

# Environmental Product Declaration

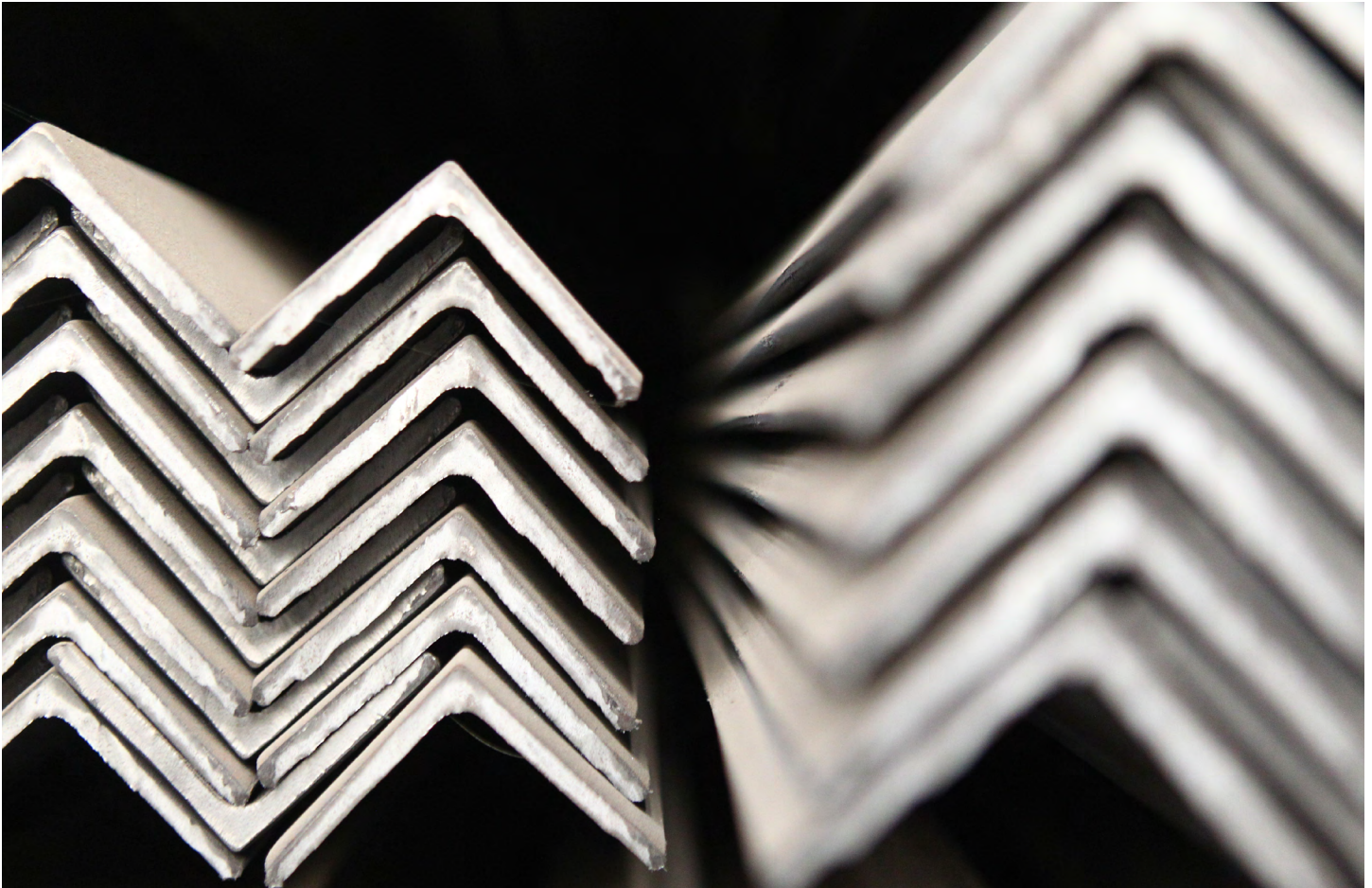


In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

# Equal Angles

from

## Tosyalı Demir Çelik



#### PROGRAMME

The International EPD® System  
[www.environdec.com](http://www.environdec.com)

#### PROGRAMME OPERATOR

EPD International AB

#### LOCAL OPERATOR

EPD Turkey

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**TOSYALI** Demir Çelik







# Programme Information

## Programme Information

**Programme:** The International EPD System

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### Information about verification and reference PCR:

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

#### Product category rules (PCR)

PCR 2019:14 Version 1.11, Construction products (EN 15804:A2) Version 1.1

#### PCR review was conducted by

The Technical Committee of the International EPD® System. See [www.environdec.com/TC](http://www.environdec.com/TC) for a list of members.

Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat [www.environdec.com/contact](http://www.environdec.com/contact)

Independent verification of the declaration and data, according to ISO 14025:2006:

EPD process verification

EPD verification

#### Third party verifier

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#### Approved by

The International EPD® System Technical Committee, supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes

No

### LCA Study & EPD Design Conducted by

Semtrio Sustainability Consulting

BUDOTEK Teknopark, No 8/27

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**Tosyalı Demir Çelik San. A.Ş.** has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

# Company Information

## Owner of the EPD

### **Tosyalı Demir Çelik San. A.Ş.**

Organize Sanayi Bolgesi Sarıseki

İskenderun / HATAY

[www.tosyalidemircelik.com.tr](http://www.tosyalidemircelik.com.tr)

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Investments in our facilities started in 1993 and the production started in 1994. In 1995, equal angles was added to the production matrices. With the investment in 2001, the 2<sup>nd</sup> Rolling Mill was established and its current capacity doubled. And IPN-UPN-IPE profile is added to the product group. Tosyalı Demir Çelik rolling mill facilities in İskenderun are established on a total area of 17,667 m<sup>2</sup> with 13,000 m<sup>2</sup> closed area. The annual production capacity is 550,000 tons / year.

The following standard and special sizes are produced in the following groups in Tosyalı Demir Çelik facilities:

- From 30 mm to 120 mm / 2.8 mm to 13 mm flange thickness in the equal angles group,
- From 50 mm to 160 mm in the UPN profile (Taper flange channels) group,
- From 80 mm to 160 mm in the IPN profile (Taper flange I sections) group,
- From 80 mm to 160 mm in the IPE profile (Parallel flange I sections) group.

For all of our products, heat-based tensile tests, chemical tests, bending tests and charpy impact tests are performed in our own laboratories.

Follow-up and control of all quality system documentation is performed by using the QDMS system. All information about our products is recorded in our SAP system database. Especially with the barcode system on the product package labels, traceability is ensured until the product reaches the customer.

In Tosyalı Demir Çelik facilities, these products are made by forming 130# and 150# square billet raw materials by heating them in the furnace up to 1250 degrees and hot forming them through rotating rollers. These materials, made especially by hot forming, have a more strong structure due to homogeneous shrinkage of grain sizes.

These materials are used especially in energy transmission line, as well as all steel constructions, machinery manufacturing industries, and various structures.

Exporting its products to 33 countries, Tosyalı Demir Çelik facilities continue its activities that shape the industry and its local and international investments that will contribute to the country, people and nature.

## Production Site

### **Tosyalı Demir Çelik**

Organize Sanayi Bolgesi Sarıseki, İskenderun / HATAY

# Product Information



## Product Name: Equal Angles

Hot rolled equal angles products production facilities were established in İskenderun. The facility provides services in a total area of 17,667 m<sup>2</sup> with 13,000 m<sup>2</sup> closed area. The annual production capacity is 550,000 tons/year.

### Intended Use of Product

Equal Angles is used especially in energy transmission line, as well as all steel constructions, machinery manufacturing industries, and various structures.

### Production

In the equal angles production plant, firstly, 130x130 mm and 150x150 mm billet are heated in the furnace up to 1,250 °C. Then it passes through the rotating rollers and is formed by hot forming. These materials, especially made by hot shaping, gain a more durable structure due to the homogeneous reduction of grain sizes. Electricity, water, and natural gas are consumed in these stages.

End of the processes the profile is ready and packaged to be delivered to the customer.

## Technical Specifications

Product	Production Standards	Description
Equal Angles	ASTM A6 / A6M	Standard Specification for General Requirement for Rolled Structural Steel Bars, Plate, Shape and Sheet Piling
	EN 10025-1 : 2004	Certificate of Conformity of the Factory Production Control
	EN 10056	Steel EN 10056-1 from 30x30x2,8 mm to 120x120x13 mm

# LCA Information

## Declared unit

1000 kg of Equal Angles manufactured in Hatay facility (TR).

## Reference service life

Not applicable

## Time representativeness

The inventory for the LCA study is based on the period of 1<sup>st</sup> January 2021 and 31<sup>st</sup> December 2021

## Database(s) and LCA software used

SimaPro LCA v9.2.0.2 software with Ecoinvent v3.7.1

## Description of system boundaries

Cradle to gate with options, modules, C1-C4, D (A1-A3 + C + D)

## Data quality and data collection

Data collection for this LCA study has been carried out in accordance with data requirement stated in ISO 14040-44, ISO 14025, ISO 14020, and the requirements given in the General Program Instructions v3.01; PCR Construction products 2019:14, version 1.11 by The International EPD® System and EN 15804:2012+A2:2019.

