ENVIRONMENTAL PRODUCT DECLARATION

WELDED WIRE REINFORCEMENT

KINGMAN, AZ

Welded Wire Reinforcement

Insteel Wire Products Company is the nation's largest manufacturer of steel wire reinforcing products for concrete construction applications including welded wire reinforcement and PC strand. Consistent with our Mission and Values, Insteel maintains a leadership position in its markets and operates in close partnership with customers and suppliers. In response to emerging customer interest, Insteel has chosen to commission and publish this EPD.

ENVIRONMENTAL PRODUCT DECLARATION

INSTEEL WIRE PRODUCTS

Welded Wire Reinforcement
Designated Steel Construction Product

According to ISO 14025, and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	ASTM International 100 Barr Harbor Drive P.O. Box C700 West Conshohocken, PA 19428-2959, USA https://www.astm.org/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs), General Program Instructions, Version: 8.0, Revised 04/29/20
MANUFACTURER NAME AND ADDRESS	Insteel Wire Products Company 1373 Boggs Drive Mount Airy, NC 27030
DECLARATION NUMBER	EPD 631
DECLARED PRODUCT & DECLARED UNIT	Welded Wire Reinforcement 1 metric ton
REFERENCE PCR AND VERSION NUMBER	UL PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements v4 UL PCR Part B: Designated Steel Construction Product EPD Requirements (UL 10010-34) v2
DESCRIPTION OF PRODUCT APPLICATION/USE	Residential and nonresidential construction
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	02/15/2024
PERIOD OF VALIDITY	02/15/2029
EPD TYPE	Product-Specific
EPD SCOPE	Cradle to gate
YEAR(S) OF REPORTED PRIMARY DATA	2022
LCA SOFTWARE & VERSION NUMBER	Sphera LCA for Experts (fka GaBi) 10.7.1
LCI DATABASE(S) & VERSION NUMBER	Sphera Managed LCA Content (fka GaBi) 2023.1
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1, IPCC AR5, CML 2001-Jan 2016

The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Timothy S Brooke
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Tom Gloria, Industrial Ecology Consultants

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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.
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. See Section 3.8 of the Part B Designated Steel Construction Product PCR for additional EPD comparability guidelines.

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.
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.

1. Product Definition and Information

1.1. Description of Company/Organization

Insteel Wire Products Company is the nation's largest manufacturer of steel wire reinforcing products for concrete construction applications. The company manufactures and markets prestressed concrete strand and welded wire reinforcement. Its products are primarily sold to manufacturers of concrete products that are used in nonresidential construction. Insteel estimates that 85% of sales are derived from nonresidential construction activity and 15% are related to residential construction.

1.2. Product Description

Product Identification

Insteel's Kingman, AZ, facility produces Welded Wire Reinforcement (WWR) for reinforced concrete. WWR is a grid-type product where wires are connected at each intersection by a process of electric resistance welding, where the intersecting wires are heated with an electric current combined with pressure to effectively forge the two wires together. Wire spacings are substantially square or rectangular, and vary from 2 inches up to 24 inches or higher. WWR widths vary from 18 inches to over 12 feet. WWR lengths vary from just a few feet up to 1,000 feet, depending on the configuration.

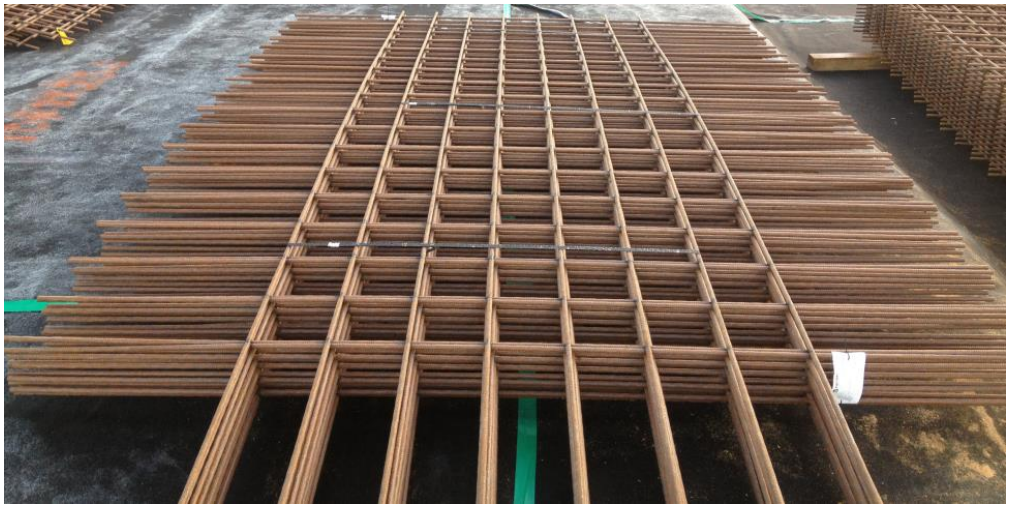

Figure 1. WWR

WWR is produced for a broad range of commercial, infrastructure and residential construction applications. In accordance with ASTM A1064, WWR may consist of plain wires (smooth wires without deformations), deformed wires, or a combination of both and is manufactured with a yield strength range of 65ksi to 80ksi for plain wire and 70ksi to 80ksi for deformed wire. WWR may be ordered to size, in some cases utilizing variable spacing and wire sizes, thereby maximizing efficient use of steel area.

