

## ENVIRONMENTAL PRODUCT DECLARATION

# STEEL BARS FOR CONCRETE REINFORCED

EPD REPORT



STEEL BARS FOR CONCRETE REINFORCED : widely applied in building structure and public construction, as well as other industrial structures

 TUNG HO STEEL ENTERPRISE CORP.

From its beginnings in “Tung Ho Hang” to today's Tung Ho Steel Enterprise Corporation, the company has always made trustworthiness the company's spiritual essence in its business. The company's core business values and objectives are embodied in the pursuit of exceptional contributions to society.

Trustworthiness does not merely represent the company's trustworthiness in relation to outside parties, customers, and society, but also signifies trustworthiness in its employees and in itself.

In response to global warming, in order to effectively mitigate the impacts of climate change, Tung Ho Steel is actively promoting energy conservation and CO<sub>2</sub> reductions, as well as proactively disclosing the carbon footprint information for its products.

Through product carbon footprint inventory, it is possible to learn about the greenhouse gas emissions throughout a product's lifecycle. This enables effective problem identification and implementation of low-carbon and energy-conserving design philosophies to increase service competitiveness.



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According to  
ISO 14025 and EN 15804

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN ROAD NORTHBROOK, IL 60611	HTTPS://WWW.UL.COM/ HTTPS://SPOT.UL.COM/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	PROGRAM OPERATOR RULES V2.7 2022	
MANUFACTURER NAME AND ADDRESS	<p>TUNG HO STEEL ENTERPRISE CORP. Headquater 6F., No.9, Sec. 1, Chang-an E. Rd., Taipei City 10441, Taiwan <a href="https://www.tunghosteel.com/EN/HomeEg/Index">https://www.tunghosteel.com/EN/HomeEg/Index</a></p> <p>Site for which this EPD is representative: Daye Works Address: No. 54, Daye S. Rd., Xiaogang Dist., Kaohsiung City 812050, Taiwan Contact person: Lin, Shih-Yu k01lsyh@tunghosteel.com</p>	
DECLARATION NUMBER	4791877788.101.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	STEEL BARS FOR CONCRETE REINFORCED Declared Unit: 1 metric ton	
REFERENCE PCR AND VERSION NUMBER	Construction Products, PCR 2019:14 version 2.0.1	
DESCRIPTION OF PRODUCT APPLICATION/USE	Widely applied in building structure and public construction, as well as other industrial structures	
PRODUCT RSL DESCRIPTION (IF APPL.)	-	
MARKETS OF APPLICABILITY	Local and international	
DATE OF ISSUE	December 29, 2025	
PERIOD OF VALIDITY	December 29, 2030	
EPD TYPE	Product-specific	
RANGE OF DATASET VARIABILITY	Mean	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	2024	
LCA SOFTWARE & VERSION NUMBER	SimaPro 10.2.0.0	
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent 3 & EF database 3.1 & Ecoinvent system processes & USLCI+ & USLCI & Industry data 2.0	
LCIA METHODOLOGY & VERSION NUMBER	EN 15804 + A2 (adapted) V1.03 / EDIP 2003 V1.07 / AWARE V1.07 / Cumulative Exergy Demand V1.09	
The PCR review was conducted by:	The International EPD System	
	LCA-lab srl, SAPI srl	
	info@environdec.com	
This declaration was independently verified in accordance with ISO 14025: 2006. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	Skye Tang, UL Solutions <i>Skye Tang.</i>	
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	C.C.Sustain ESG Solution Co., Ltd.	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Ik-Kim, Smart-Eco <i>Ik-Kim</i>	

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## LIMITATIONS

**Exclusions:** EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

**Accuracy of Results:** EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

**Comparability:** EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible\*. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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## 1. Product Definition and Information

### 1.1. Description of Company/Organization

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### 1.2. Product Description

#### Product Identification

Rebar refers to the building material used in reinforced concrete and prestressed reinforced concrete. The varieties of rebar produced by Tung Ho Steel include: Deformed Steel Re-Bar, which are primarily applied in building projects including high-rises, factories, public construction, and social welfare initiatives.





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## Product Specification

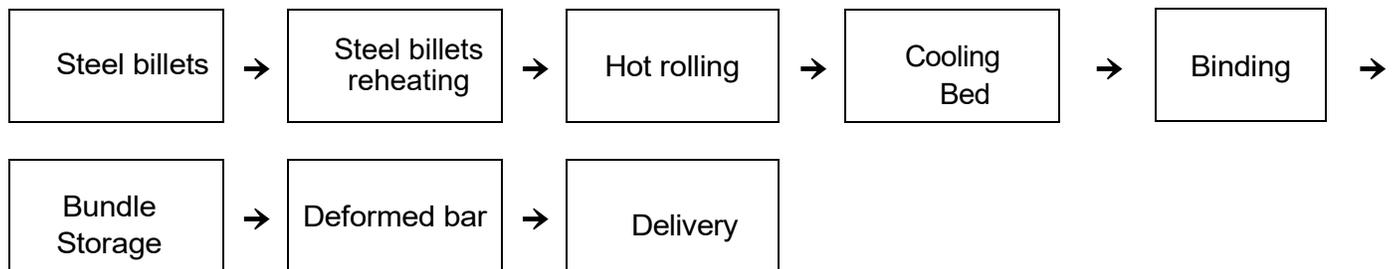
The products own CE MARK for LRV, and can be customized in accordance with Chinese National Standard(CNS) and American Society for Testing and Materials Standard(ASTM). For more details of technical specifications such as: dimensions, properties and steel grade of steel bars for concrete reinforced, please visit:  
<https://www.tunghosteel.com/EN/HomeEg/Product/Intro/2>

