup>(1)</sup>	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> steel sheet

		 Trapezoidal profile 35/207			 Trapezoidal profile 135/310			 Liner-tray 130/600			 Folded profile 65/400		
Parameter	Unit	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D
GWP	[kg CO <sub>2</sub> -Äq.]	16.50	0.01	-9,62	27.10	0.02	-15,8	27.70	0.02	-16	19.1	0.01	-11,2
ODP	[kg CFC11-Äq.]	3.51E-08	9.35E-12	2,80E-09	5.65E-08	1.55E-11	4,61E-09	5.75E-08	1.57E-11	4,66E-09	4.08E-08	1.06E-11	3,25E-009
AP	[kg SO <sub>2</sub> -Äq.]	0.058	0.000	-0,036	0.095	0.000	-0,0595	0.097	0.000	-0,0602	0.067	0.000	-0,042
EP	[kg PO <sub>4</sub> <sup>3-</sup> -Äq.]	4.92E-03	7.93E-06	-2,91E-03	8.29E-03	1.32E-05	-0,00478	8.40E-03	1.33E-05	-0,00484	5.75E-03	9.00E-06	-0,00338
POCP	[kg Ethen Äq.]	7.58E-03	6.15E-06	-5,49E-03	1.19E-02	1.02E-05	-0,00903	1.22E-02	1.03E-05	-0,00914	8.87E-03	6.99E-06	-0,00637
ADPE	[kg Sb Äq.]	1.33E-03	3.41E-09	-3,49E-07	2.19E-03	5.67E-09	-5,73E-007	2.22E-03	5.71E-09	-5,8E-007	1.54E-03	3.88E-09	-4,05E-007
ADPF	[MJ]	222.00	0.13	-115,00	361.00	0.21	-189	368.00	0.21	-192	260.00	0.14	-134
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												

### RESULTS OF THE LCA - RESOURCE USE: 1 m<sup>2</sup> steel sheet

		Trapezoidal profile 35/207			Trapezoidal profile 135/310			Liner-tray 130/600			Folded profile 65/400		
Parameter	Unit	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D
PERE	[MJ]	9	-	-	14	-	-	17	-	-	13	-	-
PERM	[MJ]	0	-	-	0	-	-	0	-	-	0	-	-
PERT	[MJ]	9	0	1	14	0	1,6	17	0	1,6	13	0	1,14
PENRE	[MJ]	230	-	-	373	-	-	380	-	-	270	-	-
PENRM	[MJ]	0	-	-	0	-	-	0	-	-	0	-	-
PENRT	[MJ]	230	0	-110	373	0	-180	380	0	-182	270	0	-127
SM	[kg]	0	-	-	0	-	-	0	-	-	0	-	-
RSF	[MJ]	-0.2	0	0,1	-0.31	0.0	0,2	-0.314	0.0	0,2	-0.218	0.0	0,14
NRSF	[MJ]	-2	0	1,24	-3.27	0.0	2	-3.31	0.0	2,1	-2.3	0.0	1,4
FW	[kg]	89	-0.4	-14	146	-0.6	-23	149	-0.6	-23	104	-0.4	-16
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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m<sup>2</sup> steel sheet

		Trapezoidal profile 35/207			Trapezoidal profile 135/310			Liner-tray 130/600			Folded profile 65/400		
Parameter	Unit	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D	A1 - A3	C4	D
HWD*	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
NHWD*	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
RWD*	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
CRU	[kg]	-	-	0	-	-	0	-	-	0	-	-	0
MFR**	[kg]	-	-	6,5	-	-	10,6	-	-	10,7	-	-	7,2
MER	[kg]	-	-	0	-	-	0	-	-	0	-	-	0
EEE	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0	0	0	0	0	0	0	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; EEE = Exported thermal energy *not declared. The advisory board of IBU clarified the declaration rules for the waste table in its last meeting of October 04, 2012. The datasets used in the model need to be revised respectively. This environmental product declaration follows the approved interim solution. ** incl. 4% scrap from production waste												

## 6. LCA: Interpretation

Production stage A1-A3 is mainly caused by the production of raw material A1 with 97-99% in all impact categories. A3 representing the cold rolling process of the steel profile product (by the IFBS members) has a small contribution of about 1-3% only. As the main contributor in the production stage is the raw material a linear correlation between weight and environmental impact is given.

