



THE INTERNATIONAL EPD® SYSTEM

Duferdofin  **NUCOR**

**ENVIRONMENTAL PRODUCT DECLARATION FOR STEEL
BEAMS AND ANGLES**

CPC CODE

**4219 - OTHER STRUCTURES (EXCEPT PREFABRICATED
BUILDINGS) AND PARTS OF STRUCTURES, OF IRON,
STEEL OR ALUMINIUM**

**AREA OF GEOGRAPHICAL APPLICATION: EUROPE
ENVIRONMENTAL PRODUCT DECLARATION VALIDATED**

N° REG: S-P-01342

REV.0

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I – The Group

Duferdofin - Nucor was formed in 2008 by a joint venture between two leading companies in the iron and steel sector: **Duferco Group** and **Nucor Corporation**.

Today Duferdofin – Nucor, with its head quarter in San Zeno Naviglio, is a reference point in Italy, Europe and North Africa for its production of beams and long products.

The smart combination of know-how, technology and human resources has naturally created a solid, cohesive system of integrated companies which are able to achieve the best synergies in the production of rolled products at competitive costs and with particular attention to environmental performance.



The group has **four production units** that cover the entire production range from liquid steel up to the finished product: San Zeno Naviglio located in Brescia, Giammoro in Messina, Pallanzeno in Verbania and San Giovanni Valdarno in Arezzo.

The plants involved in the study in question are **San Zeno Naviglio (BS)** and **Pallanzeno (VB)**.



The process begins in San Zeno plant, where round, square, rectangular section and dog bone **semi-finished** are produced, for hot rolling or direct hot forging.

The main facilities of the steel mill include a 100 t/h electric furnace with a 100 MVA transformer, a ladle furnace, a vacuum degasser and two continuous casting machines.

The plant in San Zeno Naviglio is the supplier of semi-finished products for Pallanzeno rolling mill.

The production unit in Pallanzeno (VB) has a **rolling mill**, a **finishing centre**, a warehouse for storage and shipping of finished products and a railway connection.

Pallanzeno plant is specialized in rolling small and medium range of beams (HE and IPE), UPN profiles, IPN profiles, **angles** and **special profiles for earth moving machines**, purchased by the mechanical division in San Giovanni Valdarno too.

The production capacity of the plant is about 500.000 t/year.



II – The product

The products in this study are beams and angles with various profiles produced from scrap from recycling.

Due to the fact the products have different dimensional properties, in the Environmental Product Declaration an average value is considered.

The product characteristics are described below.

Steel grade: from S235 to S355

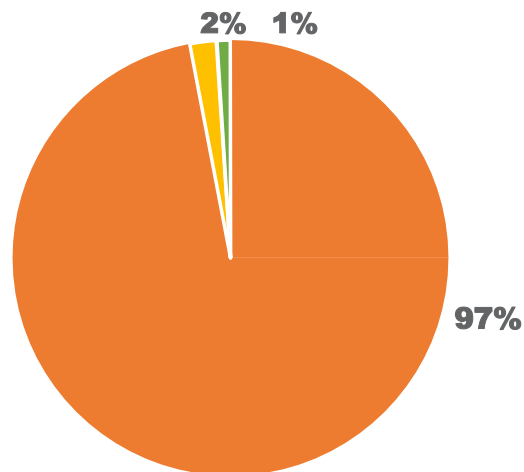
Reference standards: commercial steel grade according to EN 10025

| PRODUCTS | REFERENCE STANDARD (dimensional and shape tolerances) | DIMENSIONS (mm) | | THICKNESSES (mm) | |
|---------------------------|--|-----------------|-------|------------------|------|
| | | from | to | from | to |
| <i>HE Beams</i> | EN 10034 | 96 | 200 | 8 | 15 |
| <i>IPE Beams</i> | EN 10034 | 100 | 300 | 5,7 | 10,7 |
| <i>IPN Beams</i> | EN 10024 | 100 | 240 | 6,8 | 13,1 |
| <i>UB Beams</i> | EN 10034 | 127 | 206,8 | 7,6 | 9,6 |
| <i>UC Beams</i> | EN 10034 | 152,4 | 161,8 | 6,8 | 11,5 |
| <i>UPN Beams</i> | EN 10279 | 140 | 300 | 10 | 16 |
| <i>Equal leg angles</i> | EN 10056 - 2 | 120 | 200 | 10 | 28 |
| <i>Unequal leg angles</i> | EN 10056 - 2 | 150 | 200 | 10 | 18 |

Declaration of contents

The product considered is made of the components listed below

- Recycled Steel
- Binding Elements
- Other



Products are fabricated only with recycled material

The product doesn't contain any hazardous substances against REACH* rule.



* Regulation (EC) No 1907/2006 of the European parliament and of the council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals

III - Environmental Performance Declaration

Applied Methodology

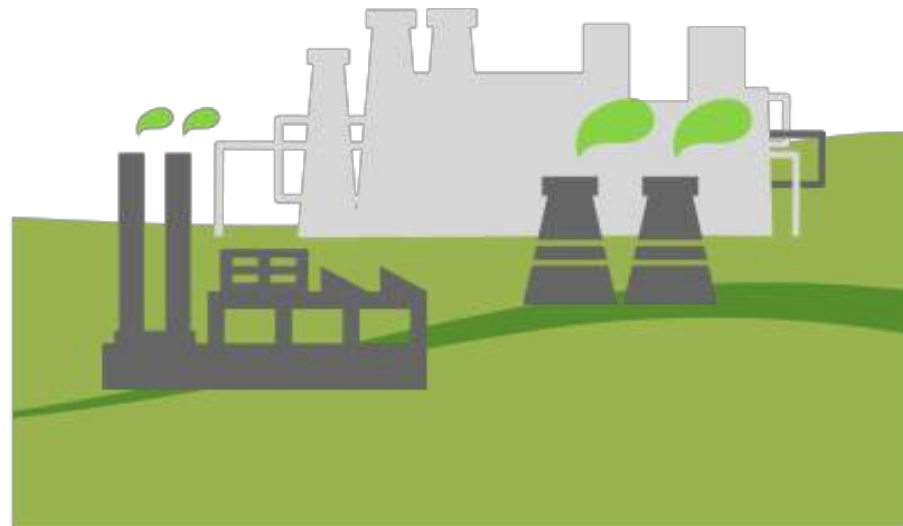
The environmental performance of the products has been calculated in compliance with the requirements of the International EPD® System, the PCR 2012:01 Version 2.2 Construction Products and the CPC 54 Construction Services (Cradle to gate with options). The methodology used to quantify environmental performance is the Life Cycle Assessment (LCA), regulated by the standard ISO 14040-14044. The objective of the LCA study is to assess the environmental load in relation to the production of beams and angles in structural steel used in construction industry.

Specific data were collected on the mills involved in the process and these refer to the year 2016.

The contribution of the proxy was less than 10%. The electrical mix used to model the electrical consumption in the A3 module is the Italian electrical mix (Source: Ecoinvent v.3- Electricity, medium voltage {IT}) market for | Alloc Def, U 512 g CO₂ eq/kWh).

This document uses the French style of the international measurement system (comma as a decimal separator).

The unit declared is 1 ton of steel beams/angles.

