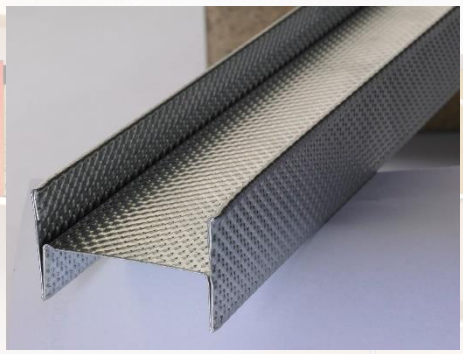
EPD®

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

Rigiprofil ULTRA Metal Profile



Date: 2017-07-18

Version: 1

Valid until: 2022-07-18

EPD VERIFIED

The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

N° VERIFICATION

S-P-00871

Rigips SAINT-GOBAIN

General information

Manufacturer: SAINT GOBAIN RIGIPS ALÇI SANAYİ VE TİCARET A.Ş. İlkbahar Mahallesi, 606. Sok. No: 8 Çankaya Ankara TÜRKİYE
Programme used: International EPD System http://www.environdec.com/
EPD registration number/declaration number: S-P-00871

PCR identification: This EPD has been made according to the International EPD System PCR 2012:01 Construction Products and Construction Services (combined PCR & PCR Basic Module Version 2.0). Valid until: 2019-03-03 with reference to the Saint Gobain Methodological Guide

Site of manufacture: Hadley Rollform Çelik Profil Üretimi A.Ş. Deri O.S.B. Gergef Sokak No: 7 34956 Tuzla TÜRKİYE
Product / product family name and manufacturer represented: Rigiprofil ULTRA metal profile / Hot-dip galvanized steel profiles / SAINT-GOBAIN RIGIPS ALÇI SANAYİ VE TİCARET A.Ş.
Declaration issued: 2017-07-18
Valid until: 2022-07-18

Demonstration of verification: an independent verification of the declaration was made, according to ISO 14025:2010. This verification was external and conducted by the following third party: Andrew Norton, Renuables, based on the PCR mentioned above.

EPD prepared by: Alex Hardwick, Thinkstep Ltd., UK. Contact: alex.hardwick@thinkstep.com

Declared Unit: The declared unit is 1 kg of Rigiprofil ULTRA hot-dip galvanized steel profiles

Declaration of hazardous substances: (Candidate List of Substances of Very High Concern): None

Scope: Turkey

Verification

PCR:	**PCR 2012:01 Construction products and Construction services, Version**
PCR review was conducted by:	**The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com**
Independent verification of the declaration, according to EN ISO 14025:2010 ☐ **Internal** ☒ **External**	
Third party verifier:	**Andrew Norton, Renuables**
Accredited or approved by	**The International EPD System**

Product description

Product description and use:
Rigiprofil ULTRA metal profiles are lightweight hot-dip galvanized (HDG) steel profiles used for mounting Rigips plasterboard systems. The product is intended for interior use and is corrosion resistant due to the zinc galvanized coating.

Description of the main product components and or materials:
Hot-dip galvanized steel profiles are manufactured from steel hot-rolled coil, which is hot-dip galvanized in zinc for corrosion resistance and rolled into application-specific profiles.

