RESTEEL
REINFORCING STEEL WIRE MESH

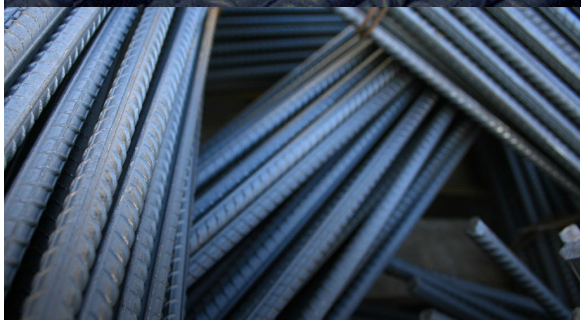
ASTM INTERNATIONAL
Helping our world work better

Environmental Product Declaration

According to ISO 14025:2006 and ISO 21930:2017

Fabricated Carbon-Steel and Low-Alloy Uncoated Reinforcing Bar

Commissioned by the Re-Steel Supply Co, Inc. Corporate



Declaration No.: EPD 233
Date of issue: 24-06-2021
Period of validity: 5 years

ASTM International Certified Environmental Product Declaration

This document is a Type III environmental product declaration for Re-Steel Fabricated Carbon-Steel and Low-Alloy Uncoated Reinforcing Bar (Rebar) products, as fabricated at eight Re-Steel Supply Co, Inc. (Re-Steel) facilities. As such the EPD is categorized as a corporate average EPD representing multiple facilities.

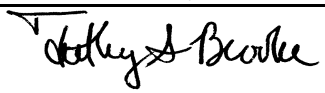
This declaration has been prepared in accordance with ISO 14025 [8], ISO 21930 [3], ISO 14040/44 [4, 5], UL Environment product category rules (PCR) for preparing an environmental product declaration for Designated Steel Construction Product EPD Requirements [7] and ASTM's General Program Instructions for Type III EPD [14].

The intent of this document is to further the development of environmentally compatible and more sustainable construction methods by providing comprehensive environmental information related to potential impacts of Re-Steel's Fabricated Carbon-Steel and Low-Alloy Uncoated Reinforcing Bar (Rebar) products in accordance with international standards.

Environmental Product Declaration Summary

General Summary	
Owner of the EPD	RESTEEL REINFORCING STEEL WIRE MESH **Re-Steel Supply Co, Inc. Corporate** 2000 Eddystone Industrial Park Eddystone, PA 19022 Link (URL): http://www.resteel.com/ *The owner of the declaration is liable for the underlying information and evidence.*
Fabrication Locations	**Re-Steel Supply Co., Inc. Corporate** 2000 Eddystone Industrial Park Eddystone, PA 19022 **CFS Steel Company** 650 East 132nd Street Bronx, New York 10454 **MJ Associates - Philadelphia** 798 East Venango Street Philadelphia, PA 19134-1218 **Re-Steel Supply Co., Inc. New England** 25 Bleachery Court, PO Box 7630 Warwick, Rhode Island 02887-7630

General Summary	
	Re-Steel Supply Co., Inc. West Virgina 63 Jr Hawvermale Way 522 Business Park Berkley Springs, WV 25411 **Victory Steel** 6400 Beckley Street Baltimore, MD 21224 **Titusville Enterprises** 191 Howard Street, #203 Franklin, PA 16323 **MJ Associates- Plainville** 75 Neal Court, Plainville, CT 06062
Declared Product & Declared Unit	Fabricated Carbon-Steel and Low-Alloy Uncoated Rebar, 1 metric ton
Reference PCR & 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).
Product Definition	Rebar is defined as uncoated concrete reinforcement steel bar (coiled, plain, deformed, or smooth) [ASTM A615, A706]. CSI /CSC are 03 21 00 UNSPSC is 30103623
Description of Product Application/Use	Rebar is used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and hold the concrete in tension. Rebar's surface is often patterned to form a better bond with the concrete.
Product RSL Description	n/a, cradle-to-gate EPD
EPD and Project Report Information	
EPD Program and Program Operator	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428 www.astm.org
General Program Instructions & Version Number	ASTM Program Operator for Product Category Rules (PCRs) and Environmental Product Declarations (EPDs), General Program Instructions, 04/29/20.
Declaration Number	EPD 233
Date of Issue	June 24th, 2021