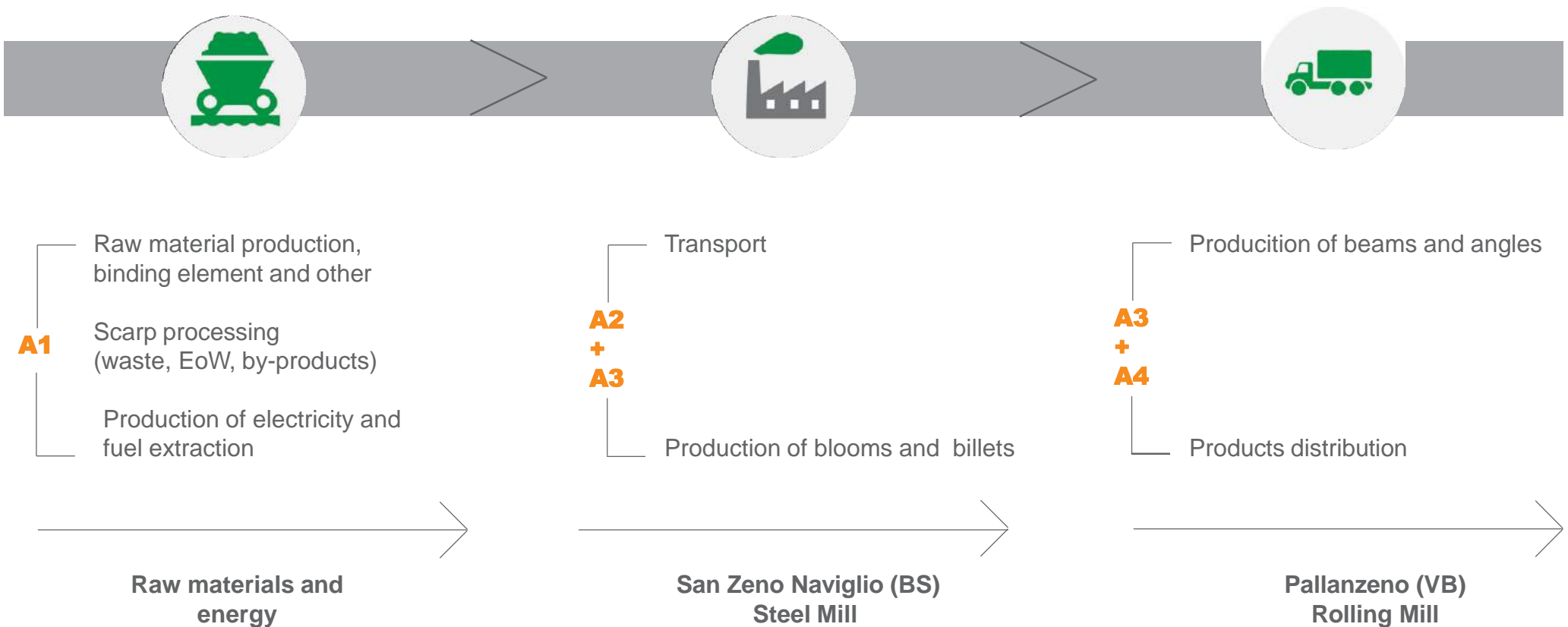


IV – System Boundaries

In compliance with the PCR reference and EN 15804 standard, the system boundaries are divided into the following three life cycle phases:

- Upstream processes (A1 - Raw Materials Supply)
- Core processes (A2 – Transportation; A3 – Manufacturing)
- Downstream processes (A4 – Distribution)

The life cycle phases included in the system boundaries are shown in the following figure:



With respect to EN 15804 standard, the study conducted is classified as “cradle-to-gate with options” EPD (declared unit): modules from A1 to A3 are included, along with the optional module A4.

| Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Resource recovery stage |
|---------------|-----------|---------------|----------------------------|---------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|--|
| Raw Materials | Transport | Manufacturing | Transport | Construction Installation | Usa | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | 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 | X | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |



Resource consumption

The data refers to a specific unit

| Resource consumption | Unità | A1 | A2 | A3 | A4 | Totale |
|--|----------------|-----------|--------|--------|--------|-----------|
| Use of primary renewable energy (excluding primary renewable energy sources used as raw materials) | MJ | 478,05 | 6,63 | 0,14 | 3,08 | 487,89 |
| Use of primary renewable energy sources used as raw materials | MJ | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Total consumption of primary renewable energy sources (primary energy and primary renewable energy resources used as raw materials) | MJ | 478,05 | 6,63 | 0,14 | 3,08 | 487,89 |
| Use of primary non-renewable energy (excluding primary renewable energy sources used as raw materials) | MJ | 25.004,89 | 987,73 | 121,91 | 805,88 | 26.920,40 |
| Use of primary non-renewable energy sources used as raw materials | MJ | 604,58 | 0,12 | 0,09 | 0,06 | 604,85 |
| Total consumption of primary non-renewable energy sources (primary energy and primary renewable energy resources used as raw materials) | MJ | 25.609,47 | 987,84 | 122,00 | 805,94 | 27.525,25 |
| Consumption of secondary raw materials (scrap iron) | kg | 1.188,81 | 0,00 | 0,00 | 0,00 | 1.188,81 |
| Consumption of secondary renewable fuels | MJ | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Consumption of secondary non-renewable fuels | MJ | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Net water consumption | m ³ | 28,16 | 0,14 | 3,44 | 0,10 | 31,84 |
| of which in the Core | | - | - | 3,43 | - | 3,43 |



Pollutant Emissions

The data refers to a specific unit

| Impact Category | Unit | A1 | A2 | A3 | A4 | Total |
|---|-------------------------------------|-----------|--------|--------|--------|-----------|
| Global warming (GWP100) | kg CO ₂ eq | 735,49 | 62,66 | 183,33 | 51,61 | 1.033,10 |
| Ozone Depletion Potential (ODP) | kg CFC -11 eq | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Acidification (AP) | kg SO ₂ eq | 3,99 | 0,38 | 0,82 | 0,32 | 5,51 |
| Eutrophication (EP) | kg PO ₄ eq | 0,36 | 0,06 | 0,09 | 0,05 | 0,56 |
| Photochemical ozone creation potential (POCP) | kg C ₂ H ₄ eq | 0,25 | 0,01 | 0,03 | 0,01 | 0,30 |
| Impoverishment of abiotic factors (elements) | kg Sb equivalent | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Impoverishment of abiotic resources (fossils) | MJ | 23.658,34 | 952,93 | 121,36 | 790,85 | 25.523,48 |

Waste production and other indicators

The data refers to a specific unit.

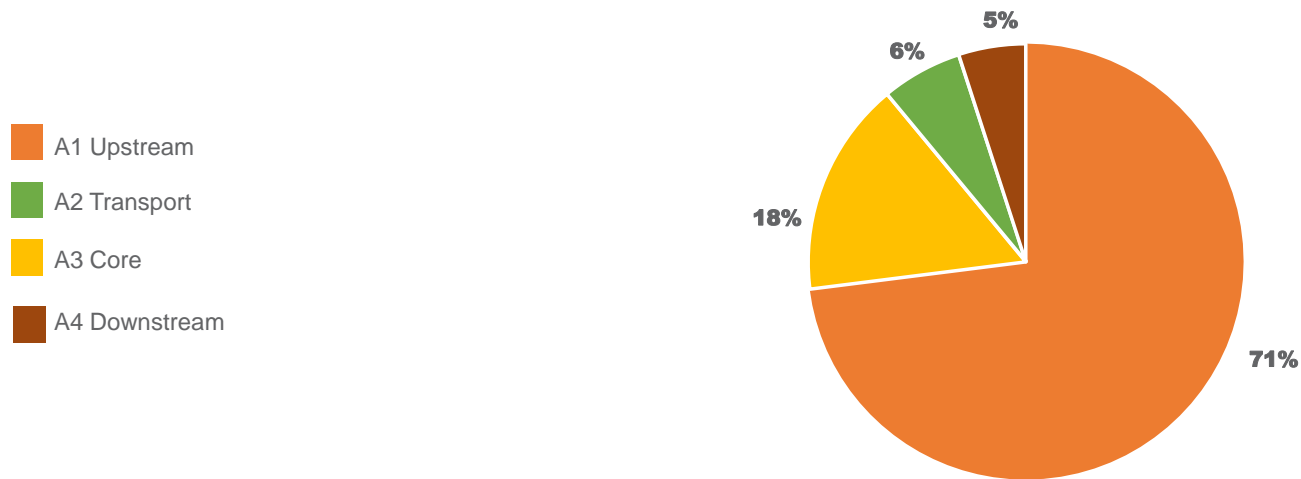
| Parameters | Unit | A1 | A2 | A3 ¹ | A4 | Total |
|---------------------------------|------|----|----|-----------------|----|--------|
| Hazardous waste disposed of | kg | - | - | 22,46 | - | 22,46 |
| Non-hazardous waste disposed of | kg | - | - | 174,55 | - | 174,55 |
| Radioactive waste disposed of | kg | - | - | - | - | - |

