DAI DUNG®

ENVIRONMENTAL PRODUCT DECLARATION

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025:2006 AND EN 15804:2012+A2:2019/AC:2021

Steel Structures (Products with many sizes will be converted into kilograms of steel)
Dai Dung Metallic Manufacture Construction and Trade Corporation

Programme:	The International EPD® System, www.environdec.com
EPD registered through the fully aligned regional hub	EPD Southeast Asia, www.epd-southeastasia.com
Programme operator:	EPD International AB
Regional hub	EPD Southeast Asia
EPD registration number:	EPD-IES-0016967
Publication date:	2024-10-25
Valid until:	2029-10-24
Geographical scope:	Vietnam

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Dai Dung Metallic Manufacture Construction and Trade Corporation
Address	Head Office: Lot No.38, Zone C, D1 Street, An Ha Industrial Park, Pham Van Hai Commune, Binh Chanh District, Ho Chi Minh City, Vietnam. Representative Office: 123 Bach Dang Street, Ward 2, Tan Binh District, Ho Chi Minh City, Vietnam.
Contact details	sales@daidung.vn
Website	www.daidung.com

PRODUCT IDENTIFICATION

Product name	Steel Structures (Products with many sizes will be converted into kilograms of steel)
Place(s) of production	Lot No.38, Zone C, D1 Street, An Ha Industrial Park, Pham Van Hai Commune, Binh Chanh District, Ho Chi Minh City, Vietnam.
CPC code	42190

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

EPD INFORMATION

Programme	The International EPD® System, www.environdec.com EPD registered through the fully aligned regional hub EPD Southeast Asia, www.epd-southeastasia.com
Programme operator	EPD International AB
Regional hub	EPD Southeast Asia
EPD standards	This EPD is in accordance with EN 15804:2012+A2:2019/AC:2021 and ISO 14025:2006 standards.
Product category rules	The CEN standard EN 15804 serves as the core PCR. In addition, the Int'l EPD System Construction products, PCR2019:14, version 1.3.4 is used.
LCA accountability	Nguyen Thi Huong Thu – GreenViet Green Building Consultancy
EPD verification	Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier ☐ EPD verification by an accredited certification body ☐ EPD verification by EPD Process Certification
Verification date	2024-10-25
EPD verifier	Catarina Silva – PIEP - Innovation in Polymer Engineering
EPD number	EPD-IES-0016967
ECO Platform nr.	
Publishing date	2024-10-25
EPD valid until	2029-10-24

PRODUCT INFORMATION

PRODUCT DESCRIPTION

Steel structures are load-bearing structures for construction projects designed and constructed with steel. Dai Dung's steel structures are positioned in the high-quality segment, meeting key projects. DDC is proud to be a pioneer in creating national-class projects with monumental scale and complex structures, meeting all requirements for load capacity, sustainability and high aesthetics.

PRODUCT APPLICATION

DDC Steel Structure focuses on constructing frame systems according to the following groups of works and projects:

- Light industrial frame systems: prefabricated factories, manufacturing plants, coal warehouses, showroom yards, high-rise buildings, ...
- Heavy industrial frame system - energy: off-shore drilling rigs, petrochemical refineries, thermal power plants.
- Transport infrastructure framework: bridges, roads, ports, train stations, stops
- Public infrastructure framework: airports, stadiums, exhibition halls, hospitals, ...
- Industrial mechanical components: silo tanks, cooling systems, steam distribution pipes, ...

DDC Construction Steel Structures is gradually creating a variety of types and special architectures of super-long and super-heavy structures to serve the renewable energy industry, developing renewable energy projects (role of development). In addition, DDC also expands infrastructure and seaports to expand production scale to meet the needs of domestic and international partners/ customers.

TECHNICAL SPECIFICATIONS

Steel structures are structural connections between metal (steel) components used to transmit and connect forces in the 20th century and shape construction standards in the 21st century.

Dai Dung steel structures meet quality standards and other characteristic requirements arising from international standards such as AISC, H-GRADE, ASME, etc., and are widely used in the field of large-scale industrial and public infrastructure - technical characteristics and high aesthetics. In particular, the main types of structures are usually load-bearing frame systems corresponding to different functions and uses in each field.

1. Frame structure

This structure rose to the forefront of manufacturing buildings, taking a pioneering position thanks to its excellent load-bearing ability and overcoming large spans of up to 100m or more.

2. Mesh structure

Mesh structure is a unique type of structure made up of the tight connection of many steel bars with joints in a certain mesh form. Thanks to this smart design, the mesh structure possesses streamlined force transmission capabilities, optimizing material usage efficiency.

At the same time, the mesh structure also has outstanding advantages in terms of light weight, ease of erection and especially good seismic resistance, ensuring project safety in harsh environmental conditions.