General Summary	
Period of Validity	5 years
Markets of Applicability	North America
EPD Type & Scope	A "Cradle-to-gate" EPD for Fabricated Carbon-Steel and Low-Alloy Uncoated Rebar. Activity stages covered include the production stage (modules A1 to A3). The declaration is intended for use in Business-to-Business (B-to-B) communication.
Year of Reported Primary Data	2020
LCA Software & Version Number	SimaPro v9.1.1.1, May 2021.
LCI Databases & Version Numbers	ecoinvent 3.6, December 2019
LCIA Methodology & Version Number	US EPA TRACI v2.1 & IPCC AR5
Content of the Declaration	This Project report follows Section 8; Project Report and Supporting Documentation, as described in UL Environment Part B PCR [7].
This declaration was independently verified in accordance with ISO 14025:2006. Internal _ External X	 Timothy Brooke ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428
The Project Report	A Cradle-to-Gate Life Cycle Assessment of Re-Steel's Fabricated Carbon-Steel and Low-Alloy Uncoated Reinforcing Bar (Rebar) Products, EPD Project Report, June 2021.
Prepared by	Athena Sustainable Materials Institute Lindita Bushi PhD, Mr. Jamie Meil and Mr. Grant Finlayson Athena Sustainable Materials Institute 119 Ross Avenue, Suite 100 Ottawa, Ontario, K1Y 0N6, Canada info@athenasmi.org
This life cycle assessment was independently verified in accordance with ISO 14044, and the reference PCR by:	 Thomas P. Gloria, PhD Industrial Ecology Consultants 35 Bracebridge Rd. Newton, MA 02459-1728 t.gloria@industrial-ecology.com

PCR Information	
Program Operator	UL Environment
Reference Part B PCR	UL Environment, Product Category Rule Guidance for Building-Related Products and Services; *Part B: Designated Steel Construction Product EPD Requirements* [7].
Date of Issue	August 2020
PCR review was conducted by:	Thomas P. Gloria, PhD (Chair) t.gloria@industrial-ecology.com Ms. Brandie Sebastien Mr. James Littlefield

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.

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

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 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.

1 PRODUCT Definition

1.1 DESCRIPTION OF ORGANIZATION

Re-Steel Supply Company, Inc. (Re-Steel) fabricates and supplies rebar, which is a finished steel product used to strengthen concrete for large-scale construction projects. Re-Steel products help make bridges, highways, major sports stadiums, high-rise buildings, and other large structures sturdier, safer, and more durable. Re-Steel is a three-generation old family-run business that is the parent company of eight fabrication facilities and one epoxy coating plant. However, the epoxy coating process and fabricated epoxy coated rebar is excluded from this EPD. All eight fabrication facilities provided their LCI data for the reference year 2020. Re-steel is producing Type III Environmental Product Declaration (EPD) for its carbon-steel and low-alloy uncoated rebar as fabricated across its various divisions and facilities located in Eddystone PA (corporate site), Bronx NY, Philadelphia PA, Warwick RI, Berkley Springs WV, Baltimore MD, Franklin PA and Plainville, CT.

Re-Steel only purchases raw rebar stock from domestic suppliers operating electric arc furnaces (EAF) using nearly 100% pre- and post-consumer scrap steel as feedstock sourced within the United States. Furthermore, all the Re-Steel fabricated rebar products are 100% recyclable at the end of their useful file.

1.2 PRODUCT DEFINITION AND INFORMATION

Rebar (short for reinforcing bar), also known as reinforcing steel, reinforcement steel, is defined as uncoated concrete reinforcement steel bar (coiled, plain, deformed, or smooth). The Concrete Reinforcing Steel Institute (CRSI) defines uncoated carbon steel reinforcing bars as reinforcing steel bars produced to ASTM A615, A706, or A996 specifications; in other words, black bars [15]. Black rebar provides superior cost effectiveness for applications where epoxy and anti-rust coatings are not needed.

Rebar's surface is often patterned to form a better bond with the concrete [17]. There are a number of ways to identify rebar from the production mill to the fabrication shop to the jobsite. Each individual reinforcing bar is manufactured with a series of individual markings [16] – see Figure 1:

- The first letter or symbol identifies the producing mill;
- The next marking is the bar size;
- The third marking symbol designates the type of reinforcing steel — usually either "S" for carbon-steel (ASTM A615) or "W" for low-alloy steel (ASTM A706);
- Finally, there will be a grade marking (60, 75, 80, 100, 120) or by the addition of one line (60) or two lines (75), three lines (80, 100), or four lines (120) that must be at least five deformations long.