## Constructional data

Table 1. Constructional data

NAME	VALUE	UNIT
Minimum yield strength (für Bleche)	280	N/mm <sup>2</sup>
Minimum tensile strength (für Bleche)	420	N/mm <sup>2</sup>
Minimum elongation (für Bleche)	≥ 18	%
Tensile strength	≥ 440	N/mm <sup>2</sup>

## Flow Diagram





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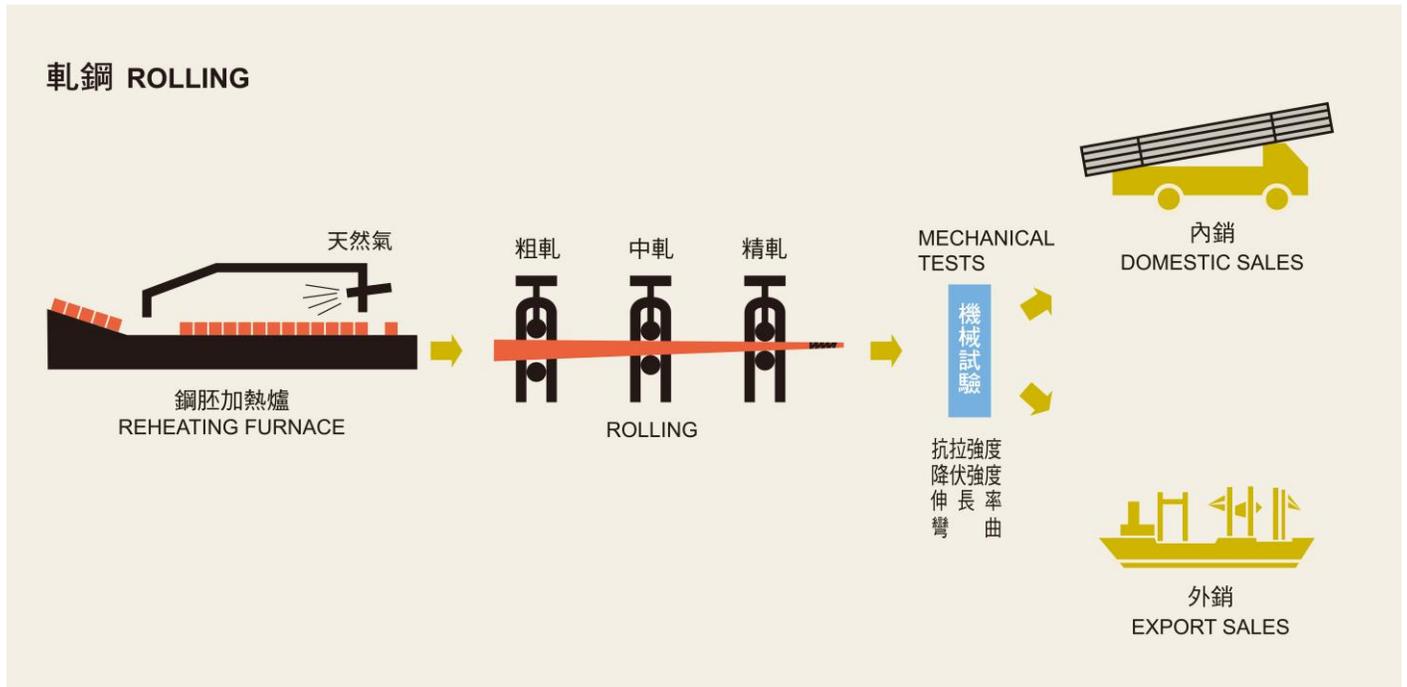


Figure 1. Flow diagram of STEEL BARS FOR CONCRETE REINFORCED manufacturing process

1.3. Application

Steel Bar widely applied in building structure and public construction, as well as other industrial structures.

1.4. Declaration of Methodological Framework

The Environmental Product Declaration (EPD) analysis is based on a cradle-to-gate system boundary, covering the life cycle stages from raw material extraction up to the factory gate, including production and transportation to the gate.

Given the structural function of the declared products, the use phase and end-of-life stages are excluded from the scope of this assessment.

Additional details regarding assumptions, cut-off criteria, and allocation procedures can be found in Sections 2.3, 2.4, and 2.8, respectively.

1.5. Technical Requirements

Daye Works currently has products that meet the standards of CNS 560 and ASTM A615/A706; there are no other newly developed products at this time.