3. Beam structure

A beam is a horizontal or inclined load-bearing bar, a basic structure with the function of supporting the beams, walls, and roof above. Beams have a simple structure and low cost, so they are commonly used in construction projects such as floor beams, roof beams, crane beams, bridge beams etc.

4. Truss structure

A truss is a type of load-bearing structure in construction projects, composed of many parts from a bar structure made of steel. This structure is often used when you want to create large spans in projects with large

apertures and heights, such as stadiums, airports, and heavy industrial warehouses.

5. Suspension structure

Suspension structures are often used in the roof frame in the form of cable connections with steel structures. Suspended structural roof frames are often used for large-span projects with large areas, such as gymnasiums, stadiums, etc., so this structure is extremely necessary and indispensable.

6. Dome structure

A prefabricated steel arch structure is correctly understood as an arch-shaped steel structure. The advantage of this structure is high visual stimulation, creating sympathy and connection that the investor or business wants to convey. Through architectural language, arch structures are often exploited for their functions in community projects, environmentally friendly projects and highly artistic aesthetics.

PRODUCT STANDARDS

EN 1090-1:2009+A1:2011
EN ISO 3834-2:2021
ASME U Stamp, ASME S Stamp
H-Grade
CWB W47.1
AISC
ISO 9001:2015
ISO 14001:2015
ISO 45001:2018

PHYSICAL PROPERTIES OF THE PRODUCT

Dai Dung's steel structure products always ensure optimal technical characteristics to meet customer needs:

- Compact structure helps shorten progress during construction: construction time, but ensuring quality will save significant resources and costs.
- Flexible in disassembly: Flexible connection, easy to transport and erect: steel structure is like Lego pieces, the connection method must be flexible so that the pieces can be merged or disassembled both conveniently and when moving, you also need to be flexible in packing arrangements.
- High durability: Strong and durable over the years; the durability of steel structures is proven through supporting objects and coatings to withstand weather and harsh environments, especially near-sea projects, offshore port ships, drilling rigs, and petrochemical projects at sea.
- High stability and safety.

ADDITIONAL TECHNICAL INFORMATION

Further information can be found at www.daidung.com.

PRODUCT RAW MATERIAL COMPOSITION

Product components	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/product
Steel plate, shape steel, tube steel	0.9865	0	0	0
Welding consumables	0.0086	0	0	0
Paint material	0.0049	0	0	0
Sum	1.0000	0	0	0

Packaging Material	Weight, kg	Weight-% (versus the product)	Biogenic carbon, kg CO2e/product	Biogenic material, kg C/product
Wood dunnage	0.0160	1.60	1.16E-04	3.18E-05
Plastic	0.0004	0.04	0	0
Sum	0.0164	1.64	1.16E-04	3.18E-05

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	99.5	Vietnam, Singapore, Australia, China, Japan, Korea
Minerals	0	N/A
Fossil materials	0.5	Vietnam
Bio-based materials	0	N/A

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0.1 % (1000 ppm).

PRODUCT LIFE-CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

The production of steel structure products begins with the preliminary processing of raw steel, such as low alloyed steel (steel plate, shape steel, tube steel, etc.) by cutting, drilling and punching holes into initial components. Next, rough assembly is performed to shape the components, then completed assembly of the components by finishing welding to ensure they are firmly linked together. The finished product (after QC staff checked) meets the drawing requirements and technical specifications are cleaned the surface before being painted. Finished products are steel structures that meet the customer's quality requirements and will be packaged by wrapping PE film to protect the edges and delivered on wood.

Manufacturing waste includes excess steel that is not utilized after cutting, which is sold as scrap for recycling. Contaminated steel is disposed of in landfills. Additionally, the painting and welding processes release emissions into the air (PM), solvent cause emissions to air (NMVOC); ancillary gases, in very small amounts, are released as carbon dioxide direct emissions to air.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation from the delivery of the final products to construction site (A4) is not considered in this study.

After the production of steel structures at the factory as well as the transportation of finished products to the construction site, there will be the erection stage (A5). The process of constructing and erecting steel structures is carried out in the following order: installing the main frame for the building, proceeding with roofing, walling, etc., and finally inspecting and handing over the project.
Losses during installation are negligible. Energy for diesel machinery during installation estimated to be 0,01 kWh per 1 kg of product.
A5 includes the disposal of packaging materials such as wood pallets, packaging film, and PE strapping, all of which are sent to landfill.

PRODUCT USE AND MAINTENANCE (B1-B7)

Impacts in B1-B7 stage have not been studied and not considered in this EPD.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

End of life stage includes deconstruction/demolition (C1), transport to waste processing (C2), waste processing for reuse, recovery and/or recycling (C3) and disposal (C4).