There are two different data classifications has been used as primary (specific) and secondary (selected generic) data. All primary data has been collected from the manufacturing plant. For secondary data Ecoinvent v3.7.1 database has been used.

Upstream data, raw materials production, transportation, fossil fuels and electricity mix data have been obtained from Ecoinvent v3.7.1 as secondary data. All manufacturing data in core processes has been gathered from the manufacturing plant. The manufacturing data are collected based on a mass balance. The profile datas in this LCA study represents the period of 1<sup>st</sup> January 2021 and 31<sup>th</sup> December 2021.

Mileage and tonnage figures for transport data to the core processes were provided by Tosyali's other plant procurement department specifically per origin of departures, however roadway upstream data per ton per kilometres were taken from Ecoinvent v3.7.1

## Allocation

Mass allocation applied for waste generated during the production of the profile and equal angles. The waste data has been allocated to profile and equal angles taking into account the total production in the relevant time period.

It has been calculated that 50% of the total waste produced in the facility will be on the profile, 50% on the equal angles.

The same percentages were used to allocate the packaging products and air emissions for two products.

## Cut-off rules

Life Cycle Inventory data for a minimum of 99 % of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass, and environmental relevance was applied.



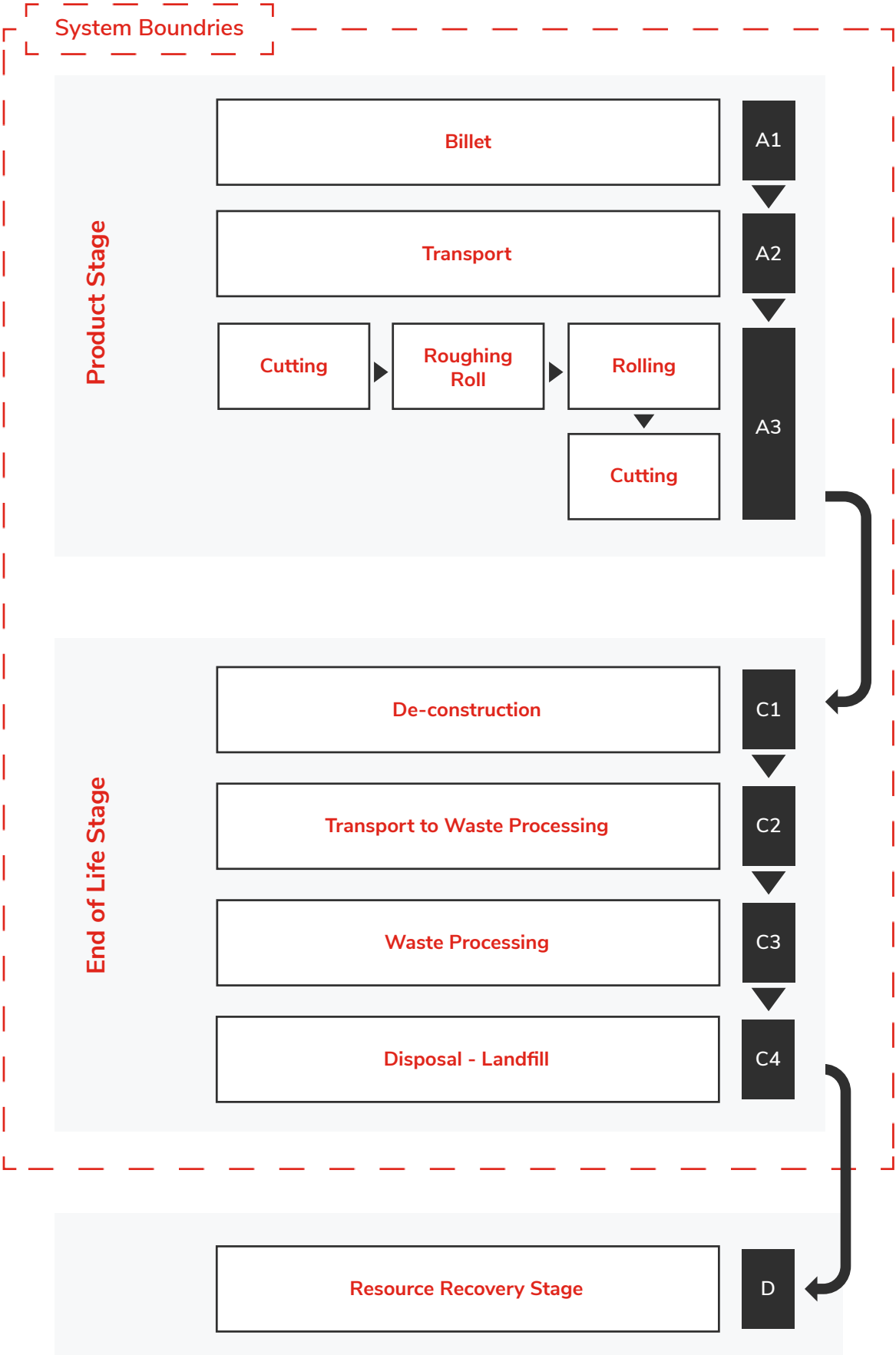


## Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				RESOURCE RECOVERY STAGE
	Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling Potential
MODULES	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	TR	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>99%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X: Declared; ND: Not Declared

# System Diagram





# Description of declared modules

## A1 - Raw Materials Supply

This module takes into account raw material extraction, processing and energy used in the production process.

## A2 - Transport to the Manufacturer

This module includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as roadway.

## A3 - Manufacturing

This stage includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered in this module. The processing of any waste arising from this stage is also included.

## C1 - De-construction

The de-construction and demolition of modules C1 are assumed to be carried out by diesel-powered machinery using a fuel cost of 0.01 kWh / kg of material at the end of their lifecycle.

## C2 - Transport to Waste Processing

An average distance of 100 km has been assumed for the transport to sorting facility. Transport is calculated on the basis of a scenario with the parameters described in the attached table.