Technical Data

NAME	VALUE	UNIT
Density	7,850	kg/m <sup>3</sup>



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Modulus of elasticity	2.1	N/mm <sup>2</sup>
Coefficient of thermal expansion	1.2	10 <sup>-5</sup> /°C
Thermal conductivity	58	W/(mK)
Melting point	1,493	°C
Electrical conductivity at 20°C	1,030	Ω <sup>-1</sup> m <sup>-1</sup>
Minimum yield strength (für low carbon steel)	280	N/mm <sup>2</sup>
Minimum tensile strength (für low carbon steel)	420	N/mm <sup>2</sup>
Minimum elongation (für Bleche)	≥ 18	%
Tensile strength	≥ 440	N/mm <sup>2</sup>

## 1.6. Properties of Declared Product as Delivered

Products can be produced according to the customer's specified length and diameter, and then packaged by binding with wire before being shipped to the customer.

## 1.7. Material Composition

The steel bars for concrete reinforced manufactured by Tung Ho are made from heated and rolled steel billets. The typical composition of the low alloyed is presented in Table 2.

Table 2. The composition of the low alloyed

ELEMENT	TYPICAL CONTENT
Iron	98.5%
Carbon	0.12%
Manganese	0.18%
Silicon	0.65%
Phosphorus	0.01%
Sulfur	0.01%
Copper	0.02%
Others(V, Nb, Al, Ni, Cr, Mo)	0.51%
Total	100%

The products do not contain any hazardous substances listed in the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC) exceeding 0.1% of the weight of the product.

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## 1.8. Manufacturing

Deformed bar production flow is: Steel billets → Steel billets reheating → Hot rolling → Cooling Bed → Binding → Bundle Storage → Deformed bar → Delivery.

## 1.9. Packaging

The steel bars for concrete reinforcement are packaged by binding with wire and applying product labels before being shipped to customers.

## 1.10. Transportation

The materials are delivered to the Tung Ho Steel Enterprise Corporation Daye Works's fabrication facility via land, ship, and air are accounted for in the model. Transportation distance to Tung Ho Steel Enterprise Corporation Daye Works is calculated separately based on the supplier location.

## 1.11. Product Installation

This inventory calculation covers stages A1 to A3, and the scope of the inventory does not include Product Installation.

## 1.12. Use

This inventory calculation covers stages A1 to A3, and the scope of the inventory does not include Use.

## 1.13. Reference Service Life and Estimated Building Service Life

This inventory calculation covers stages A1 to A3, and the scope of the inventory does not include Reference Service Life and Estimated Building Service Life.

## 1.14. Reuse, Recycling, and Energy Recovery

The steel bars for concrete reinforced is easy to recycling, but it is not suggested to be re-used as structural elements.

## 1.15. Disposal

The European Waste Index code for steel bars and coil for concrete reinforced is ewc-code-17-04-05– iron and steel.

## 2. Life Cycle Assessment Background Information

### 2.1. Functional or Declared Unit

The declared unit is one (1) metric ton of the steel bars for concrete reinforced (DEFORMED BAR).

Table 3. Declared Unit: 1 metric ton of the steel bars for concrete reinforced (DEFORMED BAR)

NAME	VALUE	UNIT
Declared unit	1	t
Thickness (des Bleches)	<a href="https://www.tunghosteel.com/EN/HomeEg/product/detail/1#tabs">https://www.tunghosteel.com/EN/HomeEg/product/detail/1#tabs</a>	mm

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Density	7850	kg/m <sup>3</sup>
Conversion factor to 1 kg	please visit: <a href="https://www.tunghosteel.com/EN/HomeEg/product/detail/1#tabs">https://www.tunghosteel.com/EN/HomeEg/product/detail/1#tabs</a>	-

## 2.2. System Boundary

This is a cradle to gate EPD. The following life cycle stages were considered:

A1 – Raw material supply.

A2 – Transport.

A3 – Manufacturing.

\*Not including “CONSTRUCT-ION PROCESS STAGE”, “USE STAGE” and “END OF LIFE STAGE”.

## 2.3. Estimates and Assumptions

The life cycle assessment does not include estimates and assumptions.

## 2.4. Cut-off Criteria

Life Cycle Inventory data for 100% of total inflows (mass and energy) to the upstream and core module have been included. Company infrastructure, employee’s transportation and administrative activities were kept out of the scope of this study.

## 2.5. Data Sources

The material, energy, transportation, waste treatment and air emission data collected are from the year 2024, and the major data source is from the ERP system of Miaoli Works. The LCA software used for this study is SimaPro 10.2.0.0, the LCI databases include Ecoinvent & U.S. LCI Database.

## 2.6. Data Quality

The collected data were checked for plausibility and consistency. Good data quality can be assumed. Data quality assessment per information module is provided in Tables 4, 5 and 6.