Steel is the ultimate recyclable material. Steel structure products, when dismantled or destroyed, still retain their nature as steel without being transformed into another type. Steel structures are easy to reuse and quite easy to recycle. Steel has a very high level of recycling – typically up to 90% of all steel used in buildings and in end-of-life items is recycled into new

steel to create new products and prolong its lifespan.
Demolition is assumed to take 0.01 kWh/kg of element. It is assumed that 100% of waste is collected (Module C1).

The transport to the disposal of the materials and landfill is estimated as 100 km. (Module C2).

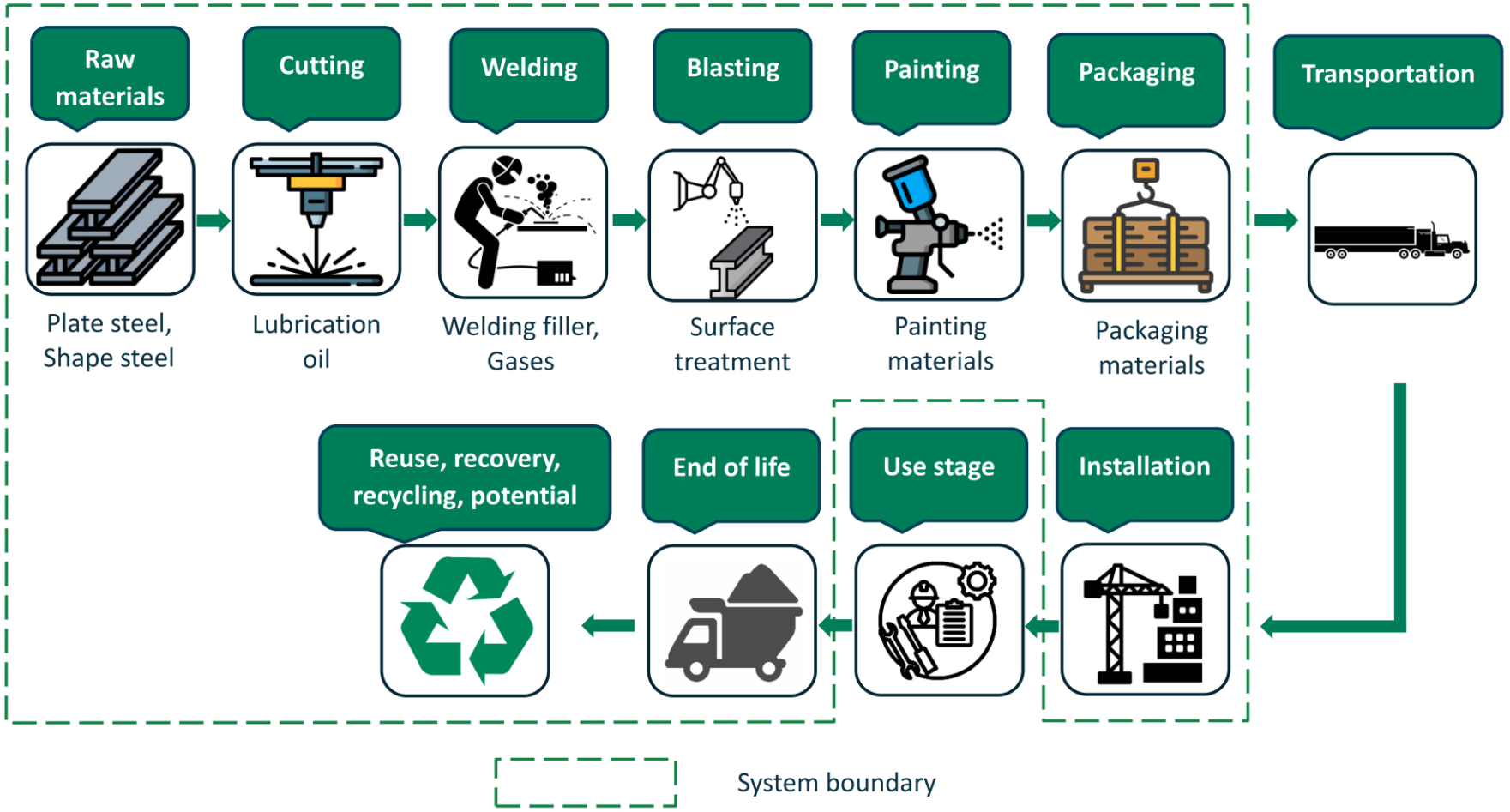
85% of steel is assumed to be recycled, with the remaining 15% landfilled according to World Steel Association, 2020 (Module C3 & C4).

Steel recycling benefits the environment by reducing waste and water and air pollution. At the same time, it also helps reduce the cost of producing new raw materials (Module D).

MANUFACTURING PROCESS

The EPD covers modules A1–A3, C1–C4, D and optional module A5 in accordance with ISO14025:2006 and EN 15804:2012+A2:2019/AC:2021.