Parameters C2 Module	
Transport by road*	Lorry, 16-32 metric ton
Distance (km)	100
Database	Ecoinvent v3.7.1

\*Technology is Euro 6

## C3 - Waste processing for reuse, recovery and/or recycling

During the pre-recycling process of recycling materials, they are separated so that they can then be effectively recycled. As a result of this processing stage, there are negligible impacts. Material that is intended for reuse does not undergo any processing prior to reusing it in another construction site, hence the zero environmental impact.

## C4 - Final disposal

100% of end-of-life products will be collected and recycled into the production system. Equal angles products are recycled. A total of 95% of end-of-life products are recycled and reused in construction projects or construction material production processes. 5% of the products are sent to the landfill.

## D - Reuse, Recovery or Recycling Potential

Equal Angles inputs to the production stage are subtracted from the construction to be recycled at end-of-life in order to obtain the profile from the product system. This remaining net profile is then sent to recycling. Module D reports the environmental aspects of recycled scrap generated at the end of life minus that used at the production stage.

## Information on which life cycle stages are not considered

This EPD only cover the Cradle to Gate with options A1-3 and C1-4 and D stages because other stages are very dependent on particular scenarios and are better developed for specific building or construction works.



## Content Declaration

Content declaration of 1000kg of equal angles

Material	Share
Scrap iron	99.0-99.9%
Alliage	0.1-1%
Renewable material	0%
Biogenic carbon	0%

# Environmental Performance

## Potential Environmental Impact *Mandatory Indicators According to EN 15804*

Results for 1000 kg of equal angles							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq	672	3.29	8.67	0	0.262	-13.8
GWP-biogenic	kg CO <sub>2</sub> eq	3.16	0.003	0.019	0	0.001	-0.225
GWP-luluc	kg CO <sub>2</sub> eq	2.28	2.62E-04	0.003	0	7.12E-05	-0.043
GWP-total	kg CO <sub>2</sub> eq	677	3.29	8.70	0	0.263	-14.0
ODP	kg CFC 11eq	3.53E-05	7.10E-07	2.13E-06	0	1.08E-07	-1.27E-06
AP	mol H <sup>+</sup> eq	3.63	0.034	0.027	0	0.002	-0.103
EP-Freshwater	kg PO <sub>4</sub> <sup>3-</sup> eq	0.333	0.005	0.003	0	3.32E-04	-0.013
EP-Aquatic Freshwater	kg P eq	0.034	1.09E-05	6.50E-05	0	2.76E-06	-0.001
EP-Marine	kg N eq	0.648	0.015	0.006	0	0.001	-0.025
EP-Terrestrial	kg N eq	7.22	0.167	0.068	0	0.009	-0.283
POCP	kg NMVOC eq	2.03	0.046	0.027	0	0.003	-0.097
ADP-minerals & metals*	kg Sb eq	0.001	1.33E-06	2.12E-05	0	5.87E-07	-1.07E-04
ADP-fossil*	MJ	6390	45.2	141	0	7.35	-246
WDP	m <sup>3</sup>	123	0.065	0.466	0	0.330	-5.17