Rebar is used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and hold the concrete in tension. The most common steel rebar used in concrete products are manufactured in compliance with ASTM A615. ASTM A615 states that welding of A615 steel should be approached with caution since no specific provisions have been included

to enhance its weldability [12]. Reinforcing bars conforming to ASTM A706 specifications are recommended for use in seismic-resistant reinforced concrete structures that require controlled tensile properties or for applications that involve extensive welding [13].

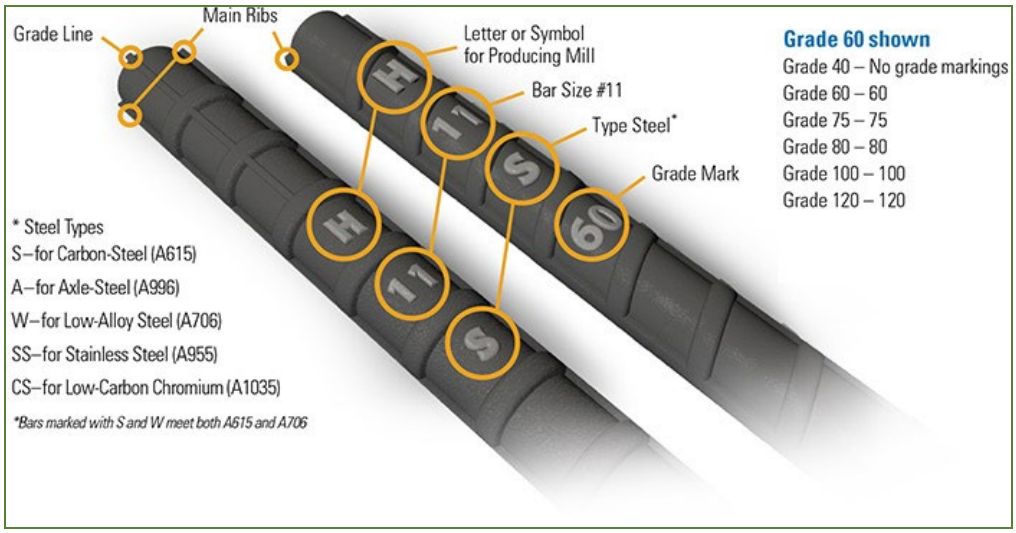


Figure 1 ASTM Bar Marking Sequence [CRSI 2021]

1.3 TECHNICAL DATA

Tables 1 summarizes key technical data for Re-Steel's uncoated fabricated rebar products for the 2020 calendar year.

Table 1. Re-Steel Uncoated Fabricated Rebar – Specifications, Types, Grades and Sizes

Declared Product	Specifications	Types	Grades and Sizes	Total Annual Production (in %)
Re-Steel uncoated fabricated rebar	ASTM A615	Carbon-Steel Uncoated Rebar	Grade: 60 (420), 75 (520), 80 [550], and 100 [690]. Size #: 3, 4, 5, 6, 7, 8, 9, 10, 11, 14 and 18	99.8%
	ASTM A706	Low-Alloy Uncoated Rebar	Grade: 60 (420) Size #: 3, 4, 5, 6, 7, 8, 9, 10, 11, 14 and 18	0.2%

1.4 PRODUCT STANDARDS

Re-Steel's uncoated fabricated rebar meet the following standards and requirements:

- ASTM A615/A615M-20, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement [1]
- ASTM A706/A706M-16, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement [2].

1.5 PRODUCT APPLICATIONS

Rebar is used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and hold the concrete in tension. The most common steel rebar used in concrete products are manufactured in compliance with ASTM A615. Reinforcing bars conforming to ASTM A706 specifications are recommended for use in seismic-resistant reinforced concrete structures that require controlled tensile properties or for applications that involve extensive welding [2].

1.6 MATERIAL CONTENT

The material content of raw rebar stock will vary slightly from batch to batch and from supplier to supplier. In general, the steel will contain around 97% recycled iron, < 2% Manganese, <1.5% Copper, <0.9% Carbon, and a total of 1.5% or less of Nickel, Silicon, Sulfur, Tin, Phosphorus, and Vanadium. Re-Steel only purchases raw rebar stock from domestic suppliers operating electric arc furnaces (EAF) using nearly 100% pre- and post-consumer scrap steel as feedstock sourced within the United States without the need for a pure iron source in the production of raw rebar stock.