Modules A4 and B1-B7 have not been included due to the inability to measure transportation data and predict how the material will be used in the use stage.



LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2023 (01/10/2022 - 30/09/2023)

DECLARED UNIT

Declared unit	1 kg steel structures
Mass per declared unit	1 kg

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the Standards and PCR. For non-mandatory processes, only housekeeping process (electric vacuum cleaners used for collecting tiny steel scraps and dust) is excluded. For non-mandatory modules, the study excludes A4 and B1-B7.
The study does not exclude any hazardous materials or substances.

The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes for which data is available are included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total excluded input and output flows do not exceed 5% of energy usage or mass.

SYSTEM BOUNDARY

The scope of the EPD is cradle to gate with options, A5, and modules C1-C4, D.

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage		
	Raw materials	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
Modules declared	x	x	x	ND	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x		
Geography	VNM	VNM	VNM	-	VNM	-	-	-	-	-	-	-	VNM	VNM	VNM	VNM	VNM		
Share of specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-		

"X" = Modules declared; "ND" = Modules not declared.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.

In this study, as per EN 15804, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

Allocation used in Ecoinvent 3.8 environmental data sources follows the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804-standard.

For data sets in this study, the allocation of the inputs is generally carried out via the mass. The consumption and transportation of raw materials was allocated by mass ratio.

In this study one allocation occurs on steel structures production, in allocating the input and output, i.e. energy within the production site such as electricity and emission allocation is done via total production (with the unit as kg) of all products produced on an annual basis.

During the production process of steel structures, there are no other by-products produced from the production line, hence there is no occasion that requires allocation for multi-output processes.

For this project, there is only one production site. So, there is no allocation among plants.

DATABASE AND LCA SOFTWARE USED

Generic data for upstream and downstream processes use Ecoinvent 3.8 database and modelled by using One Click LCA software version 2024.
The study does not cover for environmental impacts from construction, production equipment, and other capital goods, as well as personnel-related impacts like transportation to and from work.

DATA QUALITY

The foreground data collected internally is based on yearly production amounts and extrapolations of measurements on specific machines and plants. Overall, the data quality can be described as good. The primary data collection has been done thoroughly.

UPSTREAM, CORE AND DOWNSTREAM PROCESS

The upstream process includes the production of raw materials, such as sorted scrap steel, and the generation of electricity and fuel gas, like natural gas. It also involves transporting raw and auxiliary materials from the supplier to the manufacturing plant, extracting water from sources like lakes and underground reserves, and conducting port activities such as unloading.
The core process involves marking low alloyed steel by cutting, drilling, and punching holes into initial components, as well as applying paints. It also includes the use of ancillary materials, packaging, utilities like waste collection and electricity substations, direct emissions to the environment, transportation to waste processing units, and waste processing by a registered third party for hazardous waste.
The downstream process encompasses port activities like product loading, transporting the product to customers, deconstruction and demolition, disposal, and the reuse, recovery, or recycling of end-of-life products. Additionally, it includes activities at the scrap yard, such as sorting, cutting, and shredding.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The results of modules A1-A3 should not be used without considering the results of module C, to ensure a comprehensive and accurate assessment of the product's life cycle. EN 15804 reference package based on EF 3.1.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804:2012+A2:2019/AC:2021, PEF

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	3.92E+00	2.01E-02	3.31E-03	9.39E-03	1.72E-02	7.91E-04	-8.14E-01
GWP – fossil	kg CO_2e	3.93E+00	3.68E-03	3.31E-03	9.38E-03	1.72E-02	7.90E-04	-8.14E-01
GWP – biogenic	kg CO_2e	-1.64E-02	1.64E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP – land use and land use change	kg CO_2e	3.91E-03	5.69E-07	3.30E-07	3.46E-06	1.90E-05	7.46E-07	4.50E-04
Ozone depletion potential	kg $CFC_{-11}e$	1.99E-07	7.95E-10	7.07E-10	2.16E-09	7.64E-10	3.20E-10	-2.24E-08
Acidification potential	mol H^+e	1.67E-02	3.65E-05	3.44E-05	3.97E-05	1.12E-04	7.43E-06	-3.24E-03
EP-freshwater[2)]	kg Pe	1.67E-04	1.56E-08	1.10E-08	7.68E-08	1.09E-06	8.28E-09	-2.67E-06
EP-marine	kg Ne	3.34E-03	1.64E-05	1.52E-05	1.18E-05	3.88E-05	2.57E-06	-9.41E-05
EP-terrestrial	mol Ne	3.63E-02	1.75E-04	1.67E-04	1.30E-04	3.17E-04	2.83E-05	-8.43E-03
POCP ("smog")[3)]	kg NMVOCe	1.78E-02	4.86E-05	4.59E-05	4.17E-05	1.02E-04	8.23E-06	-4.58E-03
ADP-minerals & metals[4,5)]	kg Sbe	3.21E-05	2.63E-09	1.68E-09	2.20E-08	5.90E-07	1.82E-09	-2.38E-05
ADP-fossil resources[4,5)]	MJ	5.36E+01	5.09E-02	4.45E-02	1.41E-01	1.38E-01	2.17E-02	-6.35E+00
Water use[5)]	m^3e deprived	1.84E+00	1.54E-04	1.20E-04	6.31E-04	3.23E-03	6.87E-05	2.86E-01