**GWP-fossil** = Global Warming Potential fossil fuels; **GWP-biogenic** = Global Warming Potential biogenic; **GWP-luluc** = Global Warming Potential land use and land use change; **ODP** = Depletion potential of the stratospheric ozone layer; **AP** = Acidification potential, Accumulated Exceedance; **EP-freshwater** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-aquatic freshwater** = Eutrophication potential, fraction of nutrients reaching aquatic freshwater end compartment; **EP-marine** = Eutrophication potential, fraction of nutrients reaching marine end compartment; **EP-terrestrial** = Eutrophication potential, Accumulated Exceedance; **POCP** = Formation potential of tropospheric ozone; **ADP-minerals&metals** = Abiotic depletion potential for non-fossil resources; **ADP-fossil** = Abiotic depletion for fossil resources potential; **WDP** = Water (user) deprivation potential, deprivation-weighted water consumption

\* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.



## Potential Environmental Impact *Additional Mandatory and Voluntary Indicators*

Results according to PCR2019:14 for 1000 kg of equal angles							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq	671	3.28	8.63	0	0.261	-13.3
Results according to EN 15804+A2 for 1000 kg of equal angles							
PM	[disease inc.]	2.55E-05	9.10E-07	7.57E-07	0	4.84E-08	-1.25E-05
IRP	[kBq U235 eq]	7.55	0.195	0.620	0	0.030	-1.47
ET-freshwater	[CTUe]	5459	25.8	108	0	4.62	-566
HT-cancer	[CTUh]	1.55E-06	1.27E-09	3.31E-09	0	1.38E-10	-5.21E-07
HT-non-cancer	[CTUh]	3.58E-06	1.84E-08	1.12E-07	0	2.88E-09	-1.90E-07
SQP	[pt]	823	5.87	162	0	15.45	-104

**GWP-GHG** = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; **IRP** = Ionizing radiation, human health; **ET-freshwater** = Eco-toxicity (freshwater); **HT-cancer** = Human toxicity, cancer effects; **HT-non-cancer** = Human toxicity, non-cancer effects; **SQP** = Potential soil quality index (SQP)

<sup>1</sup> The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

## Use of Resources

Results for 1000 kg of equal angles							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
PERE	MJ	770	0.234	1.723	0	0.059	-59.4
PERM	MJ	0	0	0	0	0	0
PERT	MJ	770	0.234	1.72	0	0.059	-59.4
PENRE	MJ	6966	48.1	150	0	7.81	-260
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	6966	48.1	150	0	7.81	-260
SM	kg	1046	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m <sup>3</sup>	23.1	0.023	0.129	0	0.012	-1.46

**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 re-sources; **SM** = Use of secondary material; **RSF** = Use of renewable secondary fuels; **NRSF** = Use of non-renewable secondary fuels; **FW** = Use of net fresh water

## Waste Production

Results for 1000 kg of equal angles							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	59.7	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	0	0	50.0	0
Radioactive waste disposed	kg	0	0	0	0	0	0

## Output Flows

Results for 1000 kg of equal angles							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	0	0	0
Materials for recycling	kg	0.002	0	0	0	0	950
Materials for energy recycling	kg	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0



# References

- **ISO 14040 2006** Environmental management - Life cycle assessment - Principles and framework
- **ISO 14044 2006** Environmental management - Life cycle assessment - Requirements and guidelines
- **ISO 14025 2006** Environmental labels and declarations - Type III environmental declarations Principles and procedures
- **ISO 14020 2000** Environmental labels and declarations - General principles
- **EN 15804:2012+A2:2019** Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- **The International EPD®System** [www.environdec.com](http://www.environdec.com)
- **The International EPD® System The General Programme Instructions v3.01**
- **The International EPD®System PCR 2029:14 Construction products v1.1 (EN 15804:A2)**
- **Ecoinvent 3.7.1** [www.ecoinvent.org](http://www.ecoinvent.org)
- **SimaPro LCA Software** [simapro.com](http://simapro.com)
- **Tosyalı Demir Çelik San. A.Ş.** [www.tosyalidemircelik.com.tr/en](http://www.tosyalidemircelik.com.tr/en)



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