

VIACON



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Steel structures HelCor, MultiPlate, SuperCor and UltraCor



Owner of the EPD:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804
(Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Products standards: EN 1090-1

Service Life: 100 years

PCR: ITB-PCR A

Declared unit: 1 ton

Reasons for performing LCA: B2B

Representativeness: Turkey, European

Type III Environmental Product Declaration No. 416/2023

MANUFACTURER

ViaCon İnşaat A.Ş. located in Turkey it's a part of the international ViaCon Group. The ViaCon Group is a provider of flexible corrugated steel structures and plastic pipes used to build Bridges & Culverts, GeoTechnical- and StormWater Solutions, covering the construction, reconstruction, and relining of culverts, bridges, viaducts, grade separations, wildlife crossings, tunnels, etc. that are used for establishing infrastructural connections and crossings. The ViaCon Group was founded in 1986 in Sweden and Norway, operates on European market.

PRODUCTS DESCRIPTION AND APPLICATION

This EPD covers steel product: HelCor, MultiPlate, SuperCor and UltraCor produced in Turkey (Table 1).

Table 1. product types covered by the declaration

Type of structure	Span	Product description	Steel quality and covering
MultiPlate structures	1.14m – 12.08m	Flexible, cold formed, corrugated steel plates, connected with bolts and nuts, used in mainly in civil engineering as Soil-Steel structures for roadway and railway loads.	S235 – S355 without coating/hot-dip galvanize coating/painting/ hot-dip galvanize coating & paint
SuperCor structures	3.17m – 25.41m	Flexible, cold formed, corrugated steel plates, connected with bolts and nuts, used in mainly in civil engineering as Soil-Steel structures for roadway and railway loads.	S355 – S420 without coating/hot-dip galvanize coating/painting/ hot-dip galvanize coating & paint
UltraCor structures	8.8 m – 31.96m	Flexible, cold formed, corrugated steel plates, connected with bolts and nuts, used mainly in civil engineering as soil-steel composite structures, under railway and roadway traffic loads.	S355 – S420 – S500 without coating/hot-dip galvanize coating/painting/ hot-dip galvanize coating & paint
HelCor structures	300mm - 3600mm	Flexible, cold formed, helically corrugated steel pipes HelCor® with couplings used mainly in civil engineering as steel-soil composite structures bearing rail and road traffic loads.	S250GD – S350GD Galvanized or Trenchcoated

Dimensional tolerance: acc.to EN 1090-2, weldability: acc.to EN 10025-2, resistance to brittle cracking: min 27 J, durability: surface preparation acc.to EN 1090-2, galvanizing acc.to EN 1461-2011, surface painting: acc.to EN 12944-5, producing class EXC3 acc.to EN-1090-2. More specific information (on products) is available on the producer website: ww.viacon.com.tr

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Declared unit

The declaration refers to declared unit (DU) – 1 ton of the steel products HelCor, MultiPlate, SuperCor and UltraCor manufactured in Turkey (ViaCon İnşaat Mühendislik San. Tic. A.Ş).

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the steel structures HelCor, MultiPlate, SuperCor and UltraCor is a line process in one factory of ViaCon İnşaat A.Ş. The zinc coating (hot-dip galvanization) and paint coating are outsourced a company located in Turkey. Allocation was done on product mass basis. All impacts from raw materials extraction are allocated in A1 module of the LCA. Impacts from line production were inventoried and allocated to steel structures production. Impacts from line production of the outsourced company were inventoried. The weighted average effect of the coatings is used. Utilization of packaging material was taken into consideration. Module A2 includes transport of raw materials from material suppliers to of ViaCon and to the outsourced company. All types of wastes were allocated to module A3. Energy supply, emissions and wastes were inventoried and allocated to module A3.

System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCR. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Modules A1 and A2: *Raw materials supply and transport*

Galvanized steel coils, paints, ancillary materials and packaging materials come from local as well as foreign suppliers. Means of transport include lorries with loading capacity <10 t and > 16 t. European standards for average combustion were used for calculations.

Module A3: *Production*

A scheme of the steel structures production is presented in Fig. 1.

