

ENVIRONMENTAL PRODUCT DECLARATION

STEEL ROOF AND FLOOR DECK

STEEL DECK INSTITUTE



Steel deck functions as the primary supporting surface for roofing materials and as form and/or positive reinforcement for concrete floor slabs.

This publication represents Steel Deck Institute's membership: ASC Steel Deck; Canam; Cordeck; DACS, Inc.; CSM Products and Solutions; Epic Metals Corp; Gooder-Henrichsen Co.; Intsel Steel East; Marlyn Steel Decks, Inc.; Miami Metal Deck; New Millennium Building Systems; OEG Building Materials; Roof Deck, Inc.; Seyco Deck; Sloan Supply Company, Inc.; Tri-State Decking, Inc.; Valley Joist; Verco Decking, Inc. (a NUCOR company); and Vulcraft (Nucor Corporation).



The Member Companies of the Steel Deck Institute (SDI) believe that the sustainability of the products that they manufacture compares quite favorably to those of other building material manufacturers. Because of this, the SDI has decided to create an Industry Average Environmental Product Declaration (EPD) for steel deck so that building designers and owners would be able to easily compare their products to other building materials.

The ability to recycle steel has long been recognized. However, it is not the only attribute that makes steel a sustainable material. The intent of this document is to fully demonstrate the sustainability of steel deck.





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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	General Program Instructions v.2.5 March 2020	
ASSOCIATION NAME AND ADDRESS	Steel Deck Institute P.O. Box 426, Glenshaw, PA 15116	
DECLARATION NUMBER	4789985146.101.1	
DECLARED PRODUCT & DECLARED UNIT	Steel roof and floor deck, 1 metric ton	
REFERENCE PCR AND VERSION NUMBER	Part A: Calculation Rules for the LCA and Requirements Project Report, (IBU/UL Environment, V3.2, 12.12.2018) and Part B: Designated Steel Construction Product EPD Requirements (UL Environment, V2.0, 08.26.2020).	
DESCRIPTION OF PRODUCT APPLICATION/USE	Steel deck used in construction	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	January 21, 2022	
PERIOD OF VALIDITY	5 years	
EPD TYPE	Industry average	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	2019-2020	
LCA SOFTWARE & VERSION NUMBER	GaBi v10	
LCI DATABASE(S) & VERSION NUMBER	GaBi 2021 (CUP 2021.1)	
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 + TRACI 2.1	

The sub-category PCR review was conducted by:

UL Environment

PCR Review Panel

epd@ul.com

This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017)

INTERNAL EXTERNAL

Cooper McCollum, UL Environment

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

Sphera Solutions Inc.

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:

Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

The environmental impact results of steel products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the steel product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Please refer to the results section for additional EPD comparability guidelines.

Environmental declarations from different programs (ISO 14025) may not be comparable.





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General Information

Description of Organization

Since 1939, the Steel Deck Institute (SDI) has provided uniform industry standards for the engineering, design, manufacture, and field usage of steel decks. The SDI is concerned with cold-formed steel products, with various configurations distinctive to individual manufacturers, used to support finished roofing materials or to serve as a permanent form and/or positive reinforcement for concrete floor slabs.

Members of the Institute are manufacturers of steel floor and roof decks. Associate members are manufacturers of products that are related to the use of steel decks.

Continuing SDI functions include preparation, review, and distribution of literature, referral of inquiries to appropriate sources, coordination of research and testing, and liaison with other construction industry associations on matters of common interest.

Participating Members

Several steel deck manufacturers contributed data for EPD development with production facilities within the United States, including: Alabama, Arizona, Arkansas, California, Florida, Illinois, Indiana, Nebraska, New Jersey, New York, South Carolina, Tennessee, Texas, and Virginia. The data collected represents over 85% of North American membership production. The SDI members that contributed to EPD development are: ASC Steel Deck, Canam, Cordeck, DACS, Inc., CSM Products and Solutions ; Epic Metals Corp, Gooder-Henrichsen Co., Intsel Steel East, Marlyn Steel Decks, Inc., Miami Metal Deck, New Millennium Building Systems, OEG Building Materials, Roof Deck, Inc., Seyco Deck, Sloan Supply Company, Inc., Tri-State Decking, Inc., Valley Joist, Verco Decking, Inc. (a NUCOR company), and Vulcraft (Nucor Corporation).

Product Description

Steel deck is typically manufactured by rolling or otherwise forming light gage steel coils into specific shapes. The coils are either galvanized or uncoated steel to which a coating of paint may be applied. Deck in this EPD represents product manufactured in North America from steel product produced in North America.