**Table 4. Raw material supply module data quality assessment**

DATA	TIME RELATED COVERAGE	GEOGRAPHICAL COVERAGE	TECHNOLOGICAL COVERAGE	DATA SOURCE	MEASURED OR ESTIMATED
Raw materials consumption	2024	Taiwan	Modern	Tung Ho	M
Distance of scrap transportation to recycling center	2024	Taiwan	Modern	Tung Ho	M
Energy and materials consumption of scrap processing in recycling center, as well as	2024	Taiwan	Modern	Tung Ho	M





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waste and generated emissions					
Fuels consumption and emissions related to electricity generation and distribution in Taiwan	2024	Taiwan	Modern	Tung Ho	M&E
Energy consumption and generation of emissions related to natural gas production in Taiwan	2024	Taiwan	Modern	Tung Ho	M&E
Energy and materials consumption to raw materials production for the steelworks	2024	Taiwan	Modern	Tung Ho	M&E

Table 5. Transportation module data quality assessment

DATA	TIME RELATED COVERAGE	GEOGRAPHICAL COVERAGE	TECHNOLOGICAL COVEGARE	DATA SOURCE	MEASURED OR ESTIMATED
Distance of scrap and others raw materials transportation	2024	Taiwan	Not Applicable	Tung Ho	M
Distance of auxiliary items transportation	2024	Taiwan	Not Applicable	Tung Ho	M
Distance of natural gas transportation	2024	Taiwa	Not Applicable	Tung Ho	M
Consumption of materials and energy and emissions related to the transport requirements of raw materials and auxiliary inputs	2024	Taiwan	World average	Ecoinvent	M&E

Table 6. Manufacture module data quality assessment

DATA	TIME RELATED COVERAGE	GEOGRAPHICAL COVERAGE	TECHNOLOGICAL COVEGARE	DATA SOURCE	MEASURED OR ESTIMATED
Production efficiency and generation of by-products	2024	Taiwan	Modern	Tung Ho	M
Consumption of auxiliary items	2024	Taiwan	Modern	Tung Ho	M&E
Energy and materials consumption of auxiliary items production	2024	Taiwan	Modern	Tung Ho	M&E
Waste generation	2024	Taiwan	Modern	Tung Ho	M
Waste treatment process	2024	Taiwan	Modern	Tung Ho	M&E
Air emissions and waste water generation	2024	Taiwan	Modern	Tung Ho	M&E
Distance of waste transportation	2024	Taiwan	Modern	Tung Ho	M&E
Requirements of waste transportation	2024	Taiwan	Modern	Tung Ho	M&E

2.7. Period under Review



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From January 1st to December 31st, 2024.

## 2.8. Allocation

There are no credits from recycling or energy recovery of packaging materials and production waste. On the other hand, this is a “cradle to gate” study, so there are no credits from recycling or energy recovery from the end of life of the product.

Table 7. Allocation

NUMBER	APPLICATION PRODUCTS	ALLOCATION PROPORTIONAL	ALLOCATION PROPORTIONAL(CALCULATED VALUE)	DISTRIBUTION METHOD	ALLOCATION PRINCIPLES DESCRIPTION
Allocation Principle 1	STEEL BARS FOR CONCRETE REINFORCED	3.55E-09	3.55E-09	1/Plate production	All for steel bars
Allocation Principle 2	STEEL BARS FOR CONCRETE REINFORCED	0.00E+00	0.00E+00	0	Target products not in use
Allocation Principle 3	STEEL BARS FOR CONCRETE REINFORCED	3.10E-09	3.10E-09	1/(Shaped production + Fixed-length production + Plate production)	Plant-wide production allocation

## 3. Life Cycle Assessment Results

Table 8. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

(X = included in LCA; MND = Module Not Declared).

### 3.1. Life Cycle Impact Assessment Results

Table 9. Impact Assessment Results



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EN15804 V1.03	UNIT (PER TON)	A1	A2	A3	TOTAL A1-A3
Global warming potential - total (GWP-total)	kg CO2 eq.	3.83E+02	2.31E+01	6.59E+01	4.72E+02
Global warming potential - fossil fuels (GWP-fossil)	kg CO2 eq.	3.49E+02	2.31E+01	6.58E+01	4.38E+02
Global warming potential - biogenic (GWP-biogenic)	kg CO2 eq.	3.27E+01	2.47E-02	9.68E-03	3.28E+01
Global warming potential - land use and land use change (GWP-luluc)	kg CO2 eq.	3.52E-01	1.41E-02	5.87E-02	4.25E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	7.06E-02	1.95E-08	3.28E-08	7.06E-02
Acidification potential, accumulated exceedance (AP)	mol H+ eq.	1.29E+00	5.81E-01	2.60E-01	2.13E+00
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	1.27E-03	9.48E-04	5.02E-02	5.24E-02
Eutrophication potential - marine (EP-marine)	kg N eq.	2.54E-01	1.42E-01	5.40E-02	4.50E-01
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	2.72E+00	1.58E+00	4.74E-01	4.77E+00
Photochemical ozone creation potential (POCP)	kg NMVOC eq.	8.66E-01	4.14E-01	1.36E-01	1.42E+00
Abiotic depletion potential - non-fossil resources (ADPE)	kg Sb eq.	1.55E-02	4.27E-05	3.58E-05	1.55E-02
Abiotic depletion potential - fossil resources (ADPF)	MJ, net calorific value	7.12E+03	3.14E+02	8.50E+02	8.29E+03
Water (user) deprivation potential (WDP)	m3 world eq. deprived	4.63E+02	6.96E-01	1.85E+01	4.82E+02
Global warming potential (GWP-GHG)	kg CO2 eq.	3.50E+02	2.31E+01	6.59E+01	4.39E+02