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3.07 to get PO_4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804:2012+A2:2019/AC:2021 disclaimer for Abiotic depletion and Water use. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804:2012+A2:2019/AC:2021, PEF

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidence	2.85E-07	9.69E-10	9.22E-10	1.08E-09	1.17E-08	1.50E-10	-4.13E-08
Ionizing radiation[6)]	kBq U235e	1.03E-01	2.35E-04	2.05E-04	6.71E-04	9.75E-04	9.80E-05	2.72E-02
Ecotoxicity (freshwater) [7)]	CTUe	1.01E+02	3.30E-02	2.68E-02	1.27E-01	2.35E+01	1.41E-02	-2.08E+01
Human toxicity, cancer[7)]	CTUh	1.94E-08	1.21E-12	1.03E-12	3.11E-12	1.91E-10	3.53E-13	7.66E-09
Human toxicity, non-cancer[7)]	CTUh	1.52E-07	2.55E-11	1.94E-11	1.25E-10	1.26E-09	9.24E-12	4.67E-08
SQP[7,8)]	-	1.54E+01	1.81E-02	5.79E-03	1.62E-01	7.19E-01	4.63E-02	-3.05E+00

6) EN 15804:2012+A2:2019/AC:2021 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator. 8) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
Renewable PER as energy[9)]	MJ	4.51E+00	3.55E-04	2.54E-04	1.59E-03	1.87E-02	1.88E-04	-8.93E-01
Renewable PER as material	MJ	1.50E-01	-1.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable PER	MJ	4.66E+00	-1.46E-01	2.54E-04	1.59E-03	1.87E-02	1.88E-04	-8.93E-01
Non-renewable PER as energy	MJ	5.74E+01	5.09E-02	4.45E-02	1.41E-01	1.38E-01	2.17E-02	-6.35E+00
Non-renewable PER as material	MJ	1.62E-01	-1.70E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable PER	MJ	5.76E+01	3.39E-02	4.45E-02	1.41E-01	1.38E-01	2.17E-02	-6.35E+00
Secondary materials	kg	7.34E-02	1.95E-05	1.74E-05	3.91E-05	2.47E-04	4.55E-06	5.30E-01
Renewable secondary fuels	MJ	2.78E-05	1.19E-07	5.70E-08	3.95E-07	2.05E-05	1.19E-07	-1.27E-04
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
Use of net fresh water	m^3	4.64E-02	7.31E-06	2.70E-06	1.83E-05	7.89E-05	2.37E-05	-2.15E-02

9) PER abbreviation stands for primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.26E-01	6.26E-05	5.96E-05	1.87E-04	1.41E-03	0.00E+00	-4.71E-01
Non-hazardous waste	kg	1.32E+00	1.68E-02	4.19E-04	3.07E-03	2.66E-02	1.50E-01	-1.34E+00
Radioactive waste	kg	1.23E-04	3.29E-07	3.13E-07	9.43E-07	4.44E-07	0.00E+00	5.11E-06

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
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
Materials for recycling	kg	1.24E-02	0.00E+00	0.00E+00	0.00E+00	8.50E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	5.75E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

Impact category	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-GHG[10)]	kg CO_2e	3.93E+00	3.68E-03	3.31E-03	9.38E-03	1.72E-02	7.90E-04	-8.14E-01

10) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition, the characterisation factors for the flows - CH_4 fossil, CH_4 biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 1.3.4 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019/AC:2021 except that the characterization factor for biogenic CO_2 is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity, low voltage, in Vietnam. Ecoinvent 3.8, year: 2021.
Electricity kg CO_2e / kWh	0.6
Electricity data source and quality	Electricity, photovoltaic, low voltage, World. Ecoinvent 3.8, year: 2021.
Electricity kg CO_2e / kWh	0.0766
Energy data source and quality	Market for propane (natural gas), burned in building machine, World. Ecoinvent 3.8, year: 2021.
Energy kg CO_2e / MJ	0.0898

Transport scenario documentation (A4)

Transportation from the delivery of the final products to construction site (A4) is not considered in this study.