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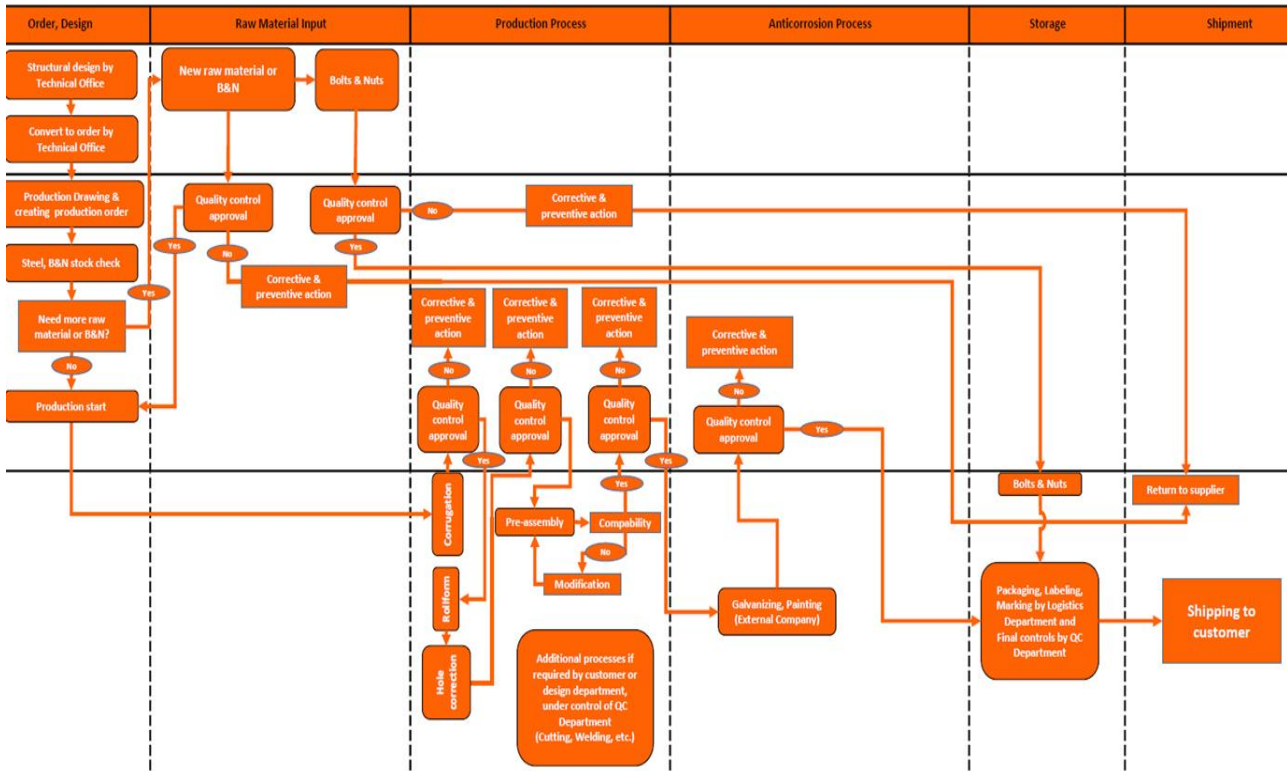


Fig. 1. A scheme of the steel structures production process by ViaCon İnşaat

Modules C2-C4 and D: End-of-life (EoL)

A precise modeling of impacts occurring at the deconstruction stage -the module C1 - is difficult but was estimated based on the existing literature (energy consumption on the standar demolition process). In the adapted end-of-life scenario, the deconstructed steel products (95%) are transported to a waste processing plant distant by 100 km on > 16t lorry EURO 5, where undergo shredding (C3). Landfill scenario is 5% of steel products (C4). Module D presents credits resulting from the recycling of the primary steel scrap, calculated in accordance with the net scrap approach developed by World Steel Association.

Table 2. End-of-life scenario for the steel structures manufactured by ViaCon

Material	Material recovery	Recycling	Landfilling
Steel scrap	100%	95%	5%

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by producer using the inventoried data at the rolling mill, KOBİZE 2021 report, ITB database and Ecoinvent v.3.9. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Data collection period

Primary data provided by ViaCon covers a period form 01.01.2021 to 31.12.2021 (1 year). The life cycle assessments were prepared for Turkey and Europe as reference area.

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Assumptions and estimates

The impacts of the representative steel products were aggregated using weighted average (including averaged coverings). Impacts were inventoried and calculated for all steel products.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804+A2.

Databases

The data for the LCA calculation comes from specific EPDs, KOBiZE, Ecoinvent v.3.9 and ITB Database. Specific data quality analysis was a part of an external audit. The carbon footprint of Turkish electricity used for calculation is 0.601 kg CO₂/kWh.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 ton of the steel structures manufactured by ViaCon. The life cycle modules included in the analysis are presented in the Table 3. The impacts of the product life cycle are presented in the Tables 4-7.

Table 3. System boundaries for the environmental characteristic of the steel structures.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