Typical steel roof and floor deck panels are 38 – 76 mm (1 ½” – 3”) in depth and are manufactured from 22 – 16 gage material. Greater depths and heavier material thicknesses are available. Floor deck panels that are used only as forms are typically shallower and are manufactured from lighter gage material.

Product Specification

Steel deck products are defined by the following standards.

- ANSI/SDI RD-2017 Standard for Steel Roof Deck
- ANSI/SDI NC-2017 Standard for Non-Composite Steel Floor Deck
- ANSI/SDI C-2017 Standard for Composite Steel Floor Deck-Slabs

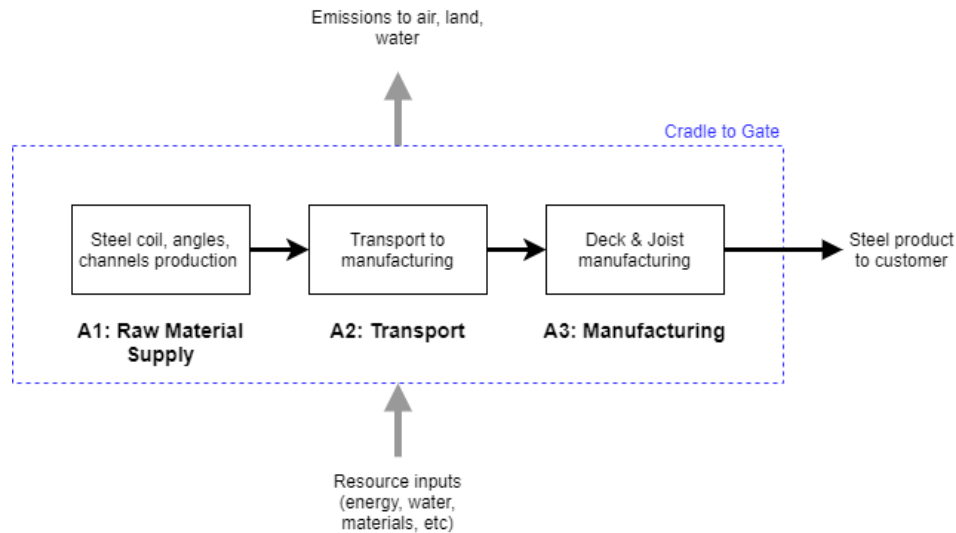




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Flow Diagram



Product Average

The data collected represents steel deck production in 2019 and 2020 by participating SDI members located throughout North America. Results are weighted according to production totals at participating facilities.

Application

Steel deck products are used as structural supports for building applications.

Material Composition

Steel deck is manufactured almost entirely from coated or galvanized steel coil, with a small amount of paint included. The products do not contain any hazardous substances according to the Resource Conservation and Recovery Act (RCRA), Subtitle 3. The products do not release dangerous substances to the environment, including indoor air emissions, gamma or ionizing radiation, or chemicals released to air or leached to water and soil.

Methodological Framework

Declared unit

The declared unit for this EPD is one metric ton of steel construction products. Note that comparison of EPD results on a mass basis alone is insufficient and should consider the technical performance of the product.





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System Boundary

This EPD is “cradle-to-gate” in scope. The life cycle stages included in the assessment represent the product stage (modules A1-A3) and include:

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
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
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

* X = module included, MND = module not declared

Allocation

No multi-output allocation was required in the foreground system of the study.

Allocation of background data (energy and materials) taken from the GaBi 2021 databases is documented online at <http://www.gabi-software.com/america/support/gabi/>. Background data for steelmaking from AISI and worldsteel use the system expansion allocation method for co-products from the steelmaking process.

Since the EPD does not cover the end-of-life of the products, end-of-life allocation is outside the scope of the study. Metal scrap from manufacturing (module A3) was balanced with the scrap demand of the raw materials module (A1) in order to calculate the net scrap input to module A1.

Under a cradle-to-gate system boundary, scrap inputs to the system are not associated with any upstream burden, and scrap produced during manufacturing is assumed to be at least the same quality as scrap inputs into steelmaking. Remelting of scrap to produce structural steel and other raw materials is accounted for within module A1 using upstream datasets.

Cut-off Rules

In lieu of arbitrary cut-off criteria, all available energy and material flow data were included in the model for processes within the system boundary.

In cases where no matching life cycle inventories were available to represent a flow, proxy data were applied based on conservative assumptions regarding environmental impacts.





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Data Sources

The LCA model was created using the GaBi 10 software system for life cycle engineering, developed by Sphera (Sphera, 2021). Background life cycle inventory data for raw materials and processes were obtained from the GaBi 2021 database (CUP 2021.1). Primary manufacturing data were provided by participating SDI member companies.

Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive internal review of the project-specific LCA models developed as well as the background data used. A full data quality assessment is documented in the background report.

Period Under Review

Primary data were collected for steel deck production during the years 2019 and 2020. Background data for steel coil production was taken from the AISI and worldsteel and represents steel production during 2017 and 2019 respectively. This analysis is intended to represent steel deck manufacturing in 2019.

Estimates and Assumptions

The steel deck inventory data was collected by participating SDI member companies to represent steel deck manufacturing in North America. Where inbound transportation data was incomplete, a distance of 500 miles by truck was used.

Proxy data were applied to some materials where no matching life cycle inventories were available as documented in the background report.

Technical Information and Scenarios

Manufacturing

Steel deck is manufactured by cold forming steel sheet into a repeating pattern of parallel ribs. The major input to the manufacturing process is the metal for the panel; however small amounts of process materials are needed, such as lubricants for the machines and welding electrodes. Energy is also needed to perform the manufacturing and move the materials.

Inbound Transportation

Inbound transportation distances and modes for steel and process materials were collected from each participating steel deck manufacturer.

Transportation

Transportation to the customer or construction site is outside the scope of this EPD.





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Product Installation

Installation is outside the scope of this EPD.

Use

Product use is outside the scope of this EPD.

Reuse, Recycling, and Energy Recovery

Product reuse, recycling, and incineration for energy recovery is outside the scope of this EPD.

Disposal

Product disposal is outside the scope of this EPD.

Environmental Indicators Derived from LCA

North American life cycle impact assessment (LCIA) results are declared using TRACI 2.1 (Bare, 2012; EPA, 2012) methodology, with the exception of GWP which is reported using the IPCC AR5 (IPCC, 2013) methodology, excluding biogenic carbon. Primary energy use represents the lower heating value (LHV) a.k.a. net calorific value (NCV).

LCIA results are relative expressions and do not predict actual impacts, the exceeding of thresholds, safety margins or risks.

Table 1. LCIA results, per 1 metric ton

PARAMETER	UNIT	TOTAL	A1	A2	A3
GWP 100	kg CO ₂ eq.	2.32E+03	2.21E+03	4.95E+01	6.56E+01
ODP*	kg CFC 11 eq.	6.25E-10	2.33E-12	9.79E-15	6.23E-10
AP	kg SO ₂ eq.	4.82E+00	4.47E+00	2.70E-01	7.58E-02
EP	kg N eq.	2.53E-01	2.23E-01	2.44E-02	5.35E-03
SFP	kg O ₃ eq.	8.47E+01	7.61E+01	6.87E+00	1.73E+00
ADP _{fossil}	MJ surplus	1.89E+03	1.69E+03	9.19E+01	1.12E+02

* ODP has limited relevance due to the absence of ozone-depleting emissions in the LCI, particularly in the foreground system.

Comparability: comparison of the environmental performance of construction works and construction products using EPD information shall be based on the product’s use and impacts at the construction works level. In general, EPDs may not be used for comparability purposes when not considered in a construction works context. Given this PCR ensures products meet the same functional requirements, comparability is permissible provided the information given for such comparison is transparent and the limitations of comparability explained.”

When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.





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Table 2. Resource use results, per 1 metric ton

PARAMETER	UNIT	TOTAL	A1	A2	A3
RPR _E	MJ LHV	1.46E+03	1.37E+03	2.86E+01	5.85E+01
RPR _M	MJ LHV	-	-	-	-
NRPR _E	MJ LHV	2.80E+04	2.62E+04	6.94E+02	1.06E+03
NRPR _M	MJ LHV	1.23E+00	-	-	1.23E+00
SM	kg	3.65E+02	3.65E+02	-	2.59E-01
RSF	MJ LHV	-	-	-	-
NRSF	MJ LHV	-	-	-	-
RE	MJ LHV	-	-	-	-
FW	m ³	5.55E+00	5.23E+00	1.22E-01	2.02E-01

Table 3. Output flows and waste categories results, per 1 metric ton

PARAMETER	UNIT	TOTAL	A1	A2	A3
HWD	kg	5.89E-01	-	-	5.89E-01
NHWD	kg	1.19E-01	-	-	1.19E-01
HLRW	kg	9.90E-04	9.36E-04	2.34E-06	5.16E-05
ILLRW	kg	8.28E-01	7.83E-01	1.97E-03	4.31E-02
CRU	kg	-	-	-	-
MR	kg	1.27E+01	-	-	1.27E+01
MER	kg	-	-	-	-
EE	MJ LHV	-	-	-	-

Per the PCR, “industry average EPDs shall report information on the statistical distribution of results for all TRACI indicators”. The min and max results presented in Table 4 represent the facilities with the lowest (best) and highest (worst) impacts, respectively. Min and max facilities are determined for each impact category separately. The mean and median do not take production volumes across facilities into account (i.e., it is a calculation based on each individual facility as a data point), while the weighted average presented in Table 1 through Table 3 is calculated via production volume weightings reported by each participating facility.