## 3.2. Life Cycle Inventory Results

Table 10. Additional voluntary environmental impact indicators (OPTIONAL)

PARAMETER	UNIT (PER TON)	A1	A2	A3	A1-A3
Particulate matter emissions (PM)	Disease incidence	1.61E-05	1.09E-06	8.27E-07	1.80E-05
Ionizing radiation, human health (IRP)	kBq U235 eq.	2.20E+04	1.48E+00	1.02E+01	2.20E+04
Eco-toxicity - freshwater (ETP-fw)	CTUe	1.69E+03	8.08E+01	1.55E+02	1.92E+03
Human toxicity, cancer effect (HTP-c)	CTUh	4.49E-03	2.74E-09	1.89E-09	4.49E-03
Human toxicity, non-cancer effects (HTP-nc)	CTUh	4.30E-04	4.71E-09	9.02E-09	4.30E-04
Land use related impacts/Soil quality (SQP)	dimensionless	4.40E+02	1.08E+02	7.39E+01	6.21E+02

Table 11. Resource Use



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PARAMETER	UNIT (PER TON)	A1	A2	A3	A1-A3
Use of renewable primary energy as energy carrier (PERE)	MJ, net calorific value	1.27E+03	2.85E+00	1.40E+01	1.28E+03
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	2.41E+03	1.24E+00	2.09E+01	2.43E+03
Total use of renewable primary energy (PERT)	MJ, net calorific value	3.68E+03	4.09E+00	3.49E+01	3.72E+03
Use of non renewable primary energy as energy carrier (PENRE)	MJ, net calorific value	7.13E+03	3.36E+02	9.07E+02	8.38E+03
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	1.47E+02	3.17E+00	1.36E+00	1.52E+02
Total use of non renewable primary energy resource (PENRT)	MJ, net calorific value	5.91E+03	3.40E+02	4.56E+01	6.30E+03
Use of secondary material (SM)	kg	0.00E+00	1.89E+03	4.81E+00	1.90E+03
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE (recovered energy)	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m3	4.60E+02	7.26E-01	1.86E+01	4.80E+02

Table 12. Output Flows and Waste Categories

PARAMETER	UNIT (PER TON)	A1	A2	A3	A1-A3
Hazardous waste disposed (HWD)	kg	1.30E-03	4.35E-04	4.06E-04	2.14E-03
Non-hazardous waste disposed (NHWD)	kg	5.85E-01	6.77E+00	3.67E+00	1.10E+01
HLRW(High-level radioactive waste, conditioned, to final repository)	[kg] or [m3]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ILLRW(Intermediate- and low-level radioactive waste, conditioned, to final repository)	[kg] or [m3]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed (RWD)	kg	2.73E-04	2.17E-03	2.61E-03	5.05E-03
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electrical energy (EEE)	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy (EET)	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 13. Carbon Emissions and Removals

PARAMETER	UNIT (PER TON)	A1	A2	A3	A1-A3
BCRP( Biogenic Carbon Removal from Product)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP (Biogenic Carbon Emission from Product)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK (Biogenic Carbon Removal from Packaging)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK (Biogenic Carbon Emission from Packaging)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00





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BCEW(Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE (Calcination Carbon Emissions)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR (Carbonation Carbon Removals)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR (Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes)	[kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## 4. LCA Interpretation

The highest proportion of GWP-total(Global warming potential total) impact of the product is module A1(raw material supply), 81.14%. The highest proportion of GWP-fossil(Global warming potential fossil fuels) impact of the product is module A1(raw material supply), 79.71%. The highest proportion of GWP-biogenic(Global warming potential biogenic) impact of the product is module A1(raw material supply), 99.90%. The highest proportion of GWP-luluc(GWP from land use and land use change) impact of the product is module A1(raw material supply), 82.87%.The highest proportion of ODP(Depletion potential of the stratospheric ozone layer) impact of the product is module A1(raw material supply), 100.00%. The highest proportion of AP(Acidification potential, accumulated exceedance) impact of the product is module A1(raw material supply), 60.49%.The highest proportion of EP-freshwater(Eutrophication, fraction of nutrients reaching freshwater end compartment) impact of the product is module A3 (Manufacturing), 95.77%.The highest proportion of EP-marine(Eutrophication, fraction of nutrients reaching marine end compartment) impact of the product is module A1(raw material supply), 56.40%.The highest proportion of EP-terrestrial(Eutrophication, accumulated exceedance) impact of the product is module A1(raw material supply), 56.94%.The highest proportion of POCP(Formation potential of tropospheric ozone photochemical oxidants) impact of the product is module A1(raw material supply), 61.14%. The highest proportion of ADP- minerals & metals(Abiotic depletion potential for non-fossil resources) of the product is module A1(raw material supply), 99.49%. The highest proportion of ADP-fossil(Abiotic depletion potential for fossil resources) of the product is module A1(raw material supply), 85.96%.The highest proportion of WDP(Water (user) deprivation potential, deprivation weighted water consumption) impact of the product is module A1(raw material supply), 96.02%.