1.7 PRODUCT AVERAGE

Primary gate-to-gate LCI manufacturing and input/output transportation data were collected for Re-Steel's fabricated carbon-steel and low-alloy uncoated fabricated rebar products for the reference year 2020. These data were collected from eight Re-Steel facilities located in Eddystone PA (corporate and fabrication site), Bronx NY, Philadelphia PA, Warwick RI, Berkley Springs WV, Baltimore MD, Franklin PA, and Plainville, CT. The corporate average sample represents 100% of all Re-Steel facilities that manufacture uncoated fabricated rebar. The eight facilities were combined on a production weighted basis to provide a weighted average profile for Re-Steel production of uncoated fabricated rebar.

1.8 PACKAGING

The Re-Steel fabricated rebar is packaged into bundles, which range from 1.0 to 3 metric tons. The rebar bundles are banded with steel tie wire. The piece count, length, weight, size, and grade information are declared on a tag that is stud-welded or wire-tied to one of the rebar products in the bundle. Wood dunnage is used to separate / space the fabricated bundles shipped to the job site where they are further used and recycled. Re-Steel also reuses all incoming dunnage from the trucks and rail cars that bring raw rebar stock lengths from the mills.

2 LCA METHODOLOGICAL FRAMEWORK

2.1 DECLARED UNIT

The declared unit of this study is defined as one metric ton of uncoated fabricated rebar. As shown in Table 2, both a declared unit of 1 metric ton (required) and the optional unit of 1 short ton are reported.

Table 2. Declared Unit

Parameter	Quantity	SI Units	Quantity	US Customary Units
Declared unit	1	metric ton	1	short ton
Density	7,840	kg/m^3	489	lb/ft^3

2.2 SYSTEM BOUNDARIES

Figure 2 shows the life-cycle stages and information modules that are included within the cradle-to-gate LCA system boundary of this EPD. The boundary includes the *Production stage* (A1 to A3 modules). The *Construction, Use, and End-of-Life stages* - are excluded from the system boundary. Per ISO 21930, 7.1.7.2.1 [3], the system boundary with nature (natural environment) includes those technical processes that provide the material and energy inputs into the system and the subsequent manufacturing and transport processes up to the to the factory gate, as well as the processing of any waste arising from those processes.

Production stage			**Construction stage**		**Use stage**							**End-of-life stage**			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X			MND												
X- module is included in system boundary; MND- module is not declared (excluded from system boundary)															

Figure 2 Life Cycle Stages and Modules

2.3 MANUFACTURING

The *Production stage* system boundary is shown in Figure 3. All eight fabrication operations purchased US domestic unfabricated (raw) rebar produced via the EAF production route. Scrap metal, together with alloying material additions, are melted in an EAF to obtain liquid steel and casted into steel billets. The billets are sent to the rolling mill where they are rolled and shaped to the required dimensions for the raw rebar – see Figure 3. After cooling, raw rebar products are placed in storage bays before being transported to the fabrication shops. On average, 1.016 metric ton of raw rebar is used at Re-Steel facilities to fabricate 1 metric ton of uncoated fabricated rebar products. Re-Steel fabrication scrap is 100% recycled back to US mill shops. Re-Steel rebar fabrication process consists of cutting (shear and saw), bending, threading (optional), and assembly of pieces of rebar ready for shipment to the job site.

