

# ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	<b>TAIM e.V. - Verband Industrieller Metalldeckenhersteller (Association of Industrial Metal Ceiling Manufacturers)</b>
Publisher	Institute Construction and Environment e.V. (IBU)
Programme holder	Institute Construction and Environment e.V. (IBU)
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Issue date	11.11.2013
Valid to	11.11.2018

## **Metal ceiling system made of aluminium TAIM e.V. - Verband Industrieller Metalldeckenhersteller (Association of Industrial Metal Ceiling Manufacturers)**

[www.bau-umwelt.com](http://www.bau-umwelt.com) / <https://epd-online.com>



Institut Bauen  
und Umwelt e.V.



## 1. General information

### TAIM e.V. - Verband Industrieller Metalldeckenhersteller (Association of Industrial Metal Ceiling Manufacturers)

#### Programme holder

IBU - Institut Bauen und Umwelt e.V.  
Panoramastr. 1  
10178 Berlin  
Germany

#### Declaration number

EPD-TAI-20130185-ICG2-EN

#### This Declaration is based on the Product Category Rules:

Metal ceilings, 04-2013  
(PCR tested and approved by the independent Expert Committee (SVA))

#### Issue date

11.11.2013

#### Valid to

11.11.2018



Prof. Dr.-Ing. Horst J. Bossenmayer  
(President of Institut Bauen und Umwelt e.V.)



Dr. Burkhard Lehmann  
(Managing Director IBU)

### Metal ceiling system made of aluminium

#### Holder of the Declaration

TAIM e.V.  
Leostrasse 22  
40545 Düsseldorf

#### Declared product/unit

The declared unit is 1 kg aluminium ceiling. The weight per area kg/m<sup>2</sup> is calculated for the specific product.

#### Area of applicability:

This Declaration applies to all production facilities of the TAIM e.V. members indicated on page 1. The data on which the LCA is based was recorded for the period January to December 2011.

Armstrong Metalldecken AG, [www.armstrong.com](http://www.armstrong.com)  
durlum GmbH, [www.durlum.com](http://www.durlum.com)  
Geipel AG, [www.geipel-genex.de](http://www.geipel-genex.de)  
Hunter Douglas Europe BV,  
[www.hunterdouglascontract.com](http://www.hunterdouglascontract.com)  
König GmbH & Co.KG, [www.koenig-produkte.de](http://www.koenig-produkte.de)  
Lindner Group, [www.Lindner-Group.com](http://www.Lindner-Group.com)  
Metalit Metallbauelemente AG, [www.metalit.ch](http://www.metalit.ch)  
N&E GmbH & Co.KG, [www.ne-paneeldecken.de](http://www.ne-paneeldecken.de)

The holder of the Declaration is liable for the information and evidence on which it is based; liability on the part of IBU in relation to manufacturer information, LCA data and evidence is excluded.

#### Verification

The CEN EN 15804 standard serves as the core PCR.  
Verification of the EPD by an independent third party in accordance with ISO 14025

internal  external



Dr.-Ing. Wolfram Trinius,  
Independent auditor appointed by the SVA

## 2. Product

### 2.1 Product description

Aluminium ceiling systems are manufactured from folded or roll-formed aluminium as complete construction kits or as individual components. The construction kit comprises the membrane component, e.g. linear panels or strip panel ceilings, as well as the substructure for suspending the metal ceiling. The substructure is usually made of steel. The substructure made of steel, can have various suspension heights and its design is governed by the form, functional requirements and weight of the membrane components.

### 2.2 Application

The metal ceiling systems made of aluminium outlined here are used in interior design as rectangular panels, strip panel ceiling, square tiles, expanded metal ceilings, ceiling grids or canopy ceilings, all functioning as cladding of the interior ceiling. The product is manufactured in accordance with the respective customer's requirements.

### 2.3 Technical data

The following (construction) technical data in delivery status must be indicated with reference to the respective test standard if of relevance for the product declared.

EN 13964 is the test standard.

Description	Value	Unit
Weight by area (min.)	3	kg/m <sup>2</sup>
Weight by area (max.)	8	kg/m <sup>2</sup>

### 2.4 Placing on the market / Application rules

Regulation (EU) No. 305/2011 applies for placing on the European Union market. The products require a Declaration of Performance taking consideration of the harmonised EN 13964 and CE marking.

Use is governed by national guidelines.

Metal ceilings in accordance with the technical rules published by TAIM e.V. (THM) are connected to the above ceiling using hangers or a substructure or ceiling edge trim profile directly secured to supporting structure with space in between. The Declaration refers to a metal ceiling system (membrane component with substructure). As they are not exposed to any external weathering influences, they are suspended ceilings for interior applications in accordance with EN 13964.

### 2.5 Delivery status

The metal ceiling systems, construction kits and components are produced in individual sizes and can be supplied with or without substructures. Packaging is usually on pallets and/or in cardboard. Area weight (kg/m<sup>2</sup>) depends on the specific product and manufacturer. A conversion table is helpful for converting the declared unit (kg/m<sup>2</sup>) and can be requested from the respective manufacturers. Section 3.1 includes a sample calculation for a possible application. Conversion is possible by means of simple multiplication of the results per kg by the specific basis weight.

### 2.6 Base materials / Auxiliaries

#### Base material / Auxiliary

Description	Value	Unit
Aluminium	90	%
Steel (for substructure)	< 6	%
Powder coating (polyester)	< 3	%
Acoustic tissue (cellulose/glass)	< 1	%

### 2.7 Production

The membranes are manufactured in a continuous manufacturing process. The aluminium comes mainly in coils, perforated (optional) and cut to size. This is followed by punching out and bending of the membrane component. Where the membrane components do not comprise pre-coated material, they are usually powder- or spray-painted after the cleaning process. A layer of acoustic tissue can then be applied to the back using a heating process. Adding heat activates a hot-melt adhesive embedded in the tissue which causes it to adhere to the back of the panel. Punching and perforation waste is gathered, collected by local disposal companies and redirected to the recycling centres. All production steps are carried out in accordance with the requirements and test guidelines outlined in EN 13964 and the technical rules of TAIM e.V. (THM).

### 2.8 Environment and health during manufacturing

Manufacturing conditions do not demand any particular health and safety measures with the exception of those designated by the authorities for special working areas, e.g. high-visibility vests, safety shoes, dust protection masks. The threshold limit values (TLV, e.g. Germany) are not exceeded at any point of the production process. Waste emissions generated during production are cleaned in accordance with statutory requirements. Emissions are below those outlined in the Technical Guidelines governing Air. Water/Ground: No contamination of water or soil occurs. All of the values established inside and outside the production facilities are below the applicable requirements governing noise protection in Germany. Noise-intensive plant components such as perforation lines are isolated accordingly by structural measures. The statutory guidelines governing industrial protection for metal and drywall construction apply as well as the respective provisions of the construction industry. EN ISO 14001 certificates and other manufacturer-specific documents on health, safety and environment protection can be requested from the manufacturer.

### 2.9 Product processing / Installation

The membrane of the metal ceiling system is secured to a substructure. Installation must be carried out by trained personnel, usually from the area of drywall construction.

### 2.10 Packaging

Wooden pallets, cardboard, polystyrene, plastic sheeting, steel and plastic bands are used for packing the metal ceiling systems and components. The packaging material is easily separable and can be reused if necessary. Most of the packaging can be collected, sorted by type and directed to regional recycling services. Residual materials must be disposed of in accordance with the respective national guidelines. Disposal of the product packaging (Module A4) was not taken into consideration.

### 2.11 Condition of use

On account of the many product variants, it is impossible to provide any general cleaning and maintenance recommendations. Long service lives are based on regular maintenance, care and repair of the product. As a general rule, the material composition of the product does not alter during the period of use. Documentation can be requested from the respective metal ceiling system manufacturers.

### 2.12 Environment and health during use

There are no known interactions between the product, the environment and health. Volatile organic compounds are below the valuation limit.

### 2.13 Reference Service Life

The Reference Service Life (RSL) is not taken into consideration in this study as the life cycle as a whole is not declared. For information purposes, they are indicated as an option and correspond to ≥ 50 years in accordance with the Federal Office of Building and Regional Planning (BBSR). This reference service life indicated above serves as an instrument for product selection with regard to the building's anticipated types of use. A prerequisite is the correct application, maintenance and care.



## 2.14 Extraordinary effects

### Fire

This information is provided in accordance with the criteria outlined in EN 13501-1. General details for all manufacturers can not be provided here. The extent to which the respective requirements on fire protection are complied with can be obtained from the respective manufacturer.

### Water

There are no known effects on the environment in the event of unforeseen ingress by water.

### Mechanical destruction

In the case of mechanical destruction, all of the substances remain bound. It can be assumed that in the case of coated ceilings, possible paint splinters arise in such small volumes that no negative effects are incurred by the environment.

## 2.15 Re-use phase

The metal ceiling systems can be removed and re-used without damaging the product. During the re-use phase, any remaining tissue can be easily removed

from the metal ceiling. Metal membrane components and substructure components made of steel or aluminium can be redirected to material recycling. Adhesive residue can be removed by melting. The study considers the scenarios C4 (Disposal stage) and D (Recycling potential).

## 2.16 Disposal

In accordance with the Waste Index Act (AVV) and the European Waste Catalogue (EWC), the waste key for steel as a component of metal ceiling systems made of aluminium is:

17-04-05 – Iron and steel

For aluminium: 17-04-02 – Aluminium

## 2.17 Further information

Armstrong Metalldecken AG, [www.gema.biz](http://www.gema.biz)

durlum GmbH, [www.durlum.de](http://www.durlum.de)

Geipel AG, [www.geipel-genex.de](http://www.geipel-genex.de)

Hunter Douglas Europe BV,  
[www.hunterdouglascontract.com](http://www.hunterdouglascontract.com)

König GmbH & Co.KG, [www.koenig-produkte.de](http://www.koenig-produkte.de)

Lindner Group, [www.lindner-group.com](http://www.lindner-group.com)

Metalit Metallbauelemente AG, [www.metalit.ch](http://www.metalit.ch)

N&E GmbH & Co.KG, [www.ne-paneeldecken.de](http://www.ne-paneeldecken.de)

## 3. LCA: Calculation rules

### 3.1 Declared unit

The declared unit is 1 kg metal ceiling. The area weight (kg/m<sup>2</sup>) is established for specific products by the members of the trade association. The declared unit has been defined in accordance with the PCR, Part B. The construction kit for metal ceilings made of aluminium comprises the membrane component, e.g. plank system or panels, as well as the substructure for securing the metal ceiling. The substructure is made of steel. A sample calculation for a possible application is outlined below. Owing to the varying sheet thicknesses or areas when using several membrane elements, the basis weight can vary between 3 kg/m<sup>2</sup> and 8 kg/m<sup>2</sup>.

#### Sample indication of declared unit

Description	Value	Unit
Thickness of sheet aluminium	1.5	mm
Length of membrane element	1200	mm
Width of membrane element	600	mm
Area of membrane element	0.72	m <sup>2</sup>
Panel weight	3.17	kg/m <sup>2</sup>
Substructure weight	1.98	kg/m <sup>2</sup>
Basis weight	5.15	kg/m <sup>2</sup>

### 3.2 System boundary

Type of EPD: cradle to gate, with options  
A1-A3 Product stage: Provision of raw materials, transport to the manufacturer, production (incl. provision of energy and water, provision of auxiliaries, disposal of waste)  
C4 End-of-life stage: Waste treatment and disposal:  
D Credits: Recycling potential.

### 3.3 Estimates and assumptions

Disposal during the end-of-life stage involves thermal recycling or landfilling of residual materials (Module C4) based on existing technology and current practices. Credits are offset against the equivalent data sets for electricity (DE: Power mix 2011, PE) and thermal energy from natural gas (DE: thermal energy from natural gas 2011, PE). Credits are also awarded for steel in the form of "Value of scrap". For aluminium,

it is assumed that they are directed to recycling with the result that credits are allocated to the sum of the expenses associated with primary material.

### 3.4 Cut-off criteria

All of the data from the operating data surveys, thermal energy used, power and diesel consumption were taken into consideration in the analysis. Transport (300 km) was assumed for all inputs and outputs considered or the actual transport expenses applied.

All flows accounting for more than 1% of the total mass, energy used or environmental impacts by the system were taken into consideration in the study. Processes to be ignored account for less than 5% of the impact categories of relevance.

Manufacturing of the machinery, plants and other infrastructure required for production of the items in question were not taken into consideration in the LCA.

### 3.5 Background data

The consistent data records (GaBi) included in the GaBi Data base were used for modelling the background data, preliminary products and auxiliaries for manufacturing the declared product.

### 3.6 Data quality

In order to guarantee comparability of the results, exclusively the consistent background data from the GaBi data base was used in the LCA (e.g. data sets on energy, transport, auxiliaries and consumables). The data used was last revised max. 8 years ago. The corresponding data sets were available in the GaBi data base for the respective preliminary products and auxiliaries used. The production data represents primary data from 2011.

### 3.7 Period under review

The Life Cycle Assessment was drawn up for aluminium ceiling systems based on average production data from 2011, whereby the data was analysed for various plants owned by the manufacturers referred to above. The Life Cycle

Assessment is therefore representative for the average metal ceiling systems produced.

### 3.8 Allocation

No co-product allocations were applied. Commercial waste incurred is incinerated. The energy generated in waste incineration plants is calculated taking consideration of the elementary composition and calorific value. The requisite volume of secondary materials included in production waste and end-of-life waste incurred by the system is initially returned to production or upstream chains ("closed loop"). The net volume of scrap comprises the volume of scrap

collected during the end-of-life stage plus the scrap output from production and/or the upstream chains as more scrap is generated during production than required in the upstream chains. A credit is allocated for the net volume of scrap in Module D (substitution of primary materials).

### 3.9 Comparability

As a general rule, a comparison or evaluation of EPD data is only possible when all of the data to be compared has been drawn up in accordance with EN 15804 and the building context or product-specific characteristics are taken into consideration.

## 4. LCA: Scenarios and other technical information

### End of Life (C4)

Description	Value	Unit
For re-use	0	kg
For recycling	0.77	kg
For energy recovery	0.03	kg
Collection rate	80	%

## 5. LCA: Results

The values depicted in the tables of results were calculated for 1 kg average product. For specific applications, basis weights must be calculated on the basis of information supplied by the manufacturer. Conversion is then possible by means of simple multiplication of the results per kg by the specific basis weight.

### SYSTEM BOUNDARIES (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	Production	Transport from the manufacturer to the location of application	Assembly	Use / Application	Maintenance	Repairs	Replacement	Renewal	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Landfilling	Re-use, recovery or 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

### LCA RESULTS - ENVIRONMENTAL IMPACT: 1 kg

Parameter	Unit	A1 - A3	C4	D
Global Warming Potential	[kg CO <sub>2</sub> equiv.]	1.1E+1	2.8E-3	-6.9E+0
Ozone Depletion Potential	[kg CFC11 equiv.]	1.0E-6	3.6E-14	-7.4E-7
Acidification Potential of soil and water	[kg SO <sub>2</sub> equiv.]	5.4E-2	1.6E-6	-3.4E-2
Eutrophication Potential	[kg (PO <sub>4</sub> ) <sup>3</sup> equiv.]	2.4E-3	3.7E-7	-1.4E-3
Photochemical Ozone Creation Potential	[kg ethene equiv.]	3.3E-3	1.0E-7	-1.9E-3
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	9.9E-6	5.7E-11	-3.6E-6
Abiotic Depletion Potential Fossil Fuels	[MJ]	1.1E+2	1.0E-3	-6.3E+1

### LCA RESULTS - USE OF RESOURCES: 1 kg

Parameter	Unit	A1 - A3	C4	D
Renewable primary energy as energy carrier	[MJ]	4.5E+1	7.0E-5	-3.1E+1
Renewable primary energy as material utilisation	[MJ]	4.6E-2	0.0E+0	0.0E+0
Total use of renewable primary energy sources	[MJ]	4.5E+1	7.0E-5	-3.1E+1
Non-renewable primary energy as energy carrier	[MJ]	1.6E+2	1.1E-3	-9.0E+1
Non-renewable primary energy as material utilisation	[MJ]	0.0E+0	0.0E+0	0.0E+0
Total use of non-renewable primary energy sources	[MJ]	1.6E+2	1.1E-3	-9.0E+1
Use of secondary materials	[kg]	0.0E+0	-	-
Renewable secondary fuels	[MJ]	2.0E-4	1.5E-8	-3.1E-7
Non-renewable secondary fuels	[MJ]	2.1E-3	1.5E-7	-3.3E-6
Net use of fresh water	[m <sup>3</sup> ]	-	-	-

### LCA RESULTS - OUTPUT FLOWS AND WASTE CATEGORIES:

1 kg

Parameter	Unit	A1 - A3	C4	D
Hazardous waste for disposal	[kg]	-	-	-
Disposed of, non-hazardous waste	[kg]	-	-	-
Disposed of, radioactive waste	[kg]	1.5E-2	4.3E-8	-9.1E-3
Components for re-use	[kg]	-	-	0.0E+0
Materials for recycling	[kg]	-	-	8.4E-1
Materials for energy recovery	[kg]	-	-	1.6E-3
Exported electrical energy	[MJ]	-	-	4.3E-3
Exported thermal energy	[MJ]	-	-	1.0E-2

\* Some of the data inventories used do not support the methodical approach for declaring water and waste indicators. The indicators can not therefore be accounted for (decision by the Expert Committee (SVA) on 07.01.2013).

\*\* Although sheet steel and sheet aluminium are manufactured to a certain extent from secondary materials, no secondary materials are used in the primary system (ceiling system manufacture) which is why this value is 0.

## 6. LCA: Interpretation

Almost the entire **Global Warming Potential (GWP, 100 years)** is caused by the provision of raw materials (approx. 96%). The provision of raw materials includes both iron ore or bauxite mining as well as manufacturing of the semi-finished products used (steel and aluminium coils). The remaining approx. 4% is accounted for by actual production of the metal ceiling system. In terms of the raw materials used, particularly aluminium and steel are of relevance, i.e.

emissions as a result of using thermal and electrical energy in the upstream chains. Transporting preliminary products and auxiliaries accounts for approx. 0.1% of emissions. A total of 61% of all GWP emissions are credited by recycling aluminium and steel at the end-of-life stage.

Practically 100% of the **Ozone Depletion Potential (ODP)** is attributable to the manufacture of raw

materials (primarily sheet aluminium and sheet steel). Credits account for 71%.

Almost 100% of the **Acidification Potential (AP)** during the production stage is triggered by the provision of raw materials (mainly sheet aluminium and sheet steel). 2% of the entire AP is caused by production of the actual metal ceiling system. Credits accounting for approx. 63% of all AP emissions are primarily offset by recycling aluminium and steel.

Around 94% of the entire **Eutrophication Potential (EP)** is attributable to the provision of raw materials which is primarily necessitated by the high energy requirements in the form of natural gas and electricity. Approx. 57% of all emissions are credited by recycling aluminium and steel.

96% of the **Photochemical Ozone Creation Potential (POCP)** is triggered during the production stage by the provision of raw materials in the form of sheet aluminium and sheet steel. Credits account for approx. 58%.

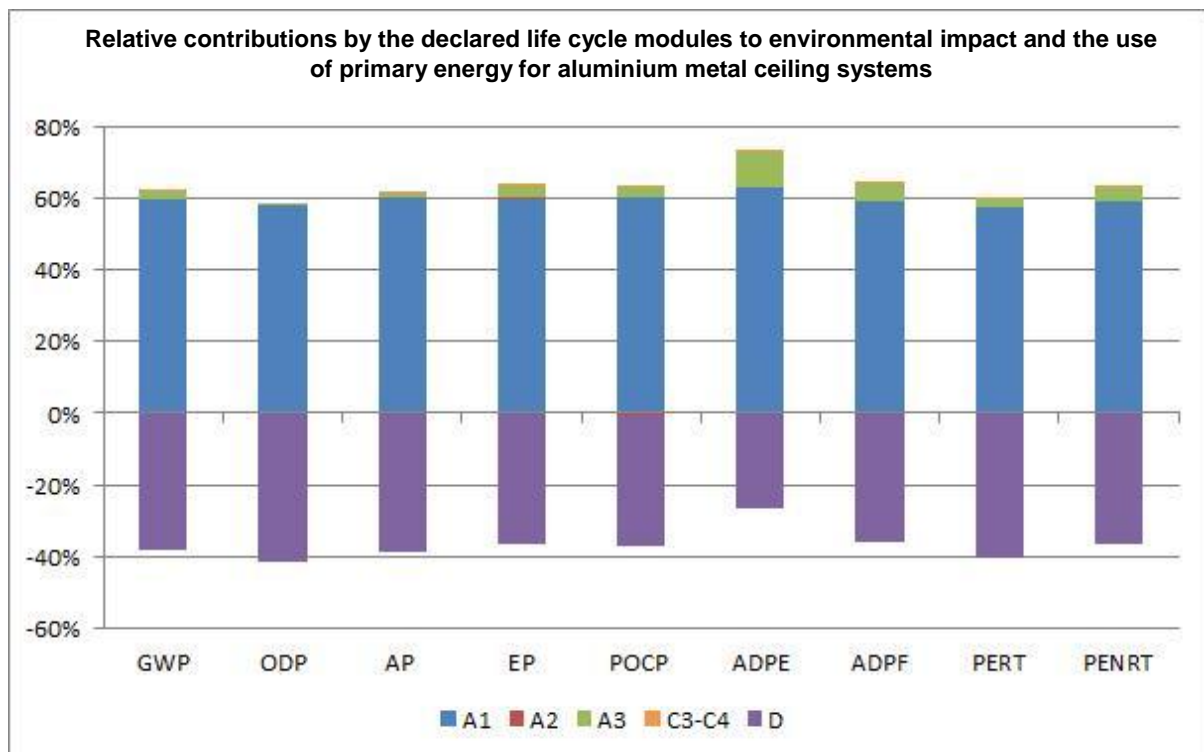
The **Abiotic Depletion Potential of non-fossil resources (ADPE)** is largely caused by the production stage in Module A1 where the upstream chain for sheet steel and sheet aluminium at 86% is the main contributor to overall ADP. Another 14% is incurred by the manufacture of metal ceilings and the auxiliaries used during this process. Credits account for 37%.

The **Abiotic Depletion Potential of Fossil Fuels (ADPF)** is primarily the result of the upstream chains in Module A1 (approx. 92%). Approx. 8% is attributable to production of the metal ceiling system. Credits of approx. 56% are largely generated for recycling steel and aluminium.

The **Total primary energy requirements** are divided among non-renewable (approx. 82%) and renewable energy (approx. 18%).

The **Total use of renewable primary energy sources (PERT)** is largely the result of the upstream chains associated with manufacturing preliminary products (Module A1) – approx. 97%. Credits (Module D) account for approx. 68% attributable to aluminium and steel recycling.

When considering the **Total use of non-renewable primary energy sources (PENRT)**, the upstream chains associated with manufacturing preliminary products account for the greatest percentage (approx. 93%). Production of the metal ceiling system accounts for approx. 7% of non-renewable primary energy sources. Total credits of approx. 58% are allocated which are incurred by recycling the metallic preliminary products.



## 7. Requisite evidence

Not of relevance; as an average EPD is involved, no details can be provided.

## 8. References

**Institut Bauen und Umwelt e.V.**, Berlin (pub.):

**General principles** for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04

**Product Category Rules for Building Products, Part A:** Calculation rules for the Life Cycle Assessment and requirements on the background report, 2013-04

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

**EN 15804:**2012-04, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products

**GaBi 6:2013:** Software system and data base for comprehensive analysis Copyright, TM Stuttgart, Echterdingen, 1992-2013

**GaBi 6:2013D:** Documentation of the GaBi 6: data sets from the data base for comprehensive analysis Copyright, TM Stuttgart, Echterdingen, 1992-2013. <http://documentation.gabi-software.com/>

**IBU PCR, Part B:** PCR – Part B: Metal ceilings, Institut Bauen und Umwelt e.V., [www.bauumwelt.com](http://www.bauumwelt.com), 2012

**EN 13964:**2007-02: Suspended ceilings – Requirements and test methods

**EN ISO 14001:**2009-11: Environmental management systems – Requirements with guidance for use; German version DIN EN ISO 14001:2009-11

**BBSR:**2006-12: Federal Office of Building and Regional Planning, Info sheet no. 4.2 - Life cycle of components and component layers, 2006-12

**EN 13501-1:**2010-01: Part 1: Classification with the results of tests on fire performance by building products; German version DIN EN 13501-1:2007

**European Waste Catalogue (EWC):** in accordance with AVV 2012-02

**THM:** 2003-11: TAIM e.V., Technisches Handbuch Metalldecken (THM) (Technical Manual for Metal Ceilings), <http://www.taim.info/de/downloads-und-merkblaetter.php#.Ukp7u5yK4ct>, German version 2003-11





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