# ENVIRONMENTAL PRODUCT DECLARATION



STEEL BARS FOR CONCRETE REINFORCED :  
widely applied in building structure and public construction, as well as other industrial structures

According to  
ISO 14025 and EN 15804

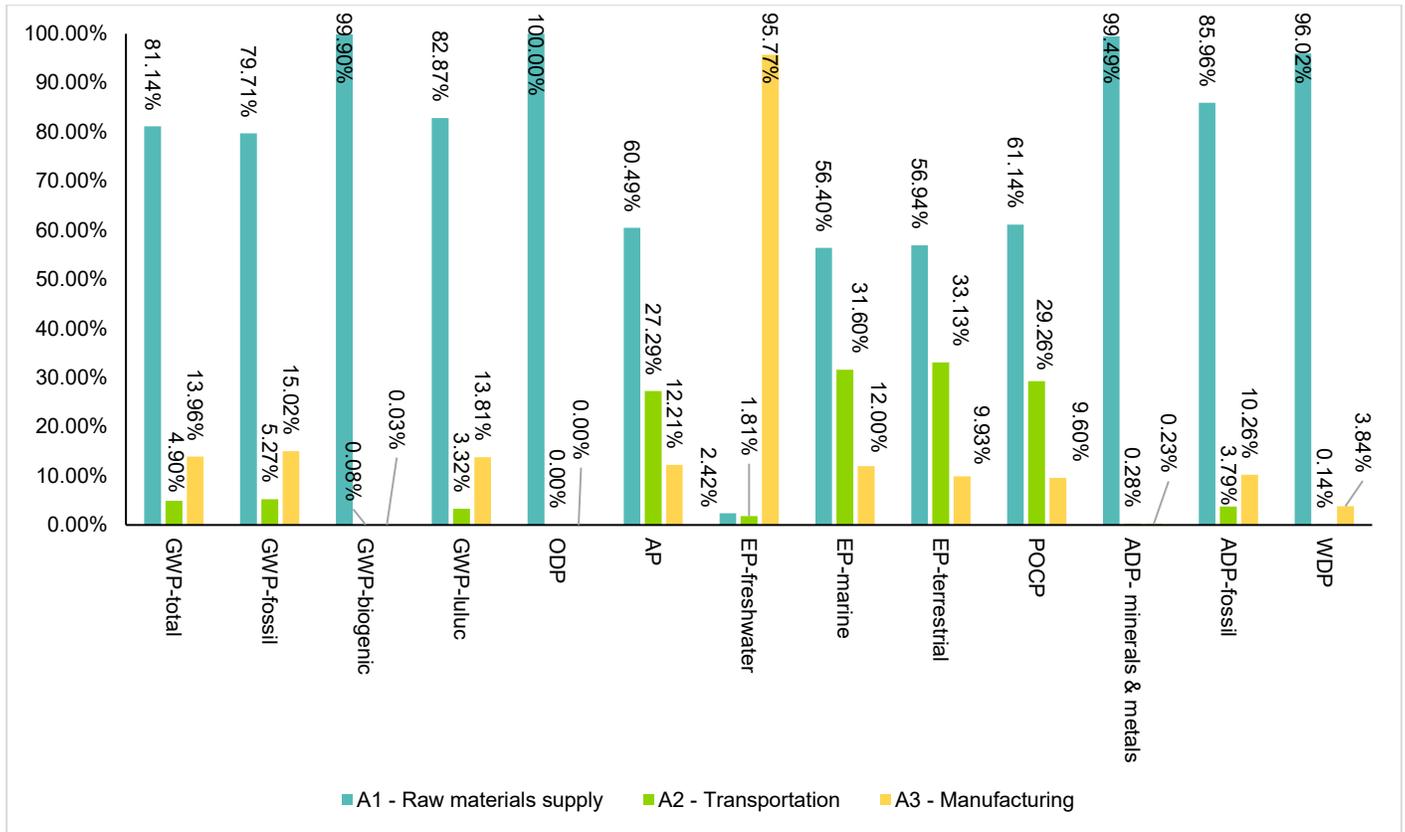


Figure 2. RESULTS OF THE LCA - ENVIRONMENTAL IMPACT

## Sensitivity Check

The study considered sensitivities of most uncertain and significant aspects of the data set, including “input of Steel Bloom(DM2)”, “transportation distance of overseas scrap (DM2)” and “in put of the other electricity thermal power”. After adjusting 20% on each item and check the changes of each LCA result, the results of sensitivity check is as shown on the tables below.