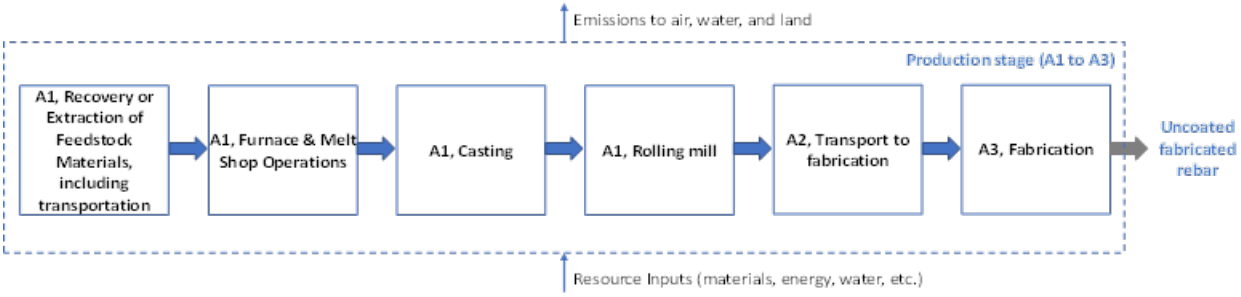


Figure 3 Production Stage (modules A1 to A3) System Boundaries

2.4 DATA SOURCES AND CALCULATIONS

LCI data collection was based on one customized LCI survey. The LCI survey was completed by all eight of Re-Steel's fabrication shops for the 2020 reference year. This EPD considers the fabricated rebar products produced by Re-Steel at the locations listed above. The results are weighted according to production totals across all locations for 2020. Data calculation procedures follow ISO 14044 [5], and Part A PCR [6]. Per ISO 21930, 7.2.2 [3], when transforming the inputs and outputs of combustible material into inputs and outputs of energy, the net calorific value (lower heating value) of fuels is applied according to scientifically based and accepted values specific to the combustible material. Per Part B PCR, 3.10 [7], SI units are used for the LCA data and results.

Both Commercial Metals Company (CMC) and NUCOR supplied about 92% of all unfabricated rebar used in the fabrication of Re-Steel's rebar products in 2020. The remaining unfabricated rebar (around 8%) was sourced from other suppliers. Both CMC and NUCOR have developed corporate average EPDs for their unfabricated rebar production for the reference year 2019 and these supply-chain specific EPDs were used to represent all unfabricated rebar input into Re-Steel's fabrication facilities [19], [20].

2.5 DATA QUALITY REQUIREMENTS AND ASSESSMENTS

A detailed description of collected data and the data quality assessment regarding the ULE PCR requirements [6-7] and ISO 14044 [5] is provided in the LCA project report. Data quality is assessed based on its representativeness (technology coverage, geographic coverage, time coverage), completeness, consistency, reproducibility, transparency, and uncertainty (Table 3).

Table 3. Data Quality Requirements and Assessments

Data Quality Requirements	Description
Technology Coverage	Data represents the prevailing technology at the Re-Steel's fabrication sites. Whenever available, for all upstream and core material and processes, North American typical or average industry LCI datasets were utilized. *Technological representativeness is characterized as "high".*
Geographic Coverage	The geographic region considered is the U.S. *Geographical representativeness is characterized as "high".*

Data Quality Requirements	Description
Time Coverage	Activity data are representative. - Rebar fabrication process - primary data collected for reference year 2020 (12 months) for eight Re-Steel fabrication sites; - In-bound/ out-bound transportation data - primary data collected for reference year 2020 (12 months); - Upstream raw rebar stock data provided by NUCOR (based on 2019 data) and CMC (based on 2019 data). - Generic data: the most appropriate LCI datasets were used as found in the US LCI Database, ecoinvent v.3.6 database for US and Global, Dec 2019. *Temporal representativeness is characterized as "medium" to "high".*
Completeness	All relevant, specific processes, including inputs (raw materials, energy, and ancillary and packaging materials) and outputs (production volume, emissions, and waste) were considered and modeled. The relevant background materials and processes were taken from the US LCI Database, ecoinvent v 3.6 LCI database for US, and modeled in SimaPro software v.9.1.1.1, 2021. The completeness of the cradle-to-gate process chain in terms of process steps is rigorously assessed.
Consistency	To ensure consistency, input/output LCI modeling of fabricated rebar products used the same LCI modeling structure, which consisted of input raw, secondary, ancillary and packaging materials, intermediate products, energy flows, water resource inputs, product outputs, co-products, by-products, emissions to air, water and soil, and solid and liquid waste disposal (if applicable). Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the facility level and selected process levels to maintain a high level of consistency.
Reproducibility	Internal reproducibility is possible since the data and the models are stored and available in *Athena Re-Steel LCI database* developed in SimaPro, 2021. A high level of transparency is provided throughout the project report as the LCI profile is presented for the declared product as well as major upstream inputs. Key primary (manufacturer specific) and secondary (generic) LCI data sources are summarized in the project report [22].
Transparency	Activity and LCI datasets are transparently disclosed in the project report, including data sources [22].
Uncertainty	A *sensitivity check* was conducted to assess the reliability of the EPD results and conclusions by determining how they are affected by uncertainties in the data or assumptions on calculation of LCIA and energy indicator results. The sensitivity check includes the results of the *sensitivity analysis and Monte Carlo uncertainty analysis*.