LCA calculation information

EPD TYPE DECLARED	Cradle to Gate with options
DECLARED UNIT	1 kg of Rigiprofil ULTRA hot-dip galvanized steel profiles
SYSTEM BOUNDARIES	Cradle to Gate with Options: Upstream & Core processes (A1 – A3), Downstream processes (A4 – A5, B1 – B7, C1 – C4 and module D).
REFERENCE SERVICE LIFE (RSL)	60 years. This value is the amount of time that we recommend our products last for without refurbishment, and corresponds to standard building design life
CUT-OFF RULES	Life Cycle Inventory data for a minimum of 99% of total energy and mass flows are included per unit process. At least 95% of total energy and mass flows are included per module.
ALLOCATIONS	In A3: Water use, recycling, energy and waste data have been calculated on a mass basis.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Scope: Turkey Production data was taken from the Hadley Rollform Çelik Profil Üretimi site located in Tuzla, Turkey. Data was collected at the site for the reference year 2016. The market for the product is also Turkey.
PRODUCT CPC CODE	42190 - Other structures (except prefabricated buildings) and parts of structures, of iron, steel or aluminium; plates, rods, angles, shapes, sections, profiles, tubes and the like, prepared for use in structures, of iron, steel or aluminium; props and similar equipment for scaffolding, shuttering or pitpropping
CONTENT DECLARATION	No substances of very high concern.

EPD's of construction products may not be comparable if they do not comply with EN15804. According to ISO 21930, EPD's might not be comparable if they are from different programmes.

Life cycle stages

Flow diagram of the product life cycle

Product stage, A1-A3

Description of the stage:
A1: Extraction and processing of raw materials and processing of secondary material input (e.g. recycling processes). This module also includes generation of electricity, steam and heat from primary energy, including their extraction, refining and transport.

A2: Transport to the manufacturer. The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportations of each raw material.

A3: Manufacturing of ancillary materials, products, co-products and packaging, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage.

Manufacturing process flow diagram

Manufacture:
Rigips ULTRA steel profiles are manufactured using hot-dip galvanized steel coil produced in the European Union. In Europe, hot-dip galvanized steel coils are generally manufactured via the blast furnace/basic oxygen furnace (BF/BOF) route. The blast furnace route produces pig iron from various forms of iron ore such as sinter, pellets and lump ore with coke as a reducing agent. The pig iron is transferred to the basic oxygen furnace vessel, where it is converted to steel by reducing the carbon content. The BOF vessel is also used to regulate other chemical properties of the steel such as the alloy content. Steel scrap is used in the BOF vessel, primarily for temperature control – the scrap content of BF/BOF steel is, on average, around 10%.

Liquid steel from the BOF vessel is cast into slabs and rolled to produce hot rolled coil. To produce hot-dip galvanized steel, the hot rolled coil is cold rolled, annealed, pickled and coated in zinc. Hot-dip galvanized steel coil is purchased by Hadley Rollform Çelik Profil Üretimi, who form it into the specific profiles required for the suspended ceiling application. The products are packaged in plastic wrap and loaded onto wooden pallets prior to distribution.

Construction process stage, A4-A5

Description of the stage:
A4: Transport to the building site,
A5: Installation into the building, including provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction process stage. These information modules also include all impacts and aspects related to any losses during this construction process stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

Transport to the building site:

PARAMETER	VALUE (expressed per declared unit) / Description
Fuel type and consumption of vehicle and vehicle type used for transport e.g. long distance truck, boat, etc.	Vehicle: Euro 5 truck-trailer with a 17.3 tonne payload capacity. Assumed to be fully laden on outward journey with an empty return. 0.523 litres per km Fuel type: Diesel
Distance	352 km. Value based on weighted average transport distance to major customers for 2016
Capacity utilisation (including empty returns)	100% capacity outward by mass 100% empty returns
Bulk density of transported products	3000 – 7000 kg/m^3 (Product density = 7850 kg/m^3)

Installation in the building:

PARAMETER	VALUE (expressed per declared unit) / Description
Ancillary materials for installation (specified by materials)	None
Water use	None
Other resource use	None
Quantitative description of energy type (regional mix) and consumption during the installation process	None modelled
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	***Profiles:*** 0.05 kg (5% scrap rate at installation) ***Plastic wrap:*** 0.000877 kg ***Wooden pallets:*** 0.00584 kg
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	***Profiles:*** 0.047 kg to steel recycling 0.003 kg to landfill ***Plastic wrap:*** 0.000877 kg to landfill ***Wooden pallets:*** 0.00468 kg to reuse $5.84x10^{-5}$ kg to recycling 0.00111 kg to landfill
Direct emissions to ambient air, soil and water	No direct emissions during installation.