Installation scenario documentation (A5)

Scenario parameter	Value
Installation resources	Diesel, burned in building machine, World. Ecoinvent 3.8, year: 2021. 0.33084 kg CO_2e/kWh Resource for installation: 0.01 kWh/kg steel
Installation waste	Treatment of waste wood, untreated, sanitary landfill: 0.0108 kg CO_2e / kg 0.01595 m^3 per declared unit of wood chips go to landfill
Installation waste	Treatment of waste plastic, mixture, sanitary landfill: 0.12 kg CO_2e / kg 0.00040 kg per declared unit of packaging film and PE strapping go to landfill
Vehicle type used for transport	Market for transport, freight, lorry >32 metric ton, EURO5
Assumptions for transportation	100 km
Capacity utilization	100 % of the capacity in volume

End of life scenario documentation

Scenario parameter	Value
Collection process	1 kg
Recovery process	0.85 kg for recycling Data source: Treatment of metal scrap, mixed, for recycling, unsorted, sorting: 0.0202 kg CO_2e / kg
Disposal	0.15 kg for final deposition Data source: Treatment of scrap steel, inert material landfill: 0.0053 kg CO_2e / kg
Vehicle type used for transport	Market for transport, freight, lorry >32 metric ton, EURO5
Assumptions for transportation	100 km
Capacity utilization	100 % of the capacity in volume

BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

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

Ecoinvent database v3.8 (2021) and One Click LCA database.

EN 15804:2012+A2:2019/AC:2021 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.

Int'l EPD System Construction products, PCR2019:14, version 1.3.4 (30.04.2024)

EPD International (2024). General Programme Instructions of the international EPD® system. Version 5.0.0 www.environdec.com.

World Steel Association (2020)

FOR FURTHER REFERENCE

Manufacturer	Dai Dung Metallic Manufacture Construction and Trade Corporation
EPD author	Nguyen Thi Huong Thu – GreenViet Green Building Consultancy
EPD verifier	Catarina Silva – PIEP - Innovation in Polymer Engineering
EPD program operator	The International EPD System
Background data	This EPD is based on Ecoinvent 3.8 (Allocation, cut-off, EN 15804) and One Click LCA databases
LCA software	The LCA and EPD have been created using One Click LCA EPD Generator for Metal-based products

ABOUT THE MANUFACTURER

Dai Dung Corporation is a pioneer and leading professional contractor in Viet Nam and the region, specializing in providing general contractor services and steel structure products for national and international key projects to meet the high technical requirements, ensuring safety, quality and progress.

Accordingly, the An Ha factory, including its four manufacturing workshops (AH1 - AH4) and office building, all meet LEED GOLD standards - Version 4. The DDC infrastructure also adheres to these standards, minimizing negative environmental impacts and enhancing quality of life. This makes DDC steel structure products a sustainable choice for partners and customers, contributing to environmental protection. Construction of the factory began in late 2017 and it officially commenced operations in 2019. With a workforce of over 2,000 professionally trained employees and certifications in ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 3834-2:2021, and the LEED GOLD factory system, An Ha factory meets the highest environmental standards.

Dai Dung Corporation has sufficient resources and systems to perform a complete package of service and product supply contracts, including but not limited to project management, consulting and design services, procurement, outsourcing, erection, completed and handed over to customers.

Services and products of the steel structure of Dai Dung Corporation focus on the following groups: Public Infrastructure, Heavy Industries – Energy, Light Industry, Transport System, Pipe, Pressure Tanks and other Mechanical Products, …
Dai Dung Corporation is gradually expanding various new products, especially super-long and super-heavy components for the renewable energy industry, renewable energy project development, infrastructure expansion and seaports to expand production scale.

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with EN 15804, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The background report (project report) for this EPD

Why does verification transparency matter? Read more online.

VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

EPD verification information	Answer
Independent EPD verifier	Catarina Silva - PIEP
EPD verification started on	2024-09-03
EPD verification completed on	2024-10-25
Approver of the EPD verifier	The International EPD System

Author & tool verification	Answer
EPD author	Nguyen Thi Huong Thu - GreenViet
EPD author training completion	2023-06-13
EPD Generator module	Metal-based products
Independent software verifier	Ugo Pretato and Elia Rillo - Studio Fieschi & Soci Srl.
Software verification date	2024-01-05

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not found any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of

- the data collected and used in the LCA calculations,
- the way the LCA-based calculations have been carried out,
- the presentation of environmental data in the EPD, and
- other additional environmental information, as present

with respect to the procedural and methodological requirements in ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Catarina Silva - PIEP - Innovation in Polymer Engineering

VERIFICATION AND REGISTRATION (INTERNATIONAL EPD SYSTEM)