The use of WWR in footings, slabs, walls and roofs provides uniform stress distribution and effective crack control. WWR also provides shear resistance and confinement reinforcing when used in columns, beams and girders.

WWR is available in the following finishing options: bending, crimping, epoxy coating, galvanizing, specialty cutting.

This EPD covers products with UNSPSC codes 30103623.

1.3. Application

Insteel's WWR is used in the following applications in residential and nonresidential construction: beams, sound walls, joists, columns, box culverts, bridge rail, drainage structures, sports venues, tunnels, median barriers, paving, and for both stem and flange reinforcement in double tees.

1.4. Declaration of Methodological Framework

This LCA uses an attributional approach.

1.5. Technical Requirements

All WWR is produced and certified according to the latest revision of ASTM A1064/A1064M.

1.6. Material Composition

One hundred percent of WWR is produced from hot-rolled steel wire rod.

1.7. Manufacturing

WWR is manufactured at Insteel's facility in Kingman, AZ. To produce WWR, the steel wire rod is first rolled or drawn to the desired diameter. WWR is fabricated as the wires are joined together through electrical resistance welding (which employs fusion combined with pressure) into a strong, serviceable mat-type product with substantially square or rectangular openings. WWR is then packaged for shipping. Depending on the set-up, wire may be straightened and cut to length in a separate operation prior to WWR fabrication.Manufacturing of WWR is represented by the flow chart in Figure 2.

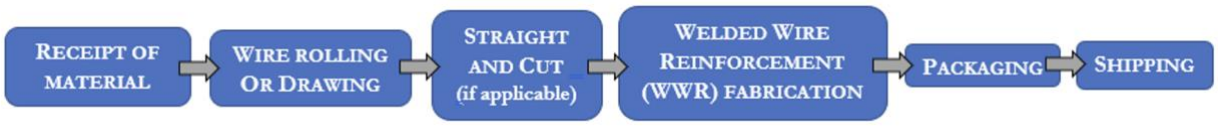

Figure 2. Manufacturing of the Product

1.8. Packaging

WWR is bundled together using steel ties and plastic straps. No other packaging is used for the product.

1.9. Transportation

Transportation from suppliers to Insteel's facility is assumed to be by barge and truck. Distances were calculated using

the supplier location and the location of manufacturing.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

The declared unit according to the UL PCR Part B: Designated Steel Construction Product EPD Requirements (UL 10010-34) v2 is 1 metric ton of product.

2.2. System Boundary

This LCA is a Cradle-to-Gate study, including raw material extraction (A1), transportation of raw materials (A2), and manufacturing (A3). These stages and the inputs and outputs included at each stage are summarized in Figure 3.

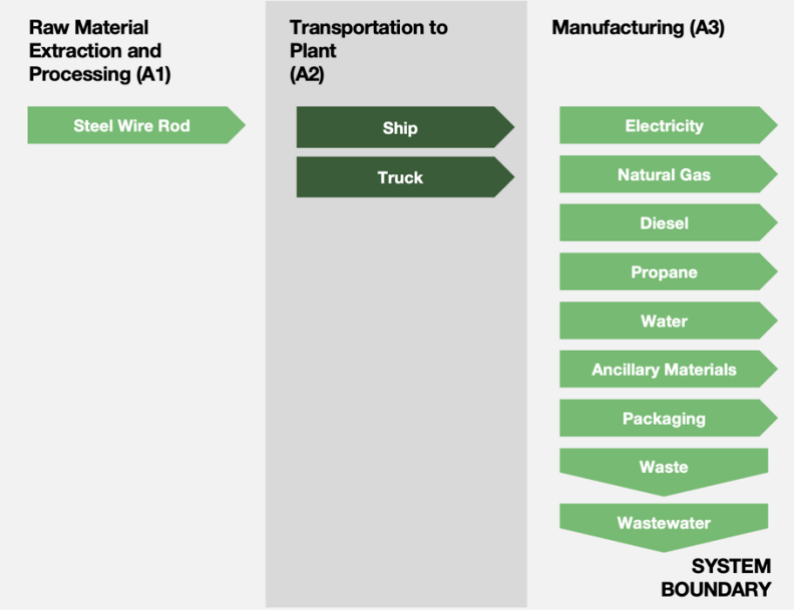

Figure 3. System Diagram

2.3. Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The primary energy and ancillary material data were collected as annual totals including all utility usage and production information. For the LCA, the energy and ancillary usage information was divided by the production to use per metric ton.

