

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025

Owner of the Declaration	Akkon Steel Structure System Co
Programme holder	Institut Bauen und Umwelt (IBU)
Publisher	Institut Bauen und Umwelt (IBU)
Declaration number	EPD-AKK-2012111-E
Issue date	18.04.2012
Valid to	17.04.2017

## Light Gauge Steel Profiles Akkon Steel Structure Systems Co

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



Institut Bauen  
und Umwelt e.V.



## General information

### Akkon Steel Structure System Co

#### Programme holder

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#### Declaration number

EPD-AKK-2012111-E

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

PCR for Structural Steel, 06-2011  
(PCR tested and approved by the independent expert committee, SVA))

#### Issue date

18.04.2012

#### Valid to

17.04.2017



Prof. Dr.-Ing. Horst J. Bossenmayer  
(President of the Institute Construction and Environment)



Prof. Dr.-Ing. Hans-Wolf Reinhardt  
(Chairman of the SVA)

### Light Gauge Steel Profiles

#### Owner of the Declaration

Akkon Steel Structure System Co  
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#### Declared product / Declared unit

Per Tonne of Light Gauge Steel profiles manufactured using cold forming process from galvanized steel

#### Scope:

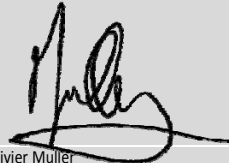
This declaration and its LCA study are relevant to Light Gauge Steel Profiles manufactured from cold-formed galvanized steel sheets in thickness from 0.6mm to 3.0mm at a single site by Akkon Steel Structure System Co. in Turkey. Profiles vary in thickness depending on the project requirements so averaged profile thickness of 1.5mm is used based on the production figures.

#### Verification

The CEN standard EN 15804 serves as the core PCR.

Verification of the EPD by an independent third party as per ISO 14025

internally  externally



Dr. Olivier Muller  
(Independent verifier appointed by SVA)

## Product

### Product description

Light Gauge Steel profiles are cold-formed profiles that are used to construct the bearing walls, flooring and roof panels of a building. Declaration is based on averaged thickness of cold-formed steel profiles prepared according to a design specification of a building.

### Application

Light Gauge Steel profiles from hot-dip galvanized steel are used in construction industry as well as many other applications: roofing (roofing sheets, roof tiles), cladding (Trapezoidal sheets, sandwich panels, wall cassettes), interior trim (trapezoidal sheets, sandwich panels, wall cassettes), flat sheets (covers, structural panels, wall connections, facing roof), roof drainage systems (gutters, downspouts, soffit boards and accessories), Automotive (vehicles, trailers, refrigeration units), white and brown goods.

Typical applications of steel profiles are:

- Detached houses,
- Villas, vineyard huts,
- School and dormitory buildings,
- Commercial buildings,
- Factory buildings,

- Additional floors for the existing buildings,
- Site buildings and annexes

Steel profiles provide short turn around for any buildings and resist better to earthquakes. Well-known advantages of steel constructions are:

- High quality, aesthetic and provides better usable space
- Lower maintenance costs
- Non combustible to fire
- Steel is environmentally friendly
- Steel construction promotes good design and safety
- Steel frame construction is rigid in structure and dimensionally stable

### Technical Data

Akkon Steel has quality management systems according to ISO 9001, Environmental management system in accordance with ISO 14001 and Occupational health and safety management in accordance with OHSAS 18001.

Light Gauge Steel profiles are manufactured from DX51 Z low carbon cold rolled galvanized steel defined by the DIN EN 10346:



- Density: 7850 kg/m<sup>3</sup>
- Elasticity module: 32 GPa
- Sliding module: not measured
- Longitudinal elongation coefficient: not measured
- Thermal conductivity at 20 °C: 59,5 W/m.K

Delivery to the following technical specification according to DIN EN 10346:2009 and DIN EN 10204:

- Minimum yield strength : 240 N/mm<sup>2</sup>
- Minimum tensile strength: 330 N/mm<sup>2</sup>
- Minimum elongation: (21%)
- Zn coating weight 100, 180 and 275 gr/m<sup>2</sup>

## LCA: Calculation rules

### Declared unit

The declared unit is 1 tonne of cold formed steel profiles manufactured from galvanized steel sheets.