Table 14. Sensitivity Analysis for Stage A1

IMPACT CATEGORY	ITEM OF SENSITIVITY CHECK	THE CURRENT LCA RESULT	THE LCA RESULT AFTER ADJUSTING 20% ON INPUT OF STEEL BLOOM(DM2)	SENSITIVITY(%)
GWP-total(Global warming potential total)	Steel Bloom(DM2)	4.72E+02	5.30E+02	12.34%
GWP-fossil(Global warming potential fossil fuels)	Steel Bloom(DM2)	4.38E+02	4.91E+02	12.05%



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GWP-biogenic(Global warming potential biogenic)	Steel Bloom(DM2)	3.28E+01	3.80E+01	16.07%
GWP-luluc(GWP from land use and land use change)	Steel Bloom(DM2)	4.25E-01	4.81E-01	13.04%
ODP(Depletion potential of the stratospheric ozone layer)	Steel Bloom(DM2)	7.06E-02	7.06E-02	0.00%
AP(Acidification potential, accumulated exceedance)	Steel Bloom(DM2)	2.13E+00	2.32E+00	9.09%
EP-freshwater(Eutrophication, fraction of nutrients reaching freshwater end compartment)	Steel Bloom(DM2)	5.24E-02	5.25E-02	0.15%
EP-marine(Eutrophication, fraction of nutrients reaching marine end compartment)	Steel Bloom(DM2)	4.50E-01	4.89E-01	8.64%
EP-terrestrial(Eutrophication, accumulated exceedance)	Steel Bloom(DM2)	4.77E+00	5.19E+00	8.77%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	Steel Bloom(DM2)	1.42E+00	1.54E+00	8.81%
ADP- minerals & metals(Abiotic depletion potential for non-fossil resources)	Steel Bloom(DM2)	1.55E-02	1.56E-02	0.10%
ADP-fossil(Abiotic depletion potential for fossil resources)	Steel Bloom(DM2)	8.29E+03	9.22E+03	11.22%
WDP(Water (user) deprivation potential, deprivationweighted water consumption)	Steel Bloom(DM2)	4.82E+02	5.59E+02	15.95%

Table 15. Sensitivity Analysis for Stage A2

IMPACT CATEGORY	ITEM OF SENSITIVITY CHECK	THE CURRENT LCA RESULT	THE LCA RESULT AFTER ADJUSTING 20% ON THE SEA TRANSPORTATION DISTANCE OF SCRAP(DM2)	SENSITIVITY(%)
GWP-total(Global warming potential total)	Sea Transportation distance of Scrap(DM2)	4.72E+02	4.75E+02	0.67%

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GWP-fossil(Global warming potential fossil fuels)	Sea Transportation distance of Scrap(DM2)	4.38E+02	4.42E+02	0.72%
GWP-biogenic(Global warming potential biogenic)	Sea Transportation distance of Scrap(DM2)	3.28E+01	3.28E+01	0.00%
GWP-luluc(GWP from land use and land use change)	Sea Transportation distance of Scrap(DM2)	4.25E-01	4.27E-01	0.51%
ODP(Depletion potential of the stratospheric ozone layer)	Sea Transportation distance of Scrap(DM2)	7.06E-02	7.06E-02	0.00%
AP(Acidification potential, accumulated exceedance)	Sea Transportation distance of Scrap(DM2)	2.13E+00	2.23E+00	4.88%
EP-freshwater(Eutrophication, fraction of nutrients reaching freshwater end compartment)	Sea Transportation distance of Scrap(DM2)	5.24E-02	5.25E-02	0.19%
EP-marine(Eutrophication, fraction of nutrients reaching marine end compartment)	Sea Transportation distance of Scrap(DM2)	4.50E-01	4.75E-01	5.67%
EP-terrestrial(Eutrophication, accumulated exceedance)	Sea Transportation distance of Scrap(DM2)	4.77E+00	5.05E+00	5.95%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	Sea Transportation distance of Scrap(DM2)	1.42E+00	1.49E+00	5.19%
ADP- minerals & metals(Abiotic depletion potential for non-fossil resources)	Sea Transportation distance of Scrap(DM2)	1.55E-02	1.55E-02	0.03%
ADP-fossil(Abiotic depletion potential for fossil resources)	Sea Transportation distance of Scrap(DM2)	8.29E+03	8.33E+03	0.49%
WDP(Water (user) deprivation potential, deprivationweighted water consumption)	Sea Transportation distance of Scrap(DM2)	4.82E+02	4.82E+02	0.01%

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Table 16. Sensitivity Analysis for Stage A3

