catnic®
A Tata Steel Enterprise

EPD
THIRD PARTY VERIFIED ISO 14025 & EN 15804

# Catnic® Plaster Profiles, Lath and Mesh

Environmental Product Declaration

# CONTENTS



Catnic® Plaster Profiles, Lath and Mesh
Environmental Product Declaration
(in accordance with ISO 14025 and EN 15804)

This EPD is representative and valid for the specified (named) product

Declaration Number: EPD-TS-2023-009
Date of Issue: 22nd May 2023
Valid until: 21st May 2028

Owner of the Declaration: Tata Steel Europe
Programme Operator: Tata Steel UK Limited, 18 Grosvenor Place, London, SW1X 7HS

The CEN standard EN 15804:2012+A2:2019 serves as the core Product Category Rules (PCR) supported by Tata Steel's EN 15804 verified EPD PCR documents

Independent verification of the declaration and data, according to ISO 14025 Internal

Internal ☐ External ☒

Author of the Life Cycle Assessment: Tata Steel UK
Third party verifier: Chris Foster, Eugeos Ltd.

# 1 General information

| | |
|---|---|
| Owner of EPD | Tata Steel Europe |
| Product | Catnic® plaster profiles, lath and mesh |
| Manufacturer | Catnic (a Tata Steel Enterprise) |
| Manufacturing sites | Caerphilly, Llanwern and Port Talbot |
| Product applications | Construction |
| Declared unit | 1kg of steel product |
| Date of issue | 22nd May 2023 |
| Valid until | 21st May 2028 |

EPD
THIRD PARTY VERIFIED ISO 14025 & EN 15804

This Environmental Product Declaration (EPD) is for Catnic® plaster profiles, lath and mesh, manufactured by Catnic, a Tata Steel Enterprise in the UK. The environmental indicators are for products manufactured at Caerphilly with feedstock supplied from Llanwern.

The information in this Environmental Product Declaration is based on production data from 2017 and 2019.

EN 15804 serves as the core PCR, supported by Tata Steel's EN 15804 verified EPD programme Product Category Rules documents, and this declaration has been independently verified according to ISO 14025 [1,2,3,4,5,6,7].

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Third party verifier

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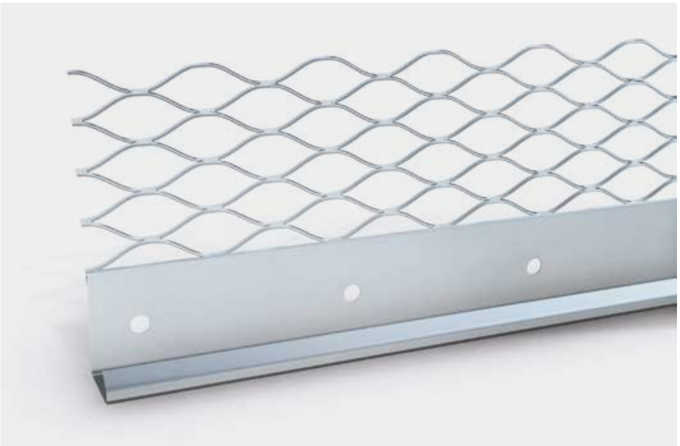
# 2 Product information

### 2.1 Product Description

The Catnic® plaster profiles, lath and mesh provide a range of steel profiles for use by professional plasterers for render, drywall and decorative applications The profiles are manufactured from hot dipped galvanised steel to EN 10346 [8] which provides corrosion protection as well as strength and protection against everyday knocks.

An image of a Catnic® profile product is shown in Figure 1 below.

**Figure 1 Catnic® plaster stop bead**



### 2.2 Manufacturing

The manufacturing sites included in the EPD are listed in Table 1 below. Some galvanised coils are also purchased from Tata Steel Distribution and other UK steel stockholders.

