ENVIRONMENTAL PRODUCT DECLARATION

STEEL DECK

STEEL ROOF DECK
STEEL FLOOR DECK

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; Bushwick Metals, LLC; Canam; Cordeck; DACS, Inc.; Epic Metals Corp; Flexospan Steel Buildings, Inc.; Gooder-Henrichsen Co.; Marlyn Steel Decks, Inc.; NY Metal Supply, Inc.; New Millennium Building Systems; OEG Building Materials; Roof Deck, Inc.; Sloan Supply Company, Inc.; Tri-State Decking, Inc.; Valley Joist; Verco Decking, Inc.; and Vulcraft Group, Nucor Corporation.

STEEL DECK INSTITUTE sdi®

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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ENVIRONMENTAL PRODUCT DECLARATION

STEEL DECK INSTITUTE
STEEL ROOF AND FLOOR DECK

According to ISO 14025

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. 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, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	Steel Deck Institute
DECLARATION NUMBER	4786052957.101.1
DECLARED PRODUCT	Steel Roof and Floor Deck
REFERENCE PCR	SCS PCR for Designated Steel Construction Products, v1.0 May 2015
DATE OF ISSUE	December 15, 2015
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications

The PCR review was conducted by:	Review Panel Chair: Thomas Gloria SCS
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	 Wade Stout, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas Gloria, Industrial Ecology Consultants

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Product Definition

Association Description

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.

SDI's PURPOSE

SDI's purpose is three-fold:

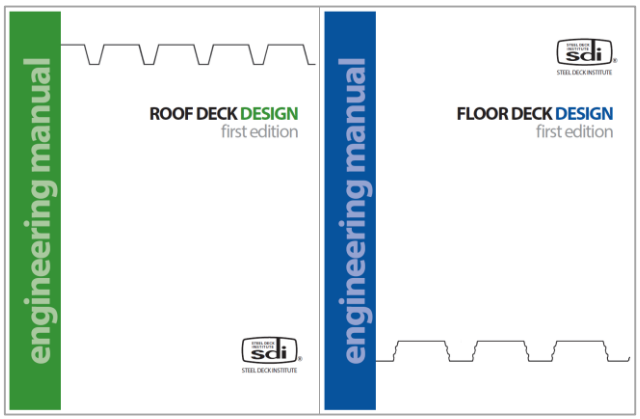
1. To develop steel decks that are engineered for structural soundness, that maintain consistent quality, that adapt to a wide range of designs and systems, and that are economical in both initial and life-cycle costs.
2. To initiate design and installation procedures that conform to good construction practices and that meet cost requirements.
3. To make this information readily accessible to designers and owners.

Participating Members

Eight manufacturers contributed data for EPD development, including Canam; DACS, Inc.; Epic Metals Corp; Marlyn Steel Decks, Inc.; New Millennium Building Systems; Roof Deck, Inc.; Verco Decking, Inc.; and Vulcraft Group, Nucor Corporation. Manufacturing locations within the United States included Alabama, Arizona, Arkansas, California, Florida, Illinois, Indiana, Nebraska, New Jersey, New York, Pennsylvania, South Carolina, Texas, and Virginia. Collectively, these manufacturers represent over 85% of North American membership production. Other SDI members contributed to EPD development and are represented in this publication. These members include ASC Steel Deck; Bushwick Metals, LLC; Cordeck; Flexospan Steel Buildings, Inc.; Gooder-Henrichsen Co; NY Metal Supply, Inc.; OEG Building Materials; Sloan Supply Company, Inc.; Tri-State Decking, Inc.; and Valley Joist.

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



Delivered Product Configurations

Typical steel roof and floor deck panels are 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.