2.6 ALLOCATION RULES

Allocation rules, as specified in Part A PCR [6]and Part B PCR [7] were followed. Re-Steel manufacturing facilities produce a wide range of uncoated fabricated rebars sizes and grades. Inputs/outputs were allocated over the total outputs of uncoated fabricated rebars on a "mass" basis. LCI modeling accounts for the plant specific fabrication yields in accordance with ISO 14044, 4.3.4.2 [5].

Unfabricated rebar is an integral commodity used in the production of uncoated fabricated rebars. As a result, both CMC and NUCOR EPDs for unfabricated rebars were applied in this LCA study [19], [20]. CMC and NUCOR EPD results based on physical allocation approach are used. The physical allocation approach follows the partitioning methodology developed by worldsteel

[18]. It is also noted that no burden or credit is allocated to the fabrication scrap (burden free) for the uncoated fabricated rebar product system. In addition, allocation related to transport is based on the mass of transported inputs and outputs.

2.7 CUT-OFF CRITERIA

The cut-off criteria as per Part A PCR [6] and ISO 21930, 7.1.8 [3] were followed. Per ISO 21930, 7.1.8 [3], all input/output data required were collected and included in the LCI modelling. All known mass and energy flows are reported. No known flows are deliberately excluded. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD. No data gaps were identified for the reference year 2020.

This EPD excludes the following processes:

- Capital goods and infrastructure flows' contributions are less than 10%, and therefore have been excluded from the product system boundary.
- Personnel related activity (travel, furniture, office operations and supplies).

3 LIFE CYCLE ASSESSMENT RESULTS

Table 4 presents the EPD results for the production stage of one (1) metric ton of fabricated rebar. The EPD results for one (1) short ton of fabricated rebar are shown in Table 5. As per the ULE PCR, the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), version 2.1, 2012 impact categories are used as they provide a North American context for the mandatory category indicators to be included in this EPD. Additional mandatory resource use, waste categories and output flows are also reported as per the PCR. It should be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks [4], [5].

It is also noted that comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Table 4. EPD results for EPD Results (A1-A3) – 1 metric ton of fabricated rebar

Impact category and inventory indicators	Unit	A1, Extraction and upstream production	A2, Transport to factory	A3, Manufacturing	Total
Global warming potential, GWP 100[1)]	kg CO_2 eq	731.2	25.7	21.4	**778.3**
Ozone depletion potential, ODP[2)]	kg CFC-11 eq	2.0E-09	9.7E-07	2.7E-06	**3.7E-06**
Smog formation potential, SFP[2)]	kg O_3 eq	23.1	8.4	1.3	**32.7**
Acidification potential, AP[2)]	kg SO_2 eq	1.5	0.31	0.1	**1.9**
Eutrophication potential, EP[2)]	kg N eq	0.071	0.020	0.080	**0.2**
Fossil fuel depletion, FFD[2)]	MJ surplus	735.4	53.2	27.4	**816.1**
Renewable primary resources used as an energy carrier (fuel), RPR_E	MJ LHV	720.7	0.067	529.0	**1,250**
Renewable primary resources with energy content used as material, RPR_M[3)]	MJ LHV	0	0	0	**0**
Non-renewable primary resources used as an energy carrier (fuel), $NRPR_E$	MJ LHV	9,090	361	382	**9,833**
Non-renewable primary resources with energy content used as material, $NRPR_M$[3)]	MJ LHV	0	0	0	**0**
Secondary materials, SM[3)]	kg	1,124	0	0	**1,124**
Renewable secondary fuels, RSF[3)]	MJ LHV	0	0	0	**0**
Non-renewable secondary fuels, NRSF[3)]	MJ LHV	0	0	0	**0**
Recovered energy, RE[3)]	MJ LHV	0	0	0	**0**
Consumption of freshwater, FW[3)]	m^3	3.5	0	0	**3.5**
Hazardous waste disposed, HWD[3)]	kg	0.7	0	0	**0.713**
Non-hazardous waste disposed, NHWD[3)]	kg	9.6	0	0	**9.6**
High-level radioactive waste, conditioned, to final repository, HLRW[3)]	m^3	5.2E-04	0	8.8E-08	**5.2E-04**
Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW[3)]	m^3	4.4E-01	0	1.1E-06	**4.4E-01**
Components for re-use, CRU[3)]	kg	0	0	0	**0**
Materials for recycling, MR[3)]	kg	57	0	18	**74**
Materials for energy recovery, MER[3)]	kg	0	0	0	**0**
Recovered energy exported from the product system, EE[3)]	MJ LHV	0.037	0	0.000	**0.037**