Some limitations to the study have been identified as follows:

- Primary LCA data were not available for all supplier steel wire rod. All North American suppliers use electric arc furnace (EAF) steel for their wire rod production. Steel wire rod from these manufacturers was modeled using a steel wire rod production dataset and datasets for North American EAF steel sections to best represent the steel inputs at each supplier. The dataset for EAF steel sections was deemed the most appropriate due to the unavailability of datasets for EAF steel billets.

- Primary data on transportation of raw materials to suppliers were not provided. Transportation modes and distances were assumed based on supplier and manufacturer locations. The affect of assumptions were investigated in a sensitivity analysis in section and revealed to be insignificant for global warming impacts, but significant for other impact categories: acidification, eutrophication, and smog formation.
- Since this LCA uses the cut-off approach to model recycled material in the product, no credit is given to the product system. Instead, the manufacturer realizes reduced environmental impacts through the absence of the burden of extracting virgin material.
- Only known and quantifiable environmental impacts are considered.
- Due to the assumptions and value choices listed above, these do not reflect real-life scenarios and hence they cannot assess actual and exact impacts, but only potential environmental impacts.

2.4. Cut-off Criteria

All inputs for which data were available were included. Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data were available to warrant inclusion and/or the material input was thought to have significant environmental impact. No known flows were excluded from this LCA.

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and were used for all manufacturing processes. Whenever available, supplier data were used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production were utilized from Sphera Managed LCA Content (fka GaBi) Database 2023.1.

2.6. Data Quality

The geographical scope of the manufacturing portion of the life cycle is Kingman, AZ, in the US. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent.

The primary data provided by the manufacturer represents all information for January 2022 to December 2022. Using this data meets the PCR requirements. Time coverage of this data is considered excellent. Primary data provided by the manufacturer is specific to the technology that Insteel uses in manufacturing their product. It is site-specific and considered of good quality.

It is worth noting that the electricity and thermal energy used in manufacturing the product includes overhead energy such as lighting and heating. Sub-metering would improve the technological coverage of data quality. Data necessary to model cradle-to-gate unit processes was sourced from Sphera Managed LCA Content (fka GaBi) datasets.

2.7. Period under Review

The period under review is January 2022 to December 2022.

2.8. Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a mass basis. Manufacturing inputs were allocated on a mass basis based on quantities produced at the facility. Allocation was most prevalent in the secondary Sphera Managed LCA Content (fka GaBi) datasets used to represent upstream processes. As a default, Sphera Managed LCA Content datasets use a physical

mass basis for allocation.

3. Life Cycle Assessment Results

Table 1. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION 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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: "X" indicates that the module is included in the LCA system boundary “ND” indicates that the module is not declared in this LCA’s system boundary.

3.1. Life Cycle Impact Assessment Results

Table 2. North American Impact Assessment Results

PARAMETER	A1	A2	A3	A1-A3
IPCC AR 5				
GWP_{100} [kg CO_2 eq]	1.19E+03	1.98E+02	2.70E+02	**1.65E+03**
TRACI V2.1				
AP [kg SO_2 eq]	5.52E+00	9.02E-01	6.20E-01	**7.04E+00**
EP [kg N eq]	2.28E-01	7.99E-02	2.62E-02	**3.34E-01**
ODP [kg CFC-11 eq]	2.44E-06	5.05E-13	1.12E-10	**2.44E-06**
SFP [kg O_3 eq]	2.93E+01	2.09E+01	4.87E+00	**5.50E+01**
CML 2001-Jan 2016				
ADP_{fossil} [MJ, LHV]	1.30E+04	2.73E+03	3.43E+03	**1.91E+04**

3.2. Life Cycle Inventory Results

Table 3. Resource Use

PARAMETER	A1	A2	A3	A1-A3
RPR_E [MJ, LHV]	1.24E+03	1.10E+02	1.76E+03	**3.11E+03**
RPR_M [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
$NRPR_E$ [MJ, LHV]	1.49E+04	2.75E+03	4.54E+03	**2.22E+04**
$NRPR_M$ [MJ, LHV]	0.00E+00	0.00E+00	1.85E+01	**1.85E+01**
SM [kg]	1.07E+03	0.00E+00	0.00E+00	**1.07E+03**
RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
FW [m^3]	8.02E+00	3.76E-01	1.80E+00	**1.02E+01**