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Application and Codes of Practice

ANSI/SDI RD-2010 Standard for Steel Roof Deck

ANSI/SDI NC-2010 Standard for Non-Composite Steel Floor Deck

ANSI/SDI C-2011 Standard for Composite Steel Floor Deck-Slabs

Additional information can be found on SDI's website at www.sdi.org

Life Cycle Stages

Steel joist life cycle stages and processes are summarized in the flow diagram shown in the figure below. Only the cradle-to-gate performance is considered in the analysis.

Raw Materials

Steel deck is manufactured almost entirely from coated or galvalvanized steel coil. They do not contain any materials or substances for which there exists a route to exposure that leads to humans or flora/fauna in the environment being exposed to said materials or substances at levels exceeding safe health thresholds.

Background datasets for steel production include cold-rolled coil and hot-dipped galvanized coil manufactured in North America, as well as coil coating data. Datasets are published by Worldsteel.

Inbound Transportation

Inbound transportation distances and modes for steel were collected from each manufacturer. Some manufacturers also provided distances and modes for ancillary manufacturing materials (e.g., lubricants and welding electrodes) and packaging. These materials, however, represent a small portion of product mass; therefore, their inbound transportation impact falls under cut-off criteria.

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.

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Requirements for Underlying Life Cycle Assessment

A “cradle-to-gate” analysis using life cycle assessment (LCA) methodology was conducted for this EPD. The analysis was done according to the product category rule (PCR) for Designated Steel Construction Products and followed LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards. As such, EPDs of construction products may not be comparable if they do not comply with the same PCR. While the intent of the PCR is to increase comparability, there may still be differences among EPDs that comply with the same PCR (e.g., due to differences in system boundaries, background data, etc.).

Declared unit

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

Name	Required Unit	Optional Unit
Declared Unit	metric ton	short ton
Density	7,800 kg/m^3	487 lbs. / ft^3

System Boundaries

The “cradle-to-gate” life cycle stages represent the product stage (information modules A1-A3) and include

- A1: all extraction and processing of raw materials, any reuse of products or materials from a previous product system, processing of secondary materials, and any energy recovery or other recovery processes from secondary fuels;
- A2: all transportation to the factory gate and all internal transport;
- A3: generation of manufacturing electricity from primary energy resources, including upstream processes; production of all ancillary materials, pre-products, products, and co-products, including any packaging.

Product Stage			Construction Stage		Use Stage					End-of-Life Stage				Benefits & Loads
A1	**A2**	**A3**	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
			EXCLUDED FROM THIS STUDY											
Raw materials supply	**Transport**	**Manufacturing**	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction	Transport	Waste processing	Disposal	Reuse, recovery, recycling potential

This EPD covers United States steel deck production in 2012 by SDI member companies.

Assumptions

No significant assumptions have been made. All of the raw materials and energy inputs have been modeled using

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processes and flows that closely follow actual production data on raw materials and processes. All of the reported material and energy flows have been accounted for.

Allocation

No multi-output (i.e., co-product) allocation was performed in this study. Allocation of background data (energy and materials) taken from the GaBi 2014 databases is documented online at http://documentation.gabi-software.com/.

Cut-off Criteria

The cut-off criteria for including or excluding materials, energy and emissions data of the study are as follows:

- Mass: If a flow is less than 1% of the cumulative mass of the model it may be excluded, providing its environmental relevance is not a concern.
- Energy: If a flow is less than 1% of the cumulative energy of the model it may be excluded, providing its environmental relevance is not a concern.
- Environmental relevance: If a flow meets the above criteria for exclusion, yet is thought to potentially have a significant environmental impact, it was included.

Only inbound transportation of ancillary manufacturing materials and packaging was excluded. Additionally, capital goods for the production processes (machines, buildings, etc.) were not taken into consideration.

Life Cycle Assessment Results and Analysis

Use of Energy and Material Resources

Primary Energy	Unit	Magnitude
Use of renewable primary energy resources excluding those used as raw materials	MJ, net calorific value	992
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0
Total use of renewable primary energy resources	MJ, net calorific value	992
Use of non-renewable primary energy excluding those used as raw materials	MJ, net calorific value	28,900
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	156
Total use of non-renewable primary energy resources	MJ, net calorific value	29,000

Material Resource Use	Unit	Magnitude
Use of secondary material	metric ton	0.277
Use of renewable secondary fuels	MJ, net calorific value	0
Use of non-renewable secondary fuels	MJ, net calorific value	0
Gross fresh water intake*	m^3	23.2

* The PCR requires the reporting of “net use of fresh water.” However, inconsistencies in blue water consumption and the waste inventories of Worldsteel data, which dominates this steel fabrication model, would distort the required parameter. As a more practical contingency, fresh water intake or input, as calculated with the “blue water use” metric in GaBi, is reported instead.

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Life Cycle Impact Assessment

Parameter	Unit	Magnitude
Impact Assessment Method: TRACI 2.1		
Global warming potential (GWP)	metric ton CO_2 eq	2.37
Depletion potential of the stratospheric ozone layer (ODP)	metric ton CFC-11 eq	4.55E-08
Acidification potential of soil and water (AP)	metric ton SO_2 eq	1.07E-02
Eutrophication potential (EP)	metric ton N eq	4.81E-04
Formation potential of tropospheric ozone (POCP)	metric ton O_3 eq	1.56E-01
Impact Assessment Method: CML 2001 (version April 2013)		
Abiotic depletion potential (ADP-elements)*	metric ton Sb eq	2.06E-05
Abiotic depletion potential (ADP-fossil)	MJ, net calorific value	27,600

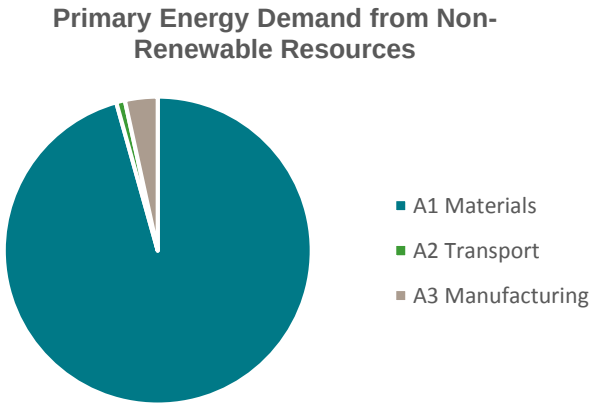
* This indicator is based on assumptions regarding current reserves estimates. Users should use caution when interpreting results because there is insufficient information on which indicator is best for assessing the depletion of abiotic resources.

Other Environmental Information

Parameter	Unit	Magnitude
Hazardous waste disposed	metric ton	3.52E-07
Non-hazardous waste disposed	metric ton	3.07E-03
Radioactive waste disposed	metric ton	5.27E-04
Components for re-use	metric ton	0
Materials for recycling	metric ton	0
Materials for energy recovery	metric ton	0
Exported energy	MJ per energy carrier	0

Visualization of Life Cycle Impact Assessment

The diagrams below illustrate the degree to which the modules drive the major impact categories.



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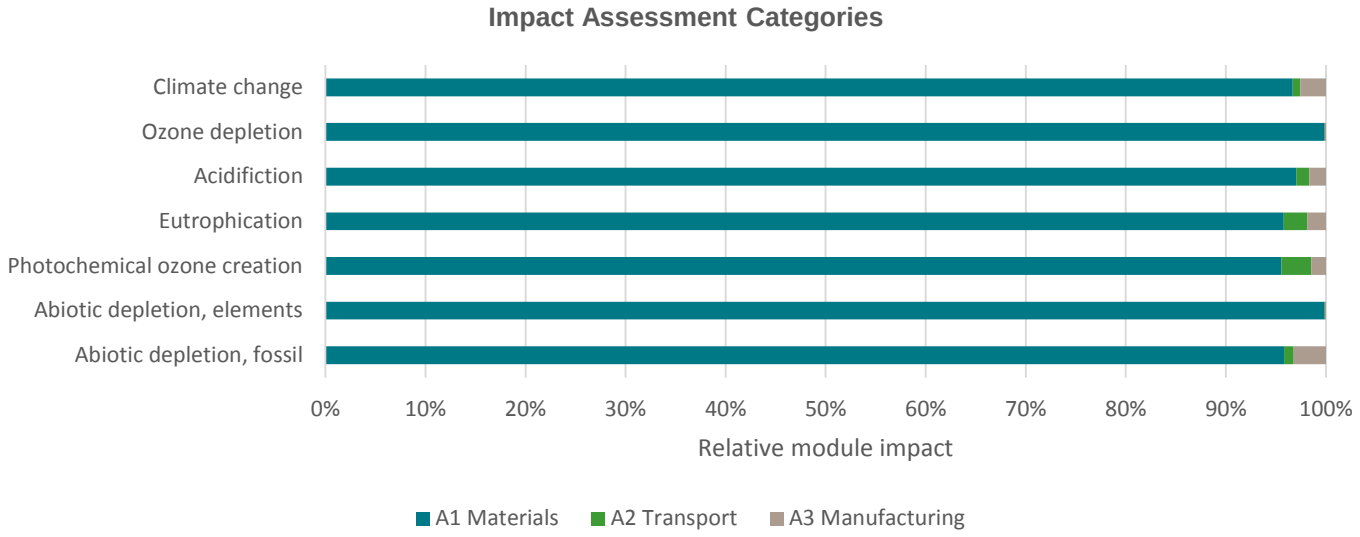

Data Quality Assessment

Temporal representativeness: All primary data were collected for the year 2012. All secondary data come from the GaBi 2014 databases and are representative of the years 2007-2013. Therefore, temporal representativeness is warranted. **Geographical representativeness:** All primary and secondary data were collected specific to the countries or regions under study. Whenever country-specific or region-specific background data were unavailable, European or global data were used as proxies. Geographical representativeness is considered to be high. **Technological representativeness:** Primary data were collected for the production of steel deck by SDI members and represent manufacturing technologies in use. Although only a subset of SDI's members participated in data collection, they collectively represent a minimum of 85% of steel deck production by SDI's membership. Where technology-specific secondary data were unavailable, proxy data were used. Technological representativeness is considered to be high. **Precision:** As the majority of the relevant foreground data are measured data or calculated based on primary information sources of the owner of the technology, precision is considered to be high. All background data are sourced from GaBi databases with the documented precision. (www.gabi-software.com)

Disclaimer: This Environmental Product Declaration (EPD) conforms to ISO 14025, ISO 14040, ISO 14044, and ISO 21930.

Scope of Results Reported: The PCR requires the reporting of a limited set of LCA metrics; therefore, there may be relevant environmental impacts beyond those disclosed by this EPD. The EPD does not indicate that any environmental or social performance benchmarks are met nor thresholds exceeded.

Accuracy of Results: This EPD has been developed in accordance with the PCR applicable for the identified product following the principles, requirements and guidelines of the ISO 14040, ISO 14044, ISO 14025 and ISO 21930 standards. The results in this EPD are estimations of potential impacts. The accuracy of results in different EPDs may vary as a result of value choices, background data assumptions and quality of data collected.

Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. Such comparisons can be inaccurate, and could lead to the erroneous selection of materials or products which are higher-impact, at least in some impact categories. Any comparison of EPDs shall be subject to the requirements of ISO 21930. For comparison of EPDs which report different module scopes, such that one EPD includes Module D and the other does not, the comparison shall only be made on the basis of Modules A1, A2 and A3. Additionally, when Module D is included in the EPDs being compared, all EPDs must use the same methodology for calculation of Module D values.

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LCA Practitioner

The EPD and underlying LCA model were developed by thinkstep, Inc. on behalf of the Steel Deck Institute.

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