Use stage (excluding potential savings), B1-B7

Description of the stage:
The use stage, related to the building fabric includes:
B1: Use or application of the installed product;
B2: Maintenance;
B3: Repair;
B4: Replacement;
B5: Refurbishment; including provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the

losses during this part of the use stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

Maintenance:

PARAMETER	VALUE (expressed per declared unit) / Description
Maintenance process	None required during lifetime of steel profiles
Maintenance cycle	None required during lifetime of steel profiles
Ancillary materials for maintenance (e.g. cleaning agent, specify materials)	None required during lifetime of steel profiles
Wastage material during maintenance (specify materials)	None required during lifetime of steel profiles
Net fresh water consumption during maintenance	None required during lifetime of steel profiles
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type, (e.g. electricity) and amount, if applicable and relevant	None required during lifetime of steel profiles

Repair:

PARAMETER	VALUE (expressed per declared unit) / Description
Repair process	None required during lifetime of steel profiles
Inspection process	None required during lifetime of steel profiles
Repair cycle	None required during lifetime of steel profiles
Ancillary materials (e.g. lubricant, specify materials)	None required during lifetime of steel profiles
Wastage material during repair (specify materials)	None required during lifetime of steel profiles
Net fresh water consumption during repair	None required during lifetime of steel profiles
Energy input during repair (e.g. crane activity), energy carrier type, (e.g. electricity) and amount if applicable and relevant	None required during lifetime of steel profiles

Replacement:

PARAMETER	VALUE (expressed per declared unit) / Description
Replacement cycle	None required during lifetime of steel profiles
Energy input during replacement (e.g. crane activity), energy carrier type, (e.g. electricity) and amount if applicable and relevant	None required during lifetime of steel profiles
Exchange of worn parts during the product's life cycle (e.g. zinc galvanized steel sheet), specify materials	None required during lifetime of steel profiles

Refurbishment:

PARAMETER	VALUE (expressed per declared unit) / Description
Refurbishment process	None required during lifetime of steel profiles
Refurbishment cycle	None required during lifetime of steel profiles
Material input for refurbishment (e.g. bricks), including ancillary materials for the refurbishment process (e.g. lubricant, specify materials)	None required during lifetime of steel profiles
Wastage material during refurbishment (specify materials)	None required during lifetime of steel profiles
Energy input during refurbishment (e.g. crane activity), energy carrier type, (e.g. electricity) and amount	None required during lifetime of steel profiles
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	None required during lifetime of steel profiles

Use of energy and water:

PARAMETER	VALUE (expressed per declared unit) / Description
Ancillary materials specified by material	None required during lifetime of steel profiles
Net fresh water consumption	None required during lifetime of steel profiles
Type of energy carrier (e.g. electricity, natural gas, district heating)	None required during lifetime of steel profiles
Power output of equipment	None required during lifetime of steel profiles
Characteristic performance (e.g. energy efficiency, emissions, variation of performance with capacity utilisation etc.)	None required during lifetime of steel profiles
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	None required during lifetime of steel profiles

End-of-life stage C1-C4

Description of the stage:
The end-of-life stage includes:
C1: Deconstruction, demolition;
C2: Transport to waste processing;
C3: Waste processing for reuse, recovery and/or recycling;
C4: Disposal, including provision and all transport, provision of all materials, products and related energy and water use.

End-of-life:

PARAMETER	VALUE (expressed per declared unit) / Description
Collection process specified by type	0.94 kg collected separately for recycling 0.06 kg collected with mixed demolition waste for landfill
Recovery system specified by type	0.94 kg recycled
Disposal specified by type	0.06 kg disposed of in landfill
Assumptions for scenario development (e.g. transportation)	Steel profile waste is assumed to be transported 50 km by road from construction/demolition site to a Turkish scrap merchant or directly to an EAF steel manufacturer. Transport to landfill is also assumed to be 50 km by road.