¹ Direct in the Core



As an example, the contribution of the various life cycle phases to the potential global warming is shown in the following figure:

Global Warming (GWP100)



V - Information

Certification Body

This EPD was approved by the accredited Certification Body RINA Services S.p.A. (Gruppo Registro Italiano Navale) to validate in agreement with reference standards published by The International EPD® System (General Programme instructions for the International EPD® System) and with the PCR 2012:01 Version 2.2 Construction Products and the CPC 54 Construction Services (Cradle to gate with options).

Standard En 15804 applied as core PCR

| | |
|---|--|
| PCR | PCR 2012:01 Construction products and construction services, Version 2.2 |
| PCR review conducted by : | Comitato Tecnico International EPD® System. <u>Contatti: info@environdec.com.</u> |
| Independent verification of the declaration and the data conducted in agreement with ISO 14025: | -EPD process certification -EPD verification |
| Third party verifier : | RINA Services S.p.A. Via Corsica 12, I-16128 Genova (Italy) Tel: +39 010 53851 Fax: +39 010 5351000 www.rina.org ACCREDIA Accreditamento n.: 001H |

Valid until 4 June 2023

Note: EPD developed using different programs cannot be compared.

EPD of construction products may not be comparable if they are not compliant with the EN 15804 standard.

All life cycle phases were analyzed and accounted for in the study.

This EPD and other pertinent information are available on the website of the International EPD® System: www.environdec.com



References

General Programme instructions for the International EPD® System, v.2.5.

PCR 2012:01 Version 2.2 Construction Products e CPC 54 Construction Services (Cradle to gate with options).

EN 15804:2012+A1:2013 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products).

ISO 21930 Environmental declaration of building products.

Database Ecoinvent v.3 (www.ecoinvent.org).

Studio LCA “Travi e Angolari in acciaio” Rev.04.

Glossary

LIFE CYCLE ASSESSMENT (LCA): a methodology regulated by ISO 14040-44 standards designed to quantify the energy and environmental load of the life cycle of a product or activity, by quantifying the energy and materials used and the emissions (solid, liquid and gaseous) released into the environment, from the extraction of raw materials to the disposal of final waste products.

GLOBAL WARMING (GWP100): the phenomenon of the global warming of the atmosphere, calculated for the next 100 years, due to release into the atmosphere of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), etc.

OZONE DEPLETION POTENTIAL (ODP) degradation and reduction, caused by chlorofluorocarbons (CFC) or chlorofluoromethanes (CFM), of the ozone layer present in the stratosphere to filter ultraviolet light from sunlight with its particularly reactive compounds.

ACIDIFICATION (AP): lowering of the pH of soil, lakes, forests, etc. due to the release into the atmosphere of acids, with harmful consequences for living organisms (eg. “acid rain”).

EUTROPHICATION (EP) reduction of the oxygen present in water bodies and necessary for the ecosystems due to the excessive richness of nutrients such as nitrogen and phosphorous.

PHOTOCHEMICAL OZONE CREATION POTENTIAL (POCP) formation of ozone on the earth's surface due to the release into the atmosphere of unburned hydrocarbons and nitrogen oxides in the presence of sunlight. This phenomenon is hazardous for living organisms, and often present in large urban centres.



People of reference for the Environmental Product Declaration:

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