The end-of-life credit given to the steel scrap after use stage (with a collection rate of 90%) contributes a

significant credit (negative value) to most of the environmental impact category results. This module representing the benefits beyond the system boundaries have the most influence in GWP (Global warming potential), PENRT (Total use of non-renewable primary energy resources), POCP (Formation potential of tropospheric ozone photochemical oxidants), ADPF (Abiotic depletion potential for fossil resources) and AP (Acidification potential of land and water).

## 7. Requisite evidence

Profiled sheets for the use as load-bearing layer in roof application or for the use as liner-trays in wall application encloses the rooms in direct contact to the interior.

The measurement of VOC emissions is not postulated by laws. Nevertheless, a study on behalf of IFBS

shows that thin walled profiled sheets with zinc and organic coating accomplish AgBB scheme.

VOC emissions are not relevant for external use.

## 8. References

Institut Bauen und Umwelt e.V. (Ed.):

### General principles

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2011-06.

### PCR Part A

Product Category Rules for Construction Products. Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, 2011-07.

### PCR Part B

Product Category Rules for Construction Products Part B: Requirements on the EPD for Thin walled profiles and profiled panels of metal, 2012-07.

[www.bau-umwelt.com](http://www.bau-umwelt.com)

**AVV:** List of Wastes Ordinance of 10 December 2001 (BGBl. I S. 3379), as last amended by Article 5 of the Ordinance of 24 February 2012 (BGBl. I S. 212).

**DIN EN ISO 14025:**2011-10: Environmental labels and declarations – Type III environmental declarations – Principles and procedures

**DIN EN 15804:**2012-04: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

**DIN 18542:**2009-07, Sealing of outside wall joints with impregnated sealing tapes made of cellular plastics - Impregnated sealing tapes - Requirements and testing

**DIN 18807-1 bis 3:**1987-06, Trapezoidal sheeting in building; trapezoidal steel sheeting; structural analysis and design

**DIN 55634:**2010-04, Paints, varnishes and coatings - Corrosion protection of supporting thin-walled building components made of steel

**DIN EN 508-1:**2009-07, Roofing products from metal sheet - Specification for self-supporting products of steel, aluminium or stainless steel sheet - Part 1: Steel

**DIN EN 1090-1&2:**2012-02, Execution of steel structures and aluminium structures

**DIN EN 10169:**2012-06, Continuously organic coated (coil coated) steel flat products - Technical delivery conditions

**DIN EN 10346:**2009-07, Continuously hot-dip coated steel flat products - Technical delivery conditions

**DIN EN 14782:**2006-03, Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements

**DIN EN 14783:**2006-12, Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements

**DIN EN ISO 12944:**1998-07, Paints and varnishes - Corrosion protection of steel structures by protective paint systems

**GaBi 5:** Software and databasis for Life Cycle Engineering. LBP, University of Stuttgart and PE International. 2011.





**GaBi Documentation:** Documentation of the GaBi 5 datasets. LBP, University of Stuttgart and PE International. 2011. <http://documentation.gabi-software.com/>

German **General Technical Approvals** for folded profiles of the respective manufacturers

**IFBS** Technical rules for lightweight metal construction

Following companies are represented with their products in this EPD:



 <p>Institut Bauen und Umwelt e.V.</p>	<p><b>Publisher</b>          Institut Bauen und Umwelt e.V.          Panoramastr. 1          10178 Berlin          Germany</p> <p>Tel +49 30 30 877 48- 0          Fax +49 30 30 877 48-29          Mail info@bau-umwelt.com          Web <a href="http://www.bau-umwelt.com">www.bau-umwelt.com</a></p>
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