Reuse/recovery/recycling potential, D

Description of the stage:
Module D includes: reuse, recovery and/or recycling potentials, expressed as net impacts and benefits.

Credits are given for the net scrap that is produced at the end of a final product's life. This net scrap is determined as follows:

Net scrap = Amount of steel recycled at end-of-life – Scrap input from previous product life cycle

The steel scrap that is generated during production is reused directly in a cycle ("loop"). This internally recycled process scrap is not used to calculate the credit that is reported in Module D. After the collection stage, the demand for scrap input to the production process is saturated by the amount of steel recycled at end-of-life (see equation above).

The value of scrap has been calculated in accordance with the methodology developed by the World Steel Association "worldsteel" and is calculated based on the difference between a theoretical 100% primary steel (BF/BOF route) and 100% secondary steel (EAF route).

LCA results

Description of the system boundary (X = Included in LCA, MNA = Module Not Assessed).

CML 2001 – Apr. 2013 has been used as the impact model. Primary data have been taken from Hadley Rollform Çelik Profil Üretimi for the 2016 reference year. Secondary data come from the 2017 GaBi database. All emissions to air, water, and soil, and all materials and energy used have been included.

PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
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
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	X	X	X	X	X	X	X	X	X

ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 eq./DU*	2.4E+00	3.2E-02	1.3E-01	0	0	0	0	0	0	0	0	4.5E-03	0	2.9E-03	-1.5E+00
Global warming drives climate change which impacts on ecosystems globally and constributes to sea level rise and extreme weather events.															
Depletion potential of the stratospheric ozone layer (ODP) - *kg CFC 11 eq./DU*	7.7E-10	2.6E-14	3.6E-11	0	0	0	0	0	0	0	0	3.6E-15	0	7.1E-15	-7.1E-12
The stratospheric ozone layer shields the earth from ultraviolet radiation that is harmful to life. Emissions of some chemicals such as chlorofluorocarbons (CFCs) catalyse the destruction of ozone in this region.															
Acidification potential (AP) - *kg SO_2 eq./DU*	1.1E-02	1.4E-04	5.4E-04	0	0	0	0	0	0	0	0	2.0E-05	0	8.3E-06	-5.8E-03
Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.															
Eutrophication potential (EP) - *kg $(PO_4)^{3-}$ eq./DU*	1.1E-03	3.5E-05	5.6E-05	0	0	0	0	0	0	0	0	4.9E-06	0	1.0E-06	-4.5E-04
Excessive enrichment of aquatic and terrestrial ecosystems can upset the balance of species resulting in effects such as algal blooms in lakes that are harmful to other life and reduce biodiversity by deoxygenating the water and releasing toxic emissions when they die and decay															
Formation potential of tropospheric ozone (POCP) - *kg Ethene eq./DU*	1.1E-03	-5.7E-05	5.4E-05	0	0	0	0	0	0	0	0	-8.0E-06	0	7.8E-07	-8.3E-04
Tropospheric ozone contributes to urban smog and can exacerbate health conditions such as asthma. It is caused by chemical reactions between nitrogen oxides and hydrocarbons brought about by the light energy of the sun.															
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb eq./DU*	1.8E-04	2.9E-09	9.0E-06	0	0	0	0	0	0	0	0	4.0E-10	0	6.0E-10	1.3E-07
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/DU*	2.8E+01	4.4E-01	1.4E+00	0	0	0	0	0	0	0	0	6.2E-02	0	4.2E-02	-1.4E+01
Consumption of non-renewable resources, lowering their availability for future generations.															