Table 4. Output Flows and Waste Categories

PARAMETER	A1	A2	A3	A1-A3
HWD [kg]	3.56E-03	7.92E-09	3.50E-06	**3.56E-03**
NHWD [kg]	2.26E+01	2.40E-01	1.94E+00	**2.47E+01**
HLRW [kg]	8.18E-04	9.36E-06	4.87E-04	**1.31E-03**
ILLRW [kg]	6.78E-01	7.88E-03	4.07E-01	**1.09E+00**
CRU [kg]	0.00E+00	1.00E+00	2.00E+00	**3.00E+00**
MR [kg]	4.30E-03	0.00E+00	2.55E+00	**2.55E+00**
MER [kg]	0.00E+00	1.00E+00	2.00E+00	**3.00E+00**
EEE [MJ, LHV]	0.00E+00	0.00E+00	5.11E-02	**5.11E-02**
EET [MJ, LHV]	0.00E+00	0.00E+00	2.40E-02	**2.40E-02**

Table 5. Carbon Emissions and Removals

PARAMETER	A1	A2	A3	A1-A3
BCRP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
BCEP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
BCRK [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
BCEK [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
BCEW [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
CCE [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
CCR [kg CO2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
CWNR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

4. LCA Interpretation

Cradle-to-gate global warming impacts for WWR from Kingman, AZ, is 1,652 kg CO2e per metric ton of product. Across all impact categories, raw materials dominated cradle-to-gate environmental impacts for Insteel's WWR. For global warming, raw materials (A1) contributed 72% of cradle-to-gate impacts, while manufacturing at Insteel's facility (A3) contributes 16%. Transportation (A2) does not contribute significantly. Raw materials impacts are dominated by the

single raw material used, steel wire rod.

Trends for other impact categories closely follow those mentioned above for GWP.

5. Additional Environmental Information

5.1. Environment and Health During Manufacturing

There are no releases of hazardous substances in the manufacturing of this product.

5.2. Environmental Activities and Certifications

Insteel tracks Scope 1 and Scope 2 GHG emissions at each plant, and is working to reduce such emissions through various Smart Energy initiatives and other projects.

6. Supporting Documentation

The full text of the acronyms in Section 3 are found in Table 6.

Table 6. Acronym Key

ACRONYM	TEXT	ACRONYM	TEXT
LCA Indicators			
AP	Acidification potential of soil and water	ODP	Depletion of stratospheric ozone layer
EP	Eutrophication potential	SFP	Smog Formation Potential
GWP	Global warming potential	ADP_{fossil}	Abiotic depletion potential for fossil resources
Resource Use Parameters			
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	RSF	Use of renewable secondary fuels
RPR_M	Use of renewable primary energy resources used as raw materials	NRSF	Use of non-renewable secondary fuels
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	RE	Recovered energy
$NRPR_M$	Use of non-renewable primary energy resources used as raw materials	FW	Net use of fresh water
SM	Use of secondary materials		
Waste Parameters and Output Flows			
HWD	Disposed-of-hazardous waste	MR	Materials for recycling
NHWD	Disposed-of non-hazardous waste	MER	Materials for energy recovery
HLRW	High-level radioactive waste, conditioned, to final repository	EEE	Recovered electrical energy exported from the product system
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	EET	Recovered thermal energy exported from the product system
CRU	Components for reuse		
Carbon Emissions and Uptake			
BCRP	Biogenic carbon removal from product	BCEW	Biogenic carbon emission from combustion of waste from renewable sources used in production processes
BCEP	Biogenic carbon emission from product	CCE	Calcination carbon emissions
BCRK	Biogenic carbon removal from packaging	CCR	Carbonation carbon removals
BCEK	Biogenic carbon emission from packaging	CWNR	Biogenic carbon emission from combustion of waste from non-renewable sources used in production processes

7. References

1. WAP Sustainability Consulting. (2024). Life Cycle Assessment, LCA Report for Insteel PC Strand and Welded Wire Reinforcement, Amended January 2024.
2. American Iron and Steel Institute. (2020). Life Cycle Inventories of North American Steel Products. Sphera.
3. CML - Department of Industrial Ecology. (2016, September 5). CML-IA Characterisation Factors. Retrieved from https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors
4. IPCC. (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
5. ISO. (2006). ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures. Geneva: International Organization for Standardization.
6. ISO. (2006). ISO 14040/Amd 1:2020: Environmental management - Life cycle assessment - Principles and framework. Geneva: International Organization for Standardization.
7. ISO. (2006). ISO 14044/Amd 1:2017/Amd 2:2020: Environmental Management - Life cycle assessment - Requirements and Guidelines. Geneva: International Organization for Standardization.
8. ISO. (2017). ISO 21930: Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services. Geneva: International Organization for Standardization.
9. UL Environment. (2018). UL PCR Part B: Designated Steel Construction Product EPD Requirements (UL 10010-34) v2. UL Environment.
10. UL Environment. (2022). Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010, V4.
11. US EPA. (2012). TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 - User Guide. Retrieved from https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf