

# ENVIRONMENTAL PRODUCT DECLARATION

nach ISO 14025

Declaration Holder	<b>Kalzip® - Aluminium standing seam roof system</b>
Issuer	Environmental Construction Products Organisation (ECO)
Programme Operator	Institut Bauen und Umwelt e.V.
Declaration Number	ECO-KAL-00010101-1107
Date of issue	01.07.2011
Validity Date	30.06.2016

## Roofing System

**Kalzip® - Aluminium standing seam roof system**

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## 01 Summary

### Kalzip® – Aluminium standing seam roof system

**Program holder**

IBU - Institut Bauen und Umwelt e.V.  
Rheinufer108  
D-53639 Königswinter  
Germany

**Declaration number**

ECO-KAL-00010101-1107

**LCA Practitioner**

PE INTERNATIONAL AG

**This declaration is based on the PCR document:**

PCR Aluminium Roofing and Cladding Systems, 2010-12

**Date of issue**

01.07.2011

**Validity date**

30.06.2016

**Declaration holder**

Kalzip GmbH  
August-Horch-Str. 20-22  
56070 Koblenz  
Germany

**Declared product/Declared unit**

Aluminium standing seam roof system Product Description. The EPD applies to 1 m<sup>2</sup> roofing System, consisting of a 1 mm aluminium standing seam sheet, 200 mm thick glass wool insulation, 1.75 E-180 plastic-coated steel clips, a bitumen SK vapour barrier, and 3.5 stainless steel fasteners.

**Verification**

Product Category Rules 'Aluminium Roofing and Cladding Systems', 2010-12, serves as guidance

Third party independent verification of the declaration, according to ISO 14025

internal

external



Hans Peters, CEO of IBU



Dr. Eva Schmincke, third party verifier

## LCA overview

### 1 m<sup>2</sup> of aluminium standing seam roof system

Environmental Parameters	Unit per m <sup>2</sup>	Product stage	Construction process stage	Use stage	End-of-Life	Next product system
Primary Energy, non renewable (excluding feedstock)	[MJ]	651.9	0.922	0	2.429	-315.6
Primary Energy, renewable (excluding feedstock)	[MJ]	129.1	0.00123	0	0.05869	-102.6
Abiotic resource depletion (ADP elements)	[kg Sb eqv.]	0.0005157	1.397E-9	0	1.391E-007	-1.159E-5
Global Warming Potential (GWP100 years)	[kg CO <sub>2</sub> -eqv.]	41.41	0.06525	0	2.376	-24.01
Ozone Depletion Potential (ODP)	[kg R11-eqv.]	4.362E-6	1.323E-10	0	3.946E-009	-2.494E-6
Acidification Potential (AP)	[kg SO <sub>2</sub> -eqv.]	0.2017	0.0002901	0	0.002291	-0.1149
Eutrophication Potential (EP)	[kg (PO <sub>4</sub> ) <sup>3-</sup> -eqv.]	0.01188	6.584E-5	0	0.000565	-0.004811
Photochemical Ozone Creation Potential (POCP)	[kg C <sub>2</sub> H <sub>2</sub> -eqv.]	0.01458	2.932E-5	0	0.0002785	-0.006512

\* The data reference consisted of specific data provided by Kalzip® and of data from the GaBi4 Database

## 02 Product

### Product description

The aluminium standing seam system is a roof system manufactured from thin gauge sheeting, either by roll-forming in the factory or by mobile roll-formers on the construction site. A range of profile cover widths and standing seam heights are available to satisfy the necessary load-span requirements. In addition a variety of outer sheets materials and finishes are available to choose from. The profiled sheets can be rollformed straight, in convex and concave curves, tapered and freeform geometry.

### Product application

The aluminium roofing and cladding sheets are profiled sheets that are joined together by mechanical zipping of the raised seams and are used as the outer skin for roofing and cladding. The sheets are suitable for ventilated and non-ventilated roof designs and all shapes of roof from 1.5 pitch. They are also suitable for all substructures and supporting structures and can be used in both new build and refurbishment projects. The structural design is tailored to suit the specific application and by choosing the appropriate thickness of insulating material can be adapted to suit the required U-value and acoustic values of the building.

Cold rolled products are used in a wide range of applications in building and construction. Typical applications are building envelopes and interior cladding.

### Delivery conditions

The standing sheet is delivered as long sheets with a thickness of 1 mm

### Technical Properties

Used alloys: EN AW 3004, 3005 and 6025

Weight: 4.0 kg/m<sup>2</sup> (65/400/t=1.0)

Minimum pitch: 1.5°

Maximum Load span: According to project based structural calculations.

Insulation and Thermal Bridging: Ranges from 0,19 W/m<sup>2</sup>K for 200 mm thick insulation (compressed to 180mm).

Fire classification: according to EN 13501-1 = A1

Fire resistance from outside: B<sub>roof</sub> (t1); B<sub>roof</sub> (t2) B<sub>roof</sub> (t3), B<sub>roof</sub> (t4).

Sun radiation: depends on the surface or color coating (dark or lighter colors).

Lightning protection:

Kalzip Aluminium profiled sheets can be regarded as natural components of a lightning conducting system as per DIN EN 62305-3, as the crimped seams of the sheets give a permanent electric connection. An essential prerequisite is, of course, that the profiled sheets are conductively connected to earth. If the complete building envelope consists of Aluminium, i.e. Kalzip® systems used for both the roof and wall cladding, the envelope will halt and collect the electrical energy from lightning and safely conduct it to earth thereby preventing dangerous voltages from affecting the power supplies.

Water vapour diffusion: sd 1500

Material properties Aluminium sheet:

R<sub>p</sub>0,2 [N/mm<sup>2</sup>] 185  
R<sub>m</sub> [N/mm<sup>2</sup>] 220  
Thickness t 1.0 mm A50mm [%] 4.0

### Sound insulation

53 dB, depends on the type and thickness of the insulation and the roof design

### Declaration of Basic Materials

The roofing system consists of:

1 mm Aluminium standing seam sheet  
200 mm thick wool insulation  
1.75 E-180 steel clips  
1 bitumen SK vapour barrier  
3.5 steel fasteners.

### Product standards

Factory and site produced standing seam sheets and factory produced facade panels are standardised according to:

Deutsches Institut für Bautechnik - Approval No. Z-14.1-181 \_ Kalzip Standing Seam Roof

The CE mark and European Technical Approval

EN 14782 'Self-supporting metal sheet for roofing, external cladding and internal lining – Product specification and requirements.'

EN 14783 'Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements'

British Board of Agrément Certificate No. 98/3481 - Kalzip Secret Fix Roof Systems

## 03 LCA scenarios

### Manufacturing Process

The profiling of the aluminium sheet occurs in-house at the German production site (electricity driven process). Profiling requires 0.121 MJ electricity per sqm. 0.015 kg of lubricant are also required in profiling per sqm. The standing sheet is stucco embossed. Insulation materials are purchased externally.

### Packaging

The packaging required to transport the finished aluminium sheet to the building site is included in the analysis, and includes polyethylene film, and steel bands. Timber is also used in packaging, however the production of timber used in packaging is excluded from the analysis as the timber is reused, and therefore the contribution of timber manufacture to a single aluminium sheet component is expected to be small. However, the weight of the timber is included in the transport of the component to the building site.

### Environment, Health and Safety in Production Stage

The company is certified according to DIN ISO 9001:2008, DIN ISO 14001:2004 and adheres to the Tata Steel Health & Safety Management System (THSMS).

### Installation

The installation of the standing seam sheets is carried out by a trained network of installers to procedures contained with the Fixing Manual. The standing seam sheets are zipped together using a zipping machine.

### Delivery

The finished product is delivered via truck and average distance of 450 km.

### Use Stage

Service life in use-stage

The roofing system has an assumed service life of 50 years.

### Maintenance in Use-Stage

As the service life of the roofing system is the equivalent to that of a standard house, no replacement of parts is necessary during the use phase of the building. Only minimal maintenance is assumed necessary (i.e. light cleaning) therefore maintenance has a negligible impact on the life cycle.

### Extraordinary impacts

The Kalzip aluminium standing seam roofing system is non flammable. It poses little risk in an earthquake due to its light weight design. In addition, the system is fully tested and calculated for projects in hurricane regions.

### End of life

Deconstruction is excluded from this study.

### Re-use

Re-use is not assumed to occur for any components.

### Disposal

The insulation material is assumed to be landfilled.

### Recycling and recovery

All steel and Aluminium components are assumed to be recycled at End of Life. The aluminium clip is easily separated into its component materials during demolition. A "near 100%" recycling rate is assumed for steel and aluminium components. The vapour barrier and the polyamide components of the clips are assumed to be incinerated to produce steam and power. A credit is given for recycled metals and for the steam and power produced from incineration.

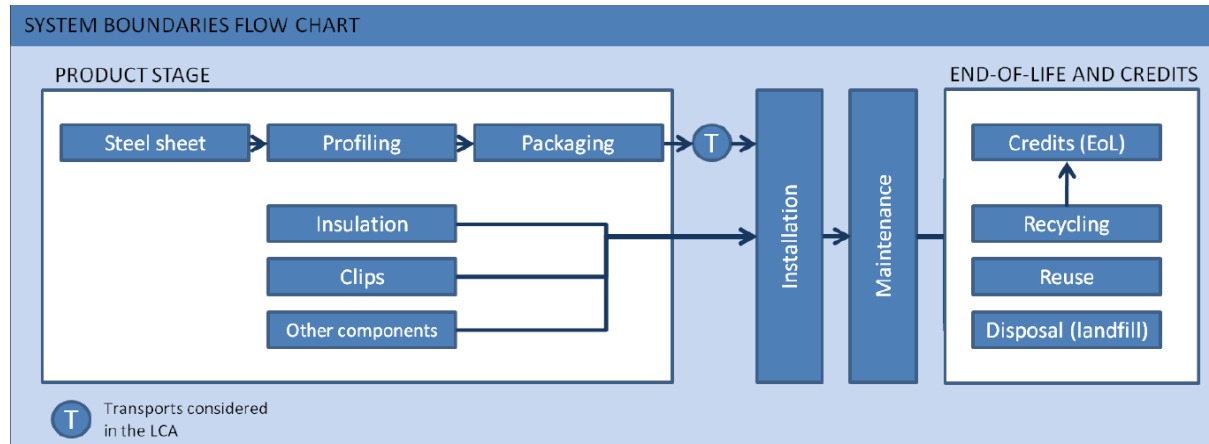
## 04 LCA calculation rules

### Declared Unit

This EPD applies to 1 m<sup>2</sup> of aluminium standing seam roof system.

### System boundaries

The system boundary is displayed below.



SYSTEM BOUNDARIES CHECK BOX (X = INCLUDED IN LCA)

Product Stage			Construction Process Stage		Use Stage					End-of-Life Stage				Benefits and loads beyond the system boundary		
Raw material supply	Transport	Manufacturing	Transport to building site	Installation on building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X		X	X	X		X								X	X	X

### Assumptions and estimates

All metal components are assumed to be recycled at end of life. The vapour barrier and polyamide components are assumed to be incinerated to produce energy. Insulation materials are landfilled.

### Cut-off criteria

All flows contributing to more than 1% of the total mass, energy or environmental impact of the system have been included in the study. The total sum of neglected processes per module A, B, C and D (for the sub-modules covered) does not exceed 5% of the impact categories.

### Data quality

Data is measured factory data for all products produced by Kalzip. Average country specific data is used for other components i.e. insulation. The data were collected under consistent methodological and boundary conditions.

### Description of data and period under consideration

Data is representative of 2009 and 2010 production processes. Primary data is provided by Kalzip, background data from the PE INTERNATIONAL Gabi Database (GaBi 2010).

### Allocation

Allocation is made at end of life, where in the next product system a credit is given for the production of heat and power from incinerated materials.

## 05 LCA results

### LCA RESULTS RESOURCE INPUT: 1 m<sup>2</sup> aluminium standing seam roof system

		Product Stage	Construction Process Stage		Use Stage	End-of-Life				Next Product System
+	Unit	Raw material supply, Manufacturing	Transport to building site	Installation on building	Use total	Deconstruction/ demolition	Transport to EoL	Waste processing	Disposal	Reuse, recovery or recycling potential
Primary energy non-renewable resources	[MJ]	651.9	0.922	0	0				2.429	-315.6
Primary energy renewable resources	[MJ]	129.1	0.00123	0	0				0.05869	-102.6
Feedstock energy non-renewable	[MJ]									
Feedstock energy renewable	[MJ]	0								
Water utilisation	[m <sup>3</sup> ]	276	0.006803	0	0				3.19	-143.4
Secondary fuels	[MJ]	0	0	0	0				0	0
Secondary Material	[kg]	0.5829	0	0	0				0	0

### LCA RESULTS OUTPUT FLOWS AND WASTE CATEGORIES: 1 m<sup>2</sup> aluminium standing seam roof system

		Product Stage	Construction Process Stage		Use Stage	End-of-Life				Next Product System
Output flow/ Waste category	Unit	Raw material supply, manufacturing	Transport to building site	Installation on building	Use total	Deconstruction/ molition	Transport to EoL	Waste processing	Disposal	Reuse, recovery or recycling potential
Components for re-use	[kg]									0
Materials for recycling	[kg]									3.175
Materials for energy recovery	[kg.]									5.148
Exported energy	[MJ.]									9.528
Hazardous waste	[kg]	3.872	0	0	0				0.07521	-3.308
Non hazardous waste	[kg]	0.1694	0	0	0				5.13E-7	0.3852
Radioactive waste	[kg]	0.05453	1.652E-6	0	0				3.915E-5	-0.03126

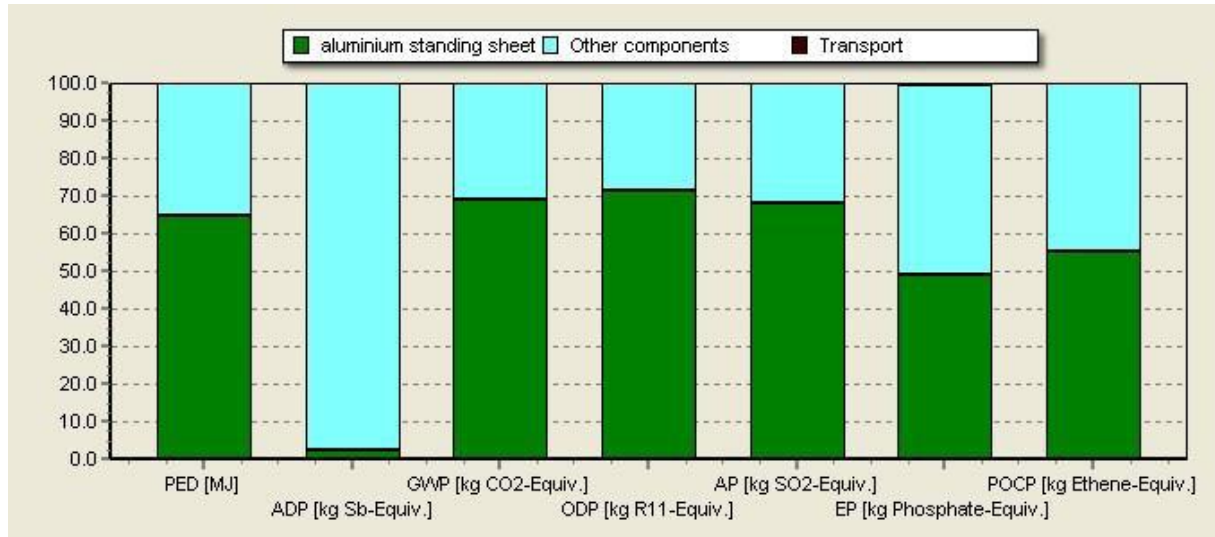
### LCA RESULTS ENVIRONMENTAL IMPACTS: 1 m<sup>2</sup> aluminium standing seam roof system

		Product Stage	Construction Process Stage		Use Stage	End-of-Life				Next Product System
	Unit	Raw material supply, Manufacturing	Transport to building site	Installation on building	Use total	Deconstruction/ demolition	Transport to EoL	Waste processing	Disposal	Reuse, recovery or recycling potential
Global Warming Potential (GWP 100 years)	[kg CO <sub>2</sub> -eqv.]	41.41	0.06525	0	0				2.376	-24.01
Ozone Depletion Potential (ODP)	[kg R11-eqv.]	4.362E-6	1.323E-10	0	0				3.946E-9	-2.494E-6
Acidification Potential (AP)	[kg SO <sub>2</sub> -eqv.]	0.2017	0.0002901	0	0				0.002291	-0.1149
Eutrophication Potential (EP)	[kg PO <sub>4</sub> <sup>5-</sup> -eqv.]	0.01188	6.584E-5	0	0				0.000565	-0.004811
Photochemical Ozone Creation Potential (POCP)	[kg C <sub>2</sub> H <sub>2</sub> -eqv.]	0.01458	2.932E-5	0	0				0.0002785	-0.006512
Abiotic resource depletion potential (ADP elements)	[kg Sb eq.]	0.0005157	1.397E-9	0	0				1.391E-7	-1.159E-5
Abiotic resource depletion potential (ADP fossil)	[MJ]	495.8	0.9173	0	0				2.286	-227.4



## LCA results interpretation

### Cradle-to-Customer LCIA Results



The above graph shows the cradle to customer results for the roofing system. These results are dominated by the aluminium sheet. Correspondingly, at the end of life, the main credit received arises from aluminium recycling (not shown).

## 06 References

<b>/PCR Aluminium Roofing and Cladding Systems/</b>	Institut Bauen und Umwelt e.V., Königswinter (Ed.): Rules for Environmental Product Declarations, Aluminium Roofing and Cladding Systems, Dec. 2010
<b>/GaBi 4/</b>	GaBi 4: Software and Database for Life Cycle Engineering, IKP [Institute for Polymer Testing and Polymer Science] University of Stuttgart and PE Europe GmbH, Leinfelden-Echterdingen, 1992 – 2010.
<b>/EN 14782/</b>	DIN EN 14782:2006-03: Self-supporting metal sheet for roofing, external cladding and internal lining – Product specification and requirements
<b>/EN 14783/</b>	DIN EN 14783:2006-12: Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements
<b>/ISO 14001/</b>	ISO 14001:2009-11: Environmental management systems – Requirements with guidance for use
<b>/ISO 14025/</b>	DIN EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures
<b>/ISO 14040/</b>	DIN EN ISO 14040:2009-11: Environmental management - Life cycle assessment - Principles and framework
<b>/ISO 14044/</b>	DIN EN ISO 14044:2006-10: Environmental management - Life cycle assessment - Requirements and guidelines

**Issuer**

ECO – Environmental  
Construction Products Organisation  
Postfach 18 02 20  
53032 Bonn  
Germany

phone +49 (0)7000 86 93 58-0  
fax +49 (0)7000 86 93 58-1  
mail [info@eco-europe.org](mailto:info@eco-europe.org)  
web [www.eco-europe.org](http://www.eco-europe.org)

**Program Operator**

Institut Bauen und Umwelt e.V.  
Rheinufer 108  
53639 Königswinter  
Germany

phone +49 (0)2223 29 66 79- 0  
fax +49 (0)2223 29 66 79- 0  
mail [info@bau-umwelt.com](mailto:info@bau-umwelt.com)  
web [www.bau-umwelt.com](http://www.bau-umwelt.com)

**Declaration Holder**

Kalzip GmbH  
August-Horch-Str. 20-22  
D-56070 Koblenz  
Germany

phone +49 (0)261 98 34 0  
fax: +49 (0)261 98 34 100  
mail: [germany@kalzip.com](mailto:germany@kalzip.com)  
web [www.kalzip.com](http://www.kalzip.com)

**LCA Practitioner**

PE INTERNATIONAL AG  
Hauptstraße 111-113  
70771 Leinfelden-Echterdingen  
Germany

phone +49 (0)711 34 18 17- 0  
fax +49 (0)711 34 18 17- 25  
mail [info@pe-international.com](mailto:info@pe-international.com)  
web [www.pe-international.com](http://www.pe-international.com)