RESOURCE USE

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials *MJ/DU*	1.9E+00	2.3E-02	9.3E-02	0	0	0	0	0	0	0	0	3.2E-03	0	3.2E-03	8.5E-01
Use of renewable primary energy used as raw materials *MJ/DU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/DU*	1.9E+00	2.3E-02	9.3E-02	0	0	0	0	0	0	0	0	3.2E-03	0	3.2E-03	8.5E-01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/DU*	2.9E+01	4.4E-01	1.5E+00	0	0	0	0	0	0	0	0	6.2E-02	0	4.4E-02	-1.4E+01
Use of non-renewable primary energy used as raw materials *MJ/DU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/DU*	2.9E+01	4.4E-01	1.5E+00	0	0	0	0	0	0	0	0	6.2E-02	0	4.4E-02	-1.4E+01
Use of secondary material *kg/DU*	1.0E-01	0	5.1E-03	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels- *MJ/DU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels - *MJ/DU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water - m^3/*DU*	1.2E-02	4.2E-05	5.8E-04	0	0	0	0	0	0	0	0	5.9E-06	0	1.8E-07	-8.7E-04

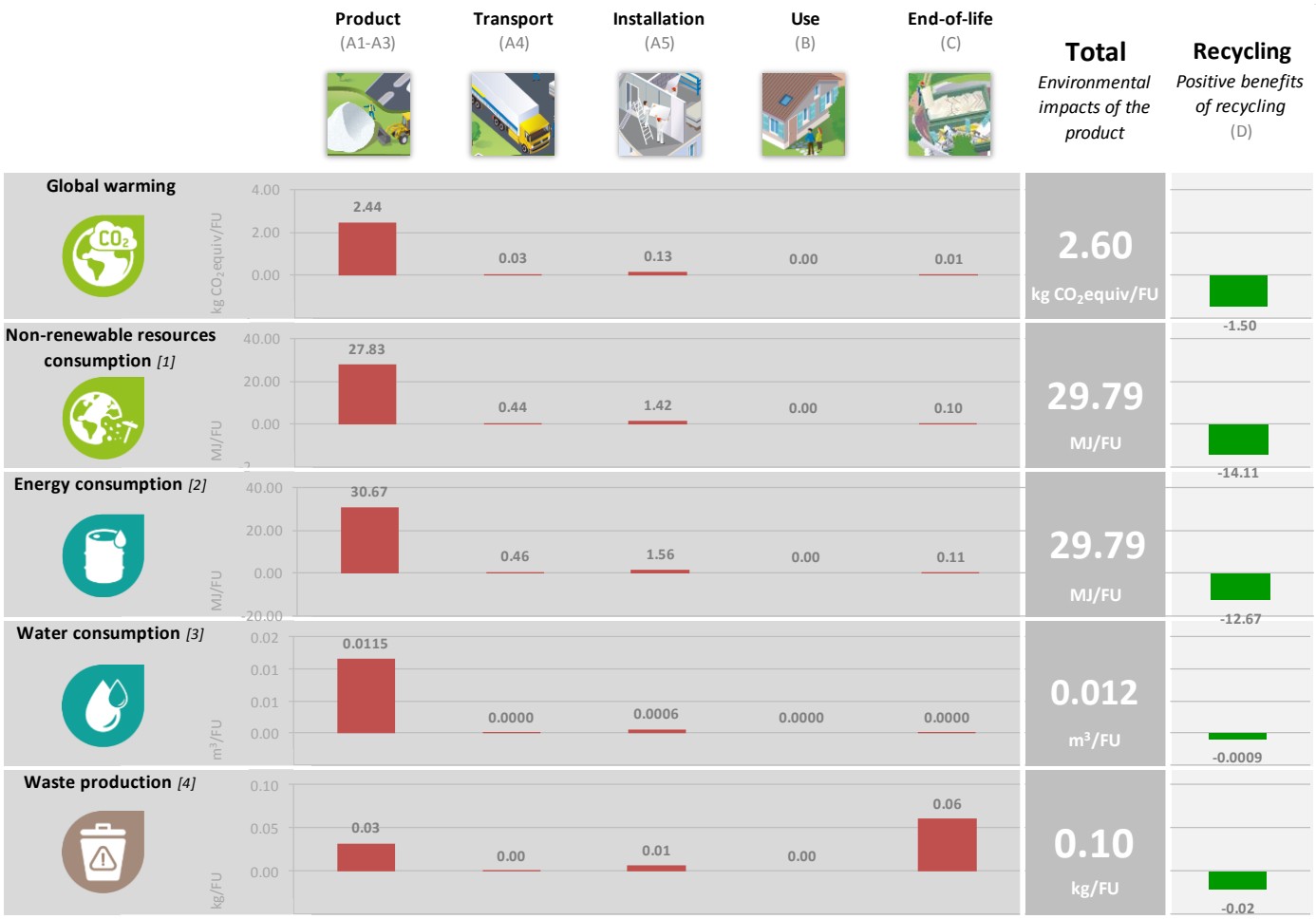
WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/DU*	4.5E-08	2.3E-08	3.6E-09	0	0	0	0	0	0	0	0	3.2E-09	0	2.1E-10	-1.0E-08
Non-hazardous (excluding inert) waste disposed *kg/DU*	3.2E-02	3.5E-05	6.2E-03	0	0	0	0	0	0	0	0	4.9E-06	0	6.0E-02	-2.1E-02
Radioactive waste disposed *kg/DU*	3.9E-04	9.1E-07	2.0E-05	0	0	0	0	0	0	0	0	1.3E-07	0	6.5E-07	2.3E-04

OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/DU*	0	0	4.7E-03	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling *kg/DU*	0	0	4.3E-02	0	0	0	0	0	0	0	0	0	9.4E-01	0	0
Materials for energy recovery *kg/DU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy, detailed by energy carrier *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LCA results interpretation per 1 kg of metal ceiling profiles



[1] This indicator corresponds to the abiotic depletion potential of fossil resources.

[2] This indicator corresponds to the total use of primary energy.

[3] This indicator corresponds to the use of net fresh water.

[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

It can clearly be seen that the main impact of the product across its lifetime is in A1, the production of the raw material. Steel production is an intensive process requiring a lot of energy and raw materials, but increasing high levels of recycled content helps to lower this. Production impacts in A3 are very low as rolling, bending and forming the steel takes a minimal amount of energy.
Some impact can be seen in Stage A5, installation, as a small amount of product is lost when products are cut to size at the construction site. No impacts occur during the use phase as the product remains in the building without maintenance or refurbishment. Impact at end of life is minimal due to the very high level of recycling (94%). This account for the positive benefit seen in Module D, as recycling avoids raw material extraction for new products.

Comments

- All steel scrap generated during production is collected and recycled.
- More information, the progress and the updates on our environmental work is available on www.rigips.com.tr.

References

1. The International EPD System PCR for Construction Products: Registration Number: 2012:01 and CPC 54 Construction Services V2

2. Saint-Gobain Environmental Product Declaration Methodological Guide for Construction Products

3. EN 15804:2012 + A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

4. ISO 21930:2007 Sustainability in building construction – Environmental declaration of building products

5. ISO 14040:2006 Environmental management -- Life cycle assessment -- Principles and framework

6. ISO 14044:2006 Environmental management -- Life cycle assessment -- Requirements and guidelines

7. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures

8. ISO 14001:2004 Environmental management systems – Requirements with guidance for use

9. LCA project report. thinkstep & Rigips/Saint-Gobain. Sheffield, UK, East Leake, UK and Ankara, Turkey, 2017

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11. Eurofer steel reuse and recycling survey. Eurofer. Brussels, Belgium, 2012.

12. GaBi ts dataset documentation for the software-system and databases, LBP, University of Stuttgart and thinkstep. Leinfelden-Echterdingen, 2017

13. World Steel Association (worldsteel) Life Cycle Methodology Report. Worldsteel. Brussels, Belgium, 2011