Table 5. EPD results for EPD Results (A1-A3) – 1 short ton of fabricated rebar

Impact category and inventory indicators	Unit	A1, Extraction and upstream production	A2, Transport to factory	A3, Manufacturing	Total
Global warming potential, GWP 100[1)]	kg CO_2 eq	663.3	23.4	19.4	**706.1**
Ozone depletion potential, ODP[2)]	kg CFC-11 eq	1.8E-09	8.8E-07	2.5E-06	**3.3E-06**
Smog formation potential, SFP[2)]	kg O_3 eq	20.9	7.6	1.2	**29.7**
Acidification potential, AP[2)]	kg SO_2 eq	1.4	0.28	0.1	**1.7**
Eutrophication potential, EP[2)]	kg N eq	0.064	0.018	0.073	**0.2**
Fossil fuel depletion, FFD[2)]	MJ surplus	667.2	48.3	24.9	**740.3**
Renewable primary resources used as an energy carrier (fuel), RPR_E	MJ LHV	653.8	0.060	479.9	**1,134**
Renewable primary resources with energy content used as material, RPR_M[3)]	MJ LHV	0	0	0	**0**
Non-renewable primary resources used as an energy carrier (fuel), $NRPR_E$	MJ LHV	8,246	328	347	**8,921**
Non-renewable primary resources with energy content used as material, $NRPR_M$[3)]	MJ LHV	0	0	0	**0**
Secondary materials, SM[3)]	kg	1,020	0	0	**1,020**
Renewable secondary fuels, RSF[3)]	MJ LHV	0	0	0	**0**
Non-renewable secondary fuels, NRSF[3)]	MJ LHV	0	0	0	**0**
Recovered energy, RE[3)]	MJ LHV	0	0	0	**0**
Consumption of freshwater, FW[3)]	m^3	3.2	0	0	**3.2**
Hazardous waste disposed, HWD[3)]	kg	0.6	0	0	**0.647**
Non-hazardous waste disposed, NHWD[3)]	kg	8.7	0	0	**8.7**
High-level radioactive waste, conditioned, to final repository, HLRW[3)]	m^3	4.7E-04	0	7.9E-08	**4.7E-04**
Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW[3)]	m^3	4.0E-01	0	9.7E-07	**4.0E-01**
Components for re-use, CRU[3)]	kg	0	0	0	**0**
Materials for recycling, MR[3)]	kg	51	0	16	**67**
Materials for energy recovery, MER[3)]	kg	0	0	0	**0**
Recovered energy exported from the product system, EE[3)]	MJ LHV	0.033	0	0.000	**0.033**

Notes:
[1)] Calculated as per U.S EPA TRACI 2.1, v1.05, SimaPro v 9.1.1.1 [10]. GWP-100, excludes biogenic CO_2 removals and emissions associated with any biobased products; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
[2)] Calculated as per U.S EPA TRACI 2.1, v1.05, SimaPro v 9.1.1.1 [10].
[3)] Calculated as per ACLCA ISO 21930 Guidance [11], respective sections 6.2 to 10.8.

4 INTERPRETATION

The above EPD results represent a production weighted average "cradle-to-gate" EPD for 1 metric and short ton of uncoated fabricated rebar as manufactured at Re-Steel's eight fabrication shops during the reference year 2020.

Extraction and upstream production (A1) dominate the EPD results – accounting for between 41% to 94% of the total environmental impacts. Primary energy consumption is predominately non-renewable based at 90% and dominated by module A1 (92%). *Transport to factory* (A2) is the second largest contributor to the declared product impacts and generally accounted for less than 12% of the overall impacts; however, it did account for 26% and 16% of the smog creation potential and acidification potential, respectively. Except for the EP (47%) and RPR_E (42%), *Manufacturing* (A3) accounted for 4% or less of the overall impacts.