Profiles are manufactured to 0.6, 0.9, 1.2, 1.5, 2.0, 3.0mm in thickness depending on the required specification of a building. Average thickness profile of 1.5mm is taken as representative based on the 2011 production figures.

### System boundary

This is a cradle to gate EPD, which covers a system boundary including raw materials, transport and manufacturing.

Raw materials include production of steel sheet from primary resources, cold rolling and hot dip galvanizing for corrosion resistance; Transport stage includes all internal and to factory gate transport; and manufacturing includes cold forming and packaging.

Primary production of steel requires raw materials such as iron ore, lime, silica, metallurgical coke etc. These raw materials are melted into liquid iron of which is reduced with carbon to form steel. The steel melt then is cast continuously to form slabs. Slabs then hot and cold rolled to required thickness to form coils to be used for various applications.

These coils or strips are then cold rolled for further thickness reduction and galvanized to form a passivation layer on the surface to prevent steel from corrosion.

## LCA: Scenarios and additional technical information

### Reuse-, Recovery- and Recycling potential (D)

Steel is 100% recyclable to produce new steel without losing any quality. It can be used to produce low carbon steel, alloyed steel or other ferrous products. However, the key element in recycling is the recycling rate. Recycled steel is converted back into the steel using Electric Arc furnaces. As such, upstream emissions of primary steel production from iron ores are avoided hence potential benefit. Primary steel production also uses various amount of steel scrap mainly to control the bath temperature in the steel converter. The profiles that are manufactured in this study are sourced from primary production.

Turkey has a very active scrap market and produced nearly 90% of the steel from recycled steel in 2008. Steel products exported to the EU as well as used in

### Base materials / Ancillary materials

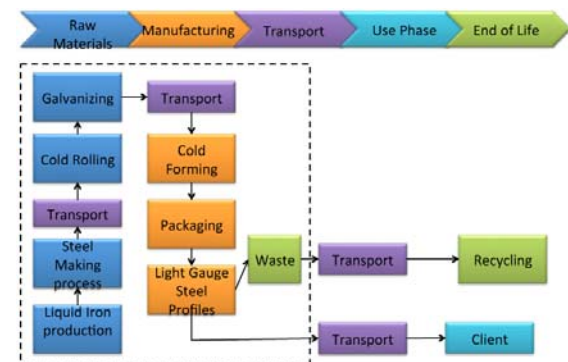
Low carbon steel produced from iron ore, coke, lime and silica as raw materials. It also contains to some degree of ferrous scrap. Iron content is more than 97% and the rest is minor impurity elements and carbon. Zinc passivation layer on the surface for corrosion prevention is also applied.

None of the contents of the end product is included in the "Candidate List of Substances of Very High Concern for Authorisation".

### Reference service life

Reference service life is not relevant due to cradle to gate boundary conditions.

The flow of the process is depicted in the figure below.



### 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.

This EPD is relevant to manufacturing of low carbon hot dip galvanised steel profiles via cold forming process to be used in steel constructions according to PCR Construction Steel and EN 15804. The relevant standard for the profiles is DIN EN 10346.

the local market. Therefore, European recycling rate of 70% for steel is used in modelling end of life.

Based on the 70% recycling rate, 700kg steel is available for recycling. 18% of this amount contributes to closed loop recycling by the primary producer (180kg). Therefore, the difference between 700kg and 180kg is the amount taken as recycling benefit (520kg). Avoidance of pig iron for steel scrap was taken as benefit Pig iron contains about 3 to 4% carbon, which is reduced during steel making. The scrap iron, on the other hand, might contain similar amount of impurities either coming from recycling stream or due to mix of different types of steels. Unalloyed construction steel is used for the Akkon profiles, so avoidance of pig iron is appropriate.

As per the waste scenario, the remaining 30% is assumed to end up at landfills.