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Table 4. Statistical distribution of LCIA results, per 1 metric ton

PARAMETER	UNIT	MIN (A1-A3)	MAX (A1-A3)	MAX/MIN RATIO (A1-A3)	MEAN (A1-A3)	MEDIAN (A1-A3)
GWP 100	kg CO ₂ eq.	1.60E+03	3.47E+03	2.17E+00	2.35E+03	2.30E+03
ODP	kg CFC 11 eq.	1.75E-12	9.70E-09	5.54E+03	5.73E-10	2.49E-12
AP	kg SO ₂ eq.	3.41E+00	7.40E+00	2.17E+00	4.87E+00	4.74E+00
EP	kg N eq.	1.87E-01	4.03E-01	2.16E+00	2.56E-01	2.52E-01
SFP	kg O ₃ eq.	6.28E+01	1.36E+02	2.17E+00	8.57E+01	8.35E+01
ADP _{fossil}	MJ surplus	1.29E+03	2.80E+03	2.17E+00	1.92E+03	1.85E+03

Visualization of Life Cycle Impact Assessment

The relative contribution of each life cycle stages to the overall cradle-to-gate impacts are presented in Figure-1.

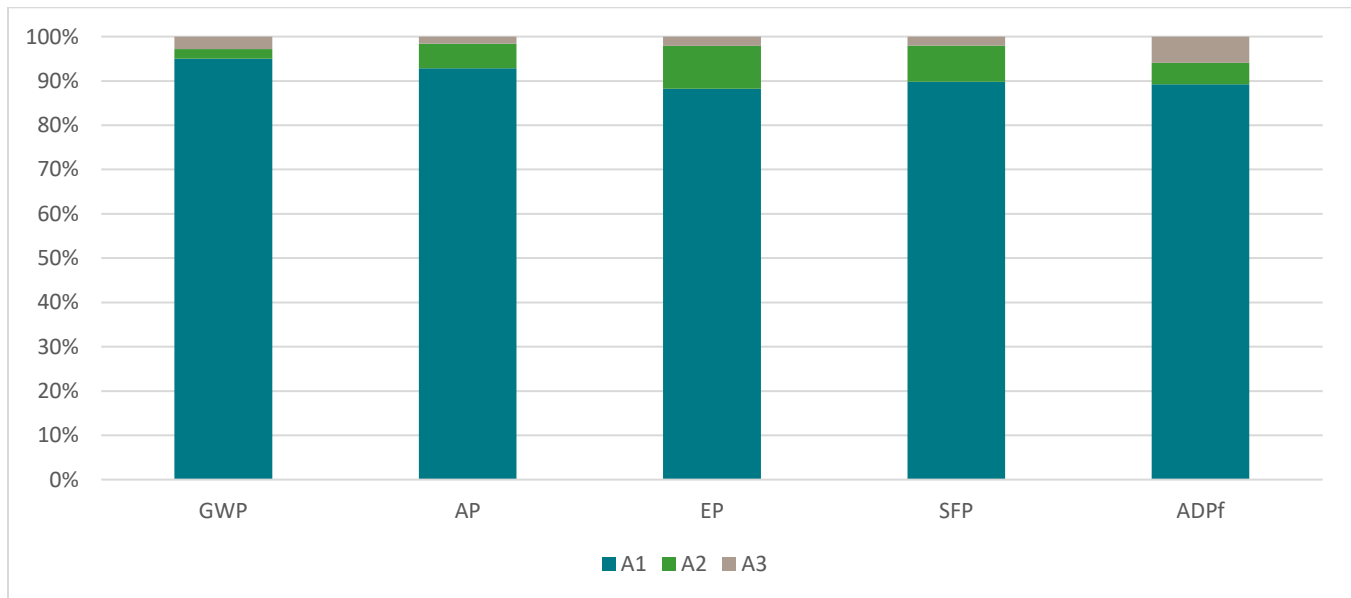


Figure 1: Relative contribution by life cycle stage for 1 metric ton of steel deck





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Interpretation

The cradle-to-gate potential environmental impacts of steel deck products are driven by upstream steel production (A1). Inbound transport to manufacturing (A2) and deck manufacturing (A3) contribute to potential environmental impacts on a smaller order of magnitude.

Additional Environmental Information

Further Information

Further information can be found on the Steel Deck Institute's website: www.sdi.org.

References

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