ISO standard and CEN standard EN 15804 serves as the core Product Category Rules (PCR)	
PCR	PCR 2019:14 Construction products, version 1.3.4
PCR review was conducted by:	The Technical Committee of the International EPD® System. See 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.
EPD verification	Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier ☐ EPD verification by an accredited certification body ☐ EPD verification by EPD Process Certification
Third party verifier	Catarina Silva - PIEP - Innovation in Polymer Engineering
	Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up during EPD validity involves third party verifier	☐ yes ☒ no

CONTACT INFORMATION

EPD Owner

Dai Dung Metallic Manufacture Construction and Trade Corporation
Lot No.38, Zone C, D1 Street, An Ha Industrial Park, Pham Van Hai Commune, Binh Chanh District, Ho Chi Minh City, Vietnam

Contact: sales@daidung.vn
Website: www.daidung.com

LCA Practitioner

GreenViet Green Building Consultancy Company Ltd.
No. 19, Street 46, Thao Dien Ward, Thu Duc City, Ho Chi Minh City, Vietnam

Contact: thunguyen@greenviet.net
Website: www.greenviet.net

Programme Operator

EPD International AB
Box 210 60, SE-100 31 Stockholm, Sweden,

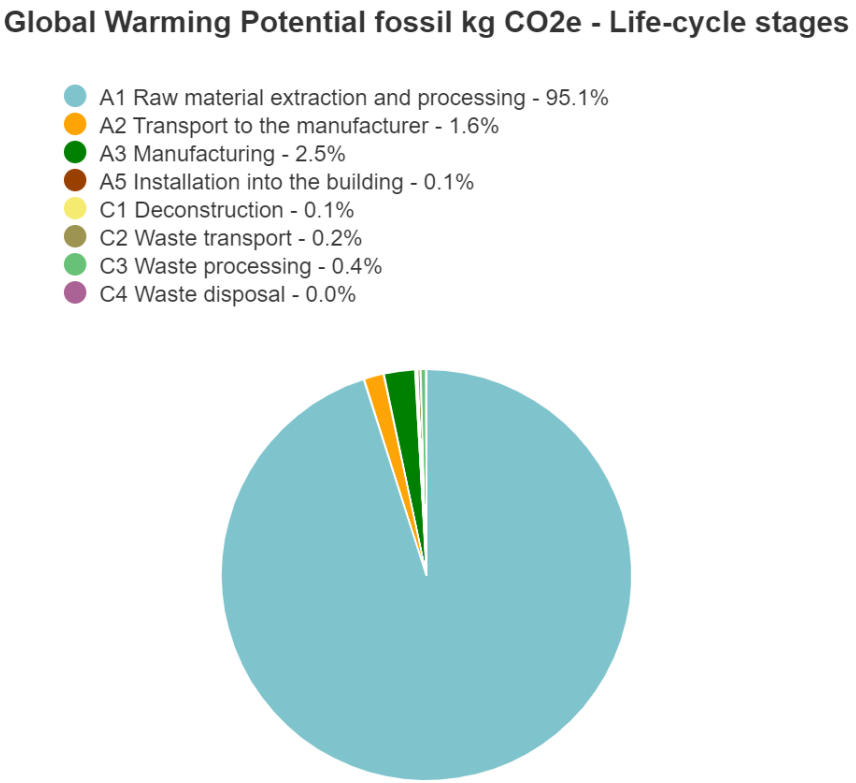
Contact: info@environdec.com
Website: www.environdec.com

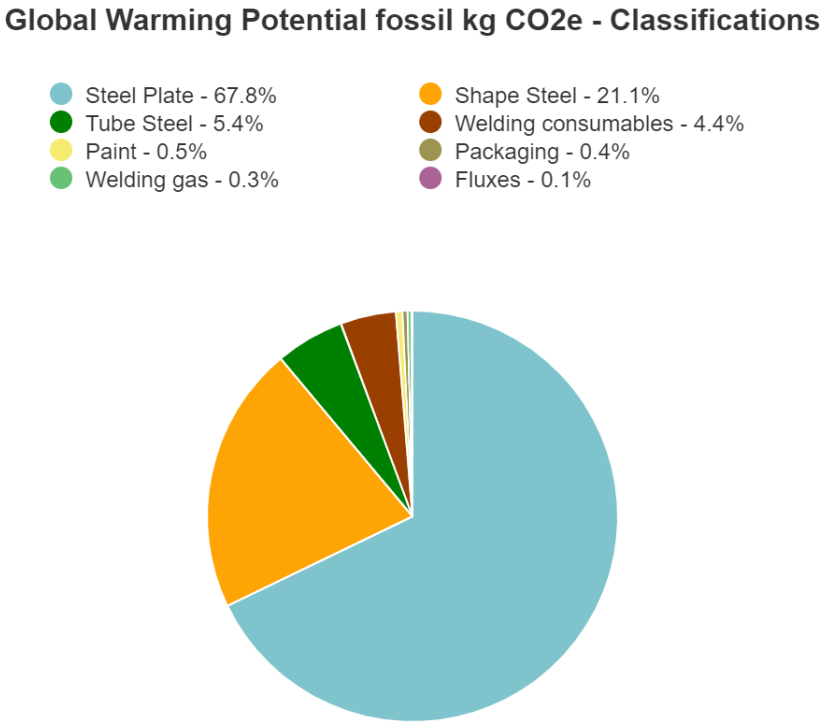
EPD Regional Hub

Regional Hub EPD Southeast Asia
Kencana Tower Level M, Business Park Kebon Jeruk,
Jl Raya Meruya Ilir No. 88,
West Jakarta 11620, Indonesia