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Table 4. Life cycle assessment (LCA) results of **the steel structures** manufactured by ViaCon İnşaat – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	1.82E+03	2.27E+01	4.33E+01	1.88E+03	1.17E+00	5.21E-01	2.25E+01	2.64E-01	-7.75E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	1.74E+03	2.26E+01	4.22E+01	1.81E+03	1.17E+00	5.19E-01	2.18E+01	2.63E-01	-7.76E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-1.86E+01	7.73E-02	6.17E-01	-1.79E+01	1.05E-03	1.78E-03	3.04E-01	6.71E-04	-1.75E+00
Global warming potential - land use and land use change	eq. kg CO ₂	9.37E+01	8.87E-03	4.74E-01	9.42E+01	1.15E-04	2.04E-04	2.55E-01	2.49E-04	-9.89E-02
Stratospheric ozone depletion potential	eq. kg CFC ₁₁	1.15E-04	5.23E-06	3.37E-06	1.24E-04	2.48E-07	1.20E-07	1.44E-07	1.07E-07	-2.89E-05
Soil and water acidification potential	eq. mol H ⁺	2.35E+01	9.18E-02	3.01E-01	2.39E+01	6.96E-03	2.11E-03	1.50E-01	2.48E-03	-3.06E+00
Eutrophication potential - freshwater	eq. kg P	8.97E-01	1.52E-03	4.63E-02	9.44E-01	3.65E-05	3.49E-05	2.48E-02	2.45E-05	-3.39E-01
Eutrophication potential - seawater	eq. kg N	2.37E+00	2.77E-02	5.46E-02	2.45E+00	2.86E-03	6.36E-04	2.59E-02	8.62E-04	-6.76E-01
Eutrophication potential - terrestrial	eq. mol N	7.61E+01	3.02E-01	4.48E-01	7.68E+01	3.14E-02	6.94E-03	2.25E-01	9.43E-03	-7.28E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	7.47E+00	9.25E-02	1.23E-02	7.58E+00	8.57E-03	2.13E-03	1.43E-07	2.74E-03	-3.84E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	6.18E-02	8.01E-05	4.73E-05	6.19E-02	5.87E-07	1.84E-06	2.37E-05	6.04E-07	-1.34E-02
Abiotic depletion potential - fossil fuels	MJ	2.14E+04	3.36E+02	6.18E+02	2.23E+04	1.56E+01	7.71E+00	2.34E+02	7.22E+00	-6.66E+03
Water deprivation potential	eq. m ³	1.10E+03	1.55E+00	1.92E+01	1.12E+03	4.19E-02	3.57E-02	9.75E+00	2.29E-02	-1.41E+02

Table 5. Life cycle assessment (LCA) results of **the steel structures** manufactured by ViaCon İnşaat – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA

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Table 6. Life cycle assessment (LCA) results of **the steel structures** manufactured by ViaCon İnşaat – the resource use (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C1	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	3.28E+03	4.81E+00	1.40E+02	3.43E+03	8.91E-02	1.11E-01	7.51E+01	6.27E-02	-5.45E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	2.26E+04	3.36E+02	6.32E+02	2.36E+04	1.56E+01	7.71E+00	2.34E+02	7.22E+00	-6.45E+03
Consumption of secondary materials	kg	7.12E+01	1.12E-01	5.81E-02	7.14E+01	6.10E-03	2.58E-03	2.93E-02	1.52E-03	-9.94E+01
Consumption of renew. secondary fuels	MJ	1.05E-02	1.24E-03	2.59E-04	1.20E-02	1.99E-05	2.85E-05	1.35E-04	3.96E-05	-1.22E-01
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	1.04E+01	4.22E-02	6.35E-01	1.11E+01	9.46E-04	9.70E-04	2.34E-01	7.90E-03	-5.39E+00

Table 7. Life cycle assessment (LCA) results of **the steel structures** manufactured by ViaCon İnşaat – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C1	C3	C4	D
Hazardous waste neutralized	kg	3.86E+01	3.77E-01	1.83E+00	4.08E+01	2.09E-02	8.65E-03	9.75E-01	7.67E-03	=6.27E-02
Non-hazardous waste neutralised	kg	1.14E+03	6.69E+00	2.20E+02	1.37E+03	1.47E-01	1.54E-01	1.19E+02	1.08E-01	-7.99E+01
Radioactive waste	kg	6.23E-02	2.50E-05	1.34E-03	6.37E-02	1.09E-04	5.76E-07	1.11E-05	4.79E-05	-8.51E-03
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.89E-02	1.04E-03	2.23E-02	1.22E-01	2.08E-05	2.39E-05	1.13E-02	1.44E-05	-1.44E-01
Materials for energy recovery	kg	7.37E-04	8.40E-06	2.30E-05	7.68E-04	3.32E-07	1.93E-07	3.75E-06	1.71E-07	-4.59E-04
Energy exported	MJ	0.00E+00	0.00E+00	7.19E-02	7.19E-02	0.00E+00	0.00E+00	1.50E-02	0.00E+00	-3.22E+01

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Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804+A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Halina Prejzner, Ph.D. eng. LCA, LCI audit and input data verification: Michał Piasecki, Ph.D, D.Sc., eng, m.piasecki@itb.pl

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- PN-EN 1090-1+A1:2012 Wykonanie konstrukcji stalowych i aluminiowych -- Część 1: Zasady oceny zgodności elementów konstrukcyjnych
- KOBIZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii. December 2021
- World Steel Association 2017 Life Cycle inventory methodology report for steel products


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CERTIFICATE No 416/2023 of TYPE III ENVIRONMENTAL DECLARATION

Product:

Steel structures: HelCor, MultiPlate, SuperCor and UltraCor

Manufacturer:

ViaCon İnşaat A.Ş.

KargalıHanbaba OSB Mah. OrganizeSanayi 2 Sok. No:23, HendekSakarya, Turkey

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued for the first time on 10th March 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skałna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, March 2023