A Monte Carlo uncertainty analysis was also conducted to assess the combined uncertainty effect of the data variability on the LCIA and energy indicator results. As a statistical method, Monte Carlo analysis establishes the uncertainty range, which expresses the variance between the upper and lower confidence limit [97.5%, 2.5%], in the calculated EPD results. Based on the Re-Steel sample data, [minimum; maximum] range data was calculated per each input/output flow for the fabricated rebar. In addition, [minimum; maximum] range data for upstream CMC and NUCOR EPD results were also considered in the framework of this EPD [20], [21]. These data are used in the Monte Carlo uncertainty analysis. This uncertainty analysis assesses the combined uncertainty effect of the inventory data (both foreground and background). It should be noted that U.S. EPA TRACI v2.1 methodology has not specified any uncertainty information of the characterization factors per impact category. With a confidence level of 95%, the confidence interval of cradle-to-gate GWP-100 of the fabricated rebar is [+45%, -50%]. Based on 1,000 runs, such information provides a quantitative indication of the potential range of results that are likely for the Re-Steel's facility specific products covered by the corporate average EPD for uncoated fabricated rebar.

5 ADDITIONAL ENVIRONMENTAL INFORMATION

- All Re-Steel uncoated fabricated rebar products are manufactured from EAF production route (recycled scrap steel) sourced within the United States.

  Table 6 shows the recycled content data per Re-Steel facility for 2020 reference year for purposes of LEED v4.1 MRc3: Building product disclosure and optimization - sourcing of raw materials (https://leeduser.buildinggreen.com/credit/NC-v4.1/MRc3#tab-credit-language). Re-Steel's facility specific recycled content data are calculated based on the

recycled content data provided by the unfabricated steel rebar suppliers for 2020 reference year.

Table 6. LEED v4.1 MRc3, Recycled Content Re-Steel facility specific data for 2020 reference year

Re-Steel Facilities	Location	Recycled Content, 2020 Reference Year		Incoming unfabricated rebar source distance (mi)
		Post - Consumer	Pre - Consumer	
1. Re-Steel Supply Co., Inc. New England	Warwick,RI	83.4%	14.8%	210.5
2. CFS Steel Company	Bronx, NY	77.6%	18.2%	48.5
3. MJ Associates-Philadelphia	Philadelphia, PA	76.2%	18.6%	120.9
4. Re-Steel Supply Co., Inc. Corporate	Eddystone, PA	77.4%	19.1%	86.9
5. Victory Steel	Baltimore, MD	79.8%	17.2%	312.0
6. Re-Steel Supply Co., Inc. West Virgina	Berkley Springs, WV	79.9%	18.2%	311.9
7. Titusville Enterprises	Franklin, PA	78.8%	19.7%	395.9
8. MJ Associates-Plainville	Plainville, CT	78.0%	19.1%	108.2

- Re-Steel fabrication scrap is 100% recycled back to US mill shops.
- The Re-Steel uncoated fabricated rebar products do not contain any hazardous substances according to the Resource Conservation and Recovery Act, 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.

6 DECLARATION TYPE

A "Production Stage" or "Cradle-to-gate" EPD of Re-Steel's production of fabricated carbon-steel and low-alloy uncoated reinforcing bar (rebar) products. The declaration presents a weighted average profile for eight facilities operated by Re-Steel and its divisions. Production stage includes the extraction and upstream production, transport to factory, and manufacturing (modules A1 to A3). The declaration is intended for Business-to-Business (B-to-B) communication.

7 EPD COMPARABILITY LIMITATION STATEMENT

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.

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

9 REFERENCES

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2. ASTM A706 / A706M – 16, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
3. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
4. ISO 14040:2006/Amd 1:2020 Environmental management - Life cycle assessment - Principles and framework.
5. ISO 14044:2006/Amd1:2017/Amd2:2020 Environmental management - Life cycle assessment - Requirements and guidelines.
6 UL Environment, Part A: Life Cycle Assessment Calculation Rules and Report Requirements, December 2018, version 3.2.
7 UL Environment, Product Category Rule for Building-Related Products and Services Part B: Steel Construction Environmental Product Declaration Requirements, August 2020.
8 ISO 14025:2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
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