IMPACT CATEGORY	ITEM OF SENSITIVITY CHECK	THE CURRENT LCA RESULT	THE LCA RESULT AFTER ADJUSTING 20% ON THE OTHER ELECTRICITY THERMAL POWER(PEE1)	SENSITIVITY(%)
GWP-total(Global warming potential total)	other electricity Thermal power (PEE1)	4.72E+02	4.84E+02	2.62%
GWP-fossil(Global warming potential fossil fuels)	other electricity Thermal power (PEE1)	4.38E+02	4.51E+02	2.82%
GWP-biogenic(Global warming potential biogenic)	other electricity Thermal power (PEE1)	3.28E+01	3.27E+01	-0.09%
GWP-luluc(GWP from land use and land use change)	other electricity Thermal power (PEE1)	4.25E-01	4.37E-01	2.74%
ODP(Depletion potential of the stratospheric ozone layer)	other electricity Thermal power (PEE1)	7.06E-02	7.06E-02	0.00%
AP(Acidification potential, accumulated exceedance)	other electricity Thermal power (PEE1)	2.13E+00	2.18E+00	2.34%
EP-freshwater(Eutrophication, fraction of nutrients reaching freshwater end compartment)	other electricity Thermal power (PEE1)	5.24E-02	6.24E-02	19.02%
EP-marine(Eutrophication, fraction of nutrients reaching marine end compartment)	other electricity Thermal power (PEE1)	4.50E-01	4.60E-01	2.22%
EP-terrestrial(Eutrophication, accumulated exceedance)	other electricity Thermal power (PEE1)	4.77E+00	4.86E+00	1.81%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	other electricity Thermal power (PEE1)	1.42E+00	1.44E+00	1.76%
ADP- minerals & metals(Abiotic depletion potential for non-fossil resources)	other electricity Thermal power (PEE1)	1.55E-02	1.55E-02	0.04%
ADP-fossil(Abiotic depletion potential for fossil resources)	other electricity Thermal power (PEE1)	8.29E+03	8.45E+03	2.00%



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WDP(Water (user) deprivation potential, deprivationweighted water consumption)	other electricity Thermal power (PEE1)	4.82E+02	4.84E+02	0.33%
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## 5. Additional Environmental Information

### 5.1. Environment and Health During Manufacturing

Tung Ho Steel Enterprise Corporation Daye Works is certified according to ISO14001 Environment Management System.

More information can be found at <https://www.tunghosteel.com/Home/Index>

### 5.2. Environment and Health During Installation

This inventory calculation covers stages A1 to A3, and the scope of the inventory does not include Environment and Health During Installation.

### 5.3. Extraordinary Effects

#### Fire

Special Fire Fighting Procedures - Do not use water on molten metal. Do not use Carbon Dioxide (CO2). Firefighters should not enter confined spaces without wearing NIOSH/MSHA approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

Unusual Fire or Explosion Hazards - Steel products do not present fire or explosion hazards under normal conditions. Any non-oxidized fine metal particles/ dust generated by grinding, sawing, abrasive blasting, or individual customer processes may produce materials that the customer should test for combustibility and other hazards in accordance with applicable regulations. High concentrations of combustible metallic fines in the air may present an explosion hazard.

#### Water

Not relevant

#### Mechanical Destruction

Not relevant

### 5.4. Delayed Emissions

No delayed emissions are expected from these products.

### 5.5. Environmental Activities and Certifications

In Kaohsiung, a center of heavy industry and manufacturing, Tung Ho Steel not only consistently optimizes product quality and customer services, but also pays significant attention to the construction of multiple environmental



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protection facilities, also has achieved remarkable outcomes.

Amid rising calls for environmental protection, how to implement the pursuit of environmental protection has become an important and inevitable topic for Taiwan and all companies to consider.

The environmental certifications verification obtained through an independent and fair review by a third-party international certification agency.

Certifications:

TUNG HO STEEL ENTERPRISE CORP. Daye Works is certified under ISO 14064, ISO 14067 Verification Statement, ISO 14001 for environmental management.

More information on TUNG HO STEEL ENTERPRISE CORP's certifications and environmental activities can be found at <https://www.tunghosteel.com>

## 5.6. Further Information

Additional information can be obtained from <https://www.tunghosteel.com>

## 6. Conclusion and Recommendation

This LCA Report has provided an assessment of the potential environmental impacts associated with the system boundary "cradle to gate", including module A1 (raw material supply) & module A2 (transportation) & module A3 (manufacturing). The LCA software used for this study is SimaPro 10.2.0.0, the LCI databases include Ecoinvent 3, EF database 3.1, Ecoinvent unit processes, Ecoinvent system processes, USLCI+, and LCA Database, and LCIA methodologies include EN 15804 + A2 Method version 1.03, EDIP2003 version 1.07, AWARE version 1.07, and Cumulative Exergy Demand method version 1.09.

The specific site of this study is located in Kaohsiung City, Taiwan. However, most of the databases we used as environmental impact factors are not local databases. In the future, if the local government can develop more databases of environmental impact factors, it will be very helpful for a more precise assessment of the potential environmental impacts. The study is not intended to support comparative assertions intended to be disclosed to the public.

## 7. References

### EN 15804

EN 15804:201204+A2 2019, Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products.

### ISO 14025

DIN EN ISO 14025:201110, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

### SimaPro

SimaPro 10.2.0.0, the LCI databases include Ecoinvent 3, EF database 3.1, Ecoinvent unit processes, Ecoinvent system processes, USLCI+, and USLCI. LCIA methodologies include EN 15804 + A2 Method version 1.03, EDIP2003 version 1.07, AWARE version 1.07, and Cumulative Exergy Demand method version 1.09.

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## Product Category Rules

Construction Products, PCR 2019:14 version 2.0.1

## 8. Study Commissioner



TUNG HO STEEL ENTERPRISE CORP.

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## 9. Photo Guidelines Study Commissioner LCA Practitioner



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