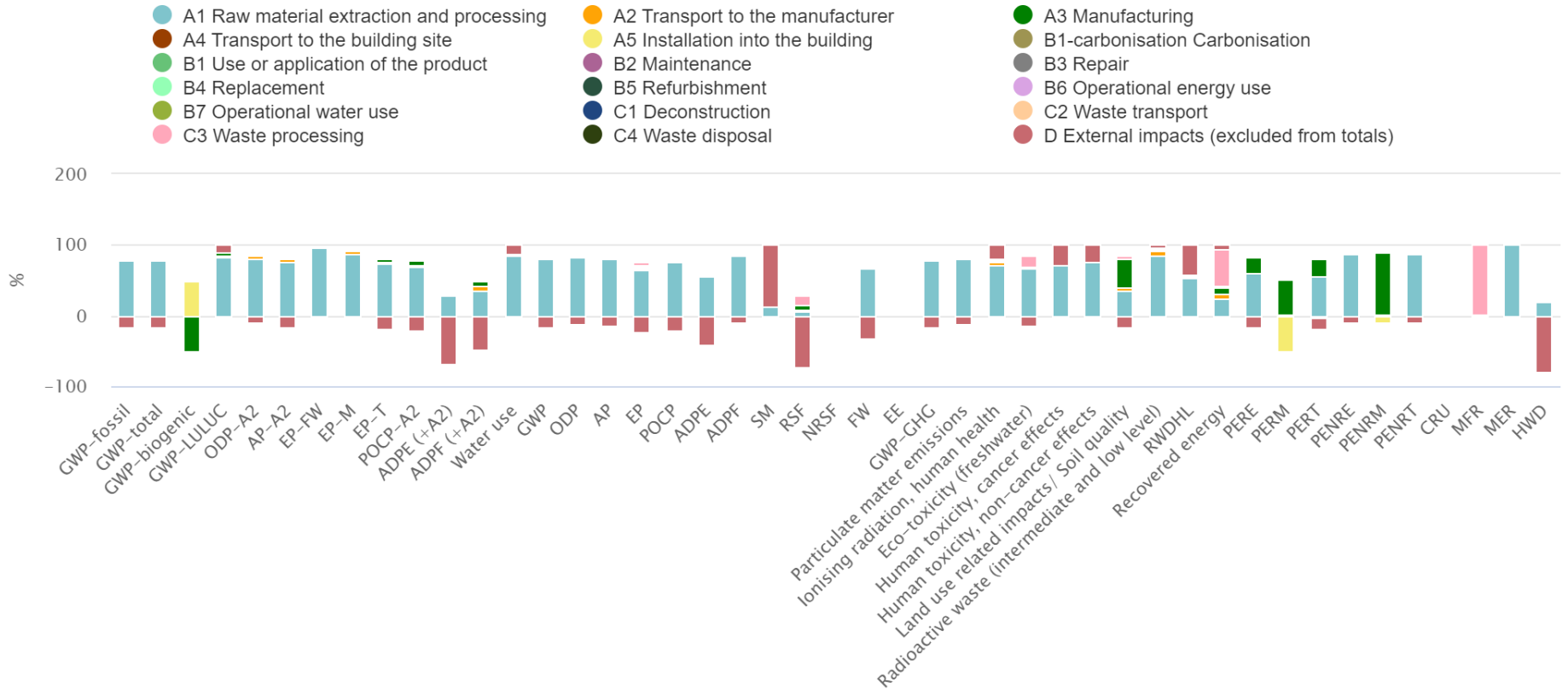
Contact: admin@epd-southeastasia.com
Website: www.epd-southeastasia.com

ANNEX : LIFE-CYCLE ASSESSMENT RESULT VISUALIZATION




Global Warming Potential fossil kg CO2e - Classifications
Steel Plate - 67.8%
Shape Steel - 21.1%
Tube Steel - 5.4%
Welding consumables - 4.4%
Paint - 0.5%
Packaging - 0.4%
Welding gas - 0.3%
Fluxes - 0.1%

Life-cycle impacts by stage as stacked columns



Life-cycle impacts by material as stacked columns