## 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	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X
RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 tonne of Light Gauge Steel Profiles																
Parameter		Unit	Manufacturing			Credits										
Parameter		Unit	A1	A2	A3	D										
Global warming potential		[kg CO <sub>2</sub> -Eq.]	2,490	50.9	82.0	-800										
Depletion potential of the stratospheric ozone layer		[kg CFC11-Eq.]	2.27E-04	7.42E-06	9.05E-06	-1.32E-05										
Formation potential of tropospheric ozone photochemical oxidants		[kg Ethene Eq.]	2.04E+00	6.55E-02	2.57E-02	-6.81E-01										
Acidification potential of land and water		[kg SO <sub>2</sub> -Eq.]	38.2	0.190	0.287	-2.56										
Eutrophication potential		[kg PO <sub>4</sub> <sup>3-</sup> -Eq.]	12.1	0.0545	0.260	-1.47										
Abiotic depletion potential for non fossil resources		[kg Sb Eq.]	21.7	0.377	0.648	-7.77										
Abiotic depletion potential for fossil resources		[MJ Eq.]	37,700	871	1,170	-12,000										
RESULTS OF THE LCA - RESOURCE USE: 1 tonne of Light Gauge Steel Profiles																
Parameter		Unit	Manufacturing			Credits										
Parameter		Unit	A1	A2	A3	D										
Use of renewable primary energy excluding renewable primary energy resources used as raw materials		[MJ]	1,180	10.9	133	-128										
Use of renewable primary energy resources used as raw materials		[MJ]	0	0	0	0										
Total use of renewable primary energy resources		[MJ]	1,180	10.9	133	-128										
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials		[MJ]	35,300	823	1,160	-11,600										
Use of non renewable primary energy resources used as raw materials		[MJ]	0	0	0	0										
Total use of non renewable primary energy resources		[MJ]	35,300	823	1,160	-11,600										
Use of secondary material		[kg]	180	-	-	0										
Use of renewable secondary fuels		[MJ]	-	-	-	-										
Use of non renewable secondary fuels		[MJ]	-	-	-	-										
Use of net fresh water		[m <sup>3</sup> ]	68.7	0.443	1.98	-8.53										
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 tonne of Light Gauge Steel Profiles																
Parameter		Unit	Manufacturing			Credits										
Parameter		Unit	A1	A2	A3	D										
Hazardous waste disposed		[kg]	1.3	-	-	-										
Non hazardous waste disposed		[kg]	71.9	-	-	-										
Radioactive waste disposed		[kg]	-	-	-	-										
Components for re-use		[kg]	-	-	-	-										
Materials for recycling		[kg]	-	-	14.9	-										
Materials for energy recovery		[kg]	-	-	-	-										
Exported energy per energy carrier [Typ]		[MJ]	-	-	-	-										



## References

### **Institut Bauen und Umwelt 2011**

Institut Bauen und Umwelt e.V., Königswinter (pub.): Generation of Environmental Product Declarations (EPDs); General principles for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2011-06

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

### **PCR 2011, Part A**

Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. 2011-09

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

### **PCR 2011, Part B**

PCR Guidance-Texts for building-Related Products and Services, from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU),

Part B: Requirements on the EPD for structural steel. 2011-06

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

### **ISO 14025**

DIN EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

### **EN 15804**

EN 15804:2011-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

### **ISO 9001**

DIN EN ISO 9001:2008, Quality Management System-Requirements.

### **ISO 14001**

DIN EN ISO 14001:2004, Environmental Management Systems-Requirement

### **OHSAS 18001**

DIN EN OHSAS 18001:2007, Occupational Health and Safety Management System

### **ISO 14040**

DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006)

### **ISO 14044**

DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14040:2006)

### **DIN EN 10346**

Continuous hot-dip coated steel flat products – Technical Terms of Delivery

### **DIN EN 10204**

Inspection documents for metallic products-Test reports

### **Ecoinvent**

Ecoinvent Centre, is a competence Centre of the Swiss Federal Institute of Technology Zürich (ETH Zurich) and Lausanne (EPF Lausanne), the Paul Scherrer Institute (PSI), the Swiss Federal Laboratories for Materials Testing and Research (Empa), and the Swiss Federal Research Station Agroscope Reckenholz-Tänikon (ART), is the world's leading supplier of consistent and transparent life cycle inventory (LCI) data of known quality with the database ecoinvent data v2.2 and offers science-based, industrial, international life cycle assessment (LCA) and life cycle management (LCM) data and services.

[www.ecoinvent.org](http://www.ecoinvent.org)

### **SimaPro**

SimaPro LCA Package, Pré Consultants, The Netherlands

[www.pre-sustainability.com](http://www.pre-sustainability.com)



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