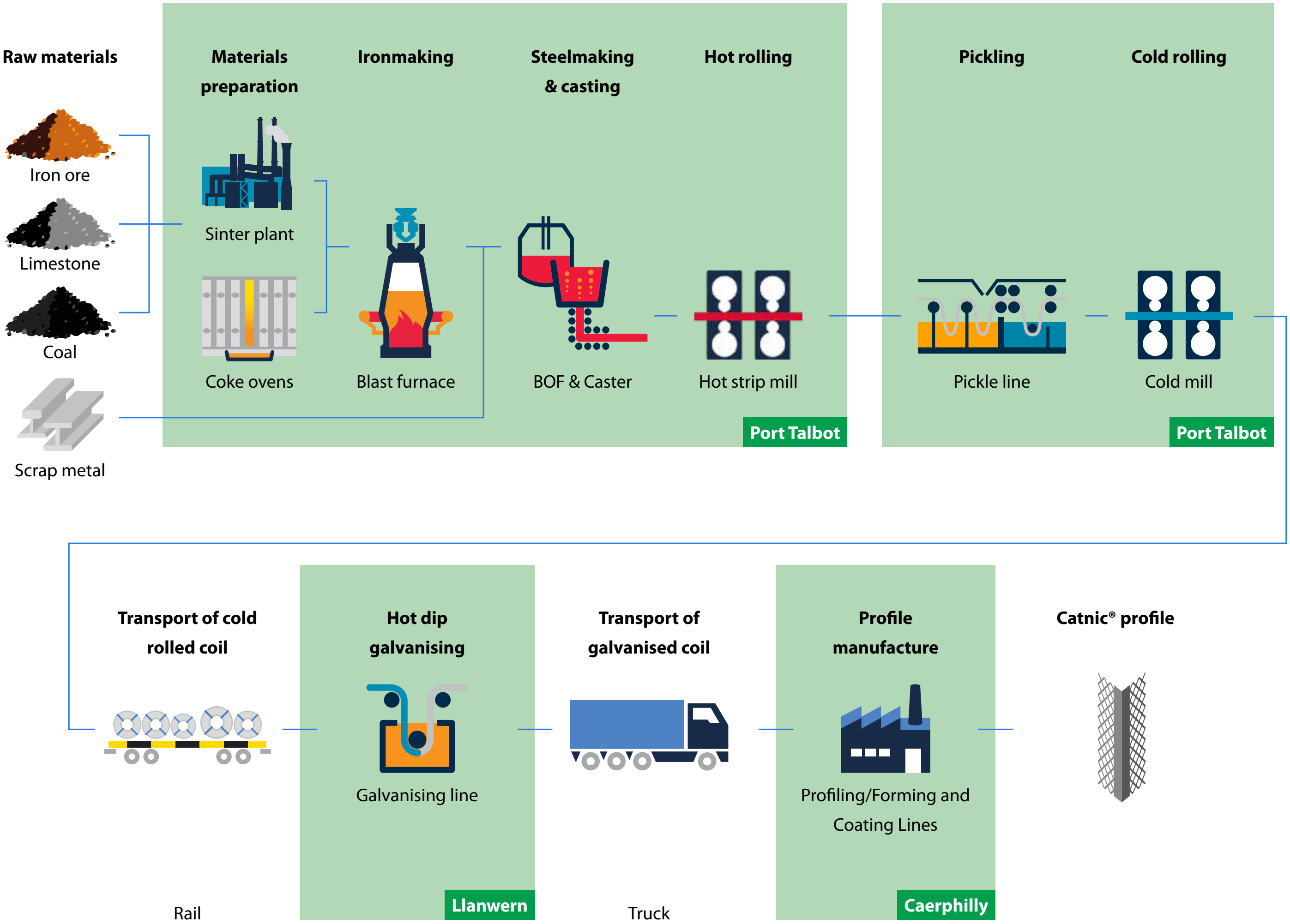
**Table 1 Participating sites**

| Site name | Product | Manufacturer | Country |
|---|---|---|---|
| **Port Talbot** | Cold rolled coil | Tata Steel | UK |
| **Llanwern** | Galvanised coil | Tata Steel | UK |
| **Caerphilly** | Profiles, lath and mesh | Catnic | UK |

The process of profile manufacture at Tata Steel begins with sinter being produced from iron ore and limestone, and together with coke from coal, reduced in a blast furnace to produce iron. Steel scrap is added to the liquid iron and oxygen is blown through the mixture to convert it into liquid steel in the basic oxygen furnace. The liquid steel is continuously cast into discrete slabs, which are subsequently reheated and rolled in a hot strip mill to produce steel coil.

The hot rolled coils are pickled and cold rolled, and transported by rail from Port Talbot to Llanwern, where the strip is galvanised on the Zodiac Line. The galvanised coils are transported to the Caerphilly site in South Wales, by road from Llanwern. The manufacturing process at Caerphilly begins with the coils being slit, perforated, roll-formed, and cut to length, before being further slit and stretched to form the profile, lath or mesh. An overview of the process from raw materials to profile product is shown in Figure 2.

**Figure 2 Process overview from raw materials to profile product (Tata Steel sourced primary steel)**



Process data for the manufacture of hot dip galvanised coil at Llanwern were gathered as part of the latest worldsteel data collection. Process data were also gathered for the profile manufacturing process at Caerphilly.

### 2.3 Technical data and specifications

The general properties of the product are shown in Table 2, and the technical specifications are presented in Table 3. The profiles are manufactured to EN 13658-1 [9], EN 13658-2 [10] or EN 14353 [11] and are CE and UKCA marked.

**Table 2 General properties of Catnic® profiles**

| | Catnic® profiles |
|---|---|
| **Length (m)** | 2.4 to 100 |
| **Width (mm)** | 25 to 700 |
| **Weight (kg/m²)** | 0.9 to 2.22 |

**Table 3 Technical specification of Catnic® profiles**

| | Catnic® profiles |
|---|---|
| **Metallic Coating** | Catnic® profiles are manufactured from hot dip galvanised steel to EN 10346 [8] plus coating type Z275 |
| **Certification** | Certifications applicable to the Caerphilly site are; ISO 9001 [12], ISO 14001 [13], BES 6001 certification [14] |

### 2.4 Packaging

Catnic® profiles are supplied in packs banded onto timber bearers or pallets. The mass of this packaging is 0.012kg of timber and 0.0014kg of plastic strapping, per kg of profile product. Polyethylene plastic film packaging is also used, 0.0006 kg per kg of profile product.

### 2.5 Biogenic Carbon content

There are no materials containing biogenic carbon in Catnic® profile products. Timber bearers are used to package the profile products and comprise a measurable mass of the total packaging as shown in Table 4 below.

**Table 4 Biogenic carbon content at the factory gate**

| | Catnic® Profiles |
|---|---|
| **Biogenic carbon content (product) (kg)** | 0 |
| **Biogenic carbon content (packaging) (kg)** | 0.006 |

Note: 1kg biogenic carbon is equivalent to 44/12 kg of $CO_2$

# 3 LCA methodology

### 3.1 Declared unit

The unit being declared is a 1kg of profile product and the material composition of the profile is detailed in Table 5.

### 3.2 Scope

This EPD can be regarded as Cradle-to-Gate (with options) and the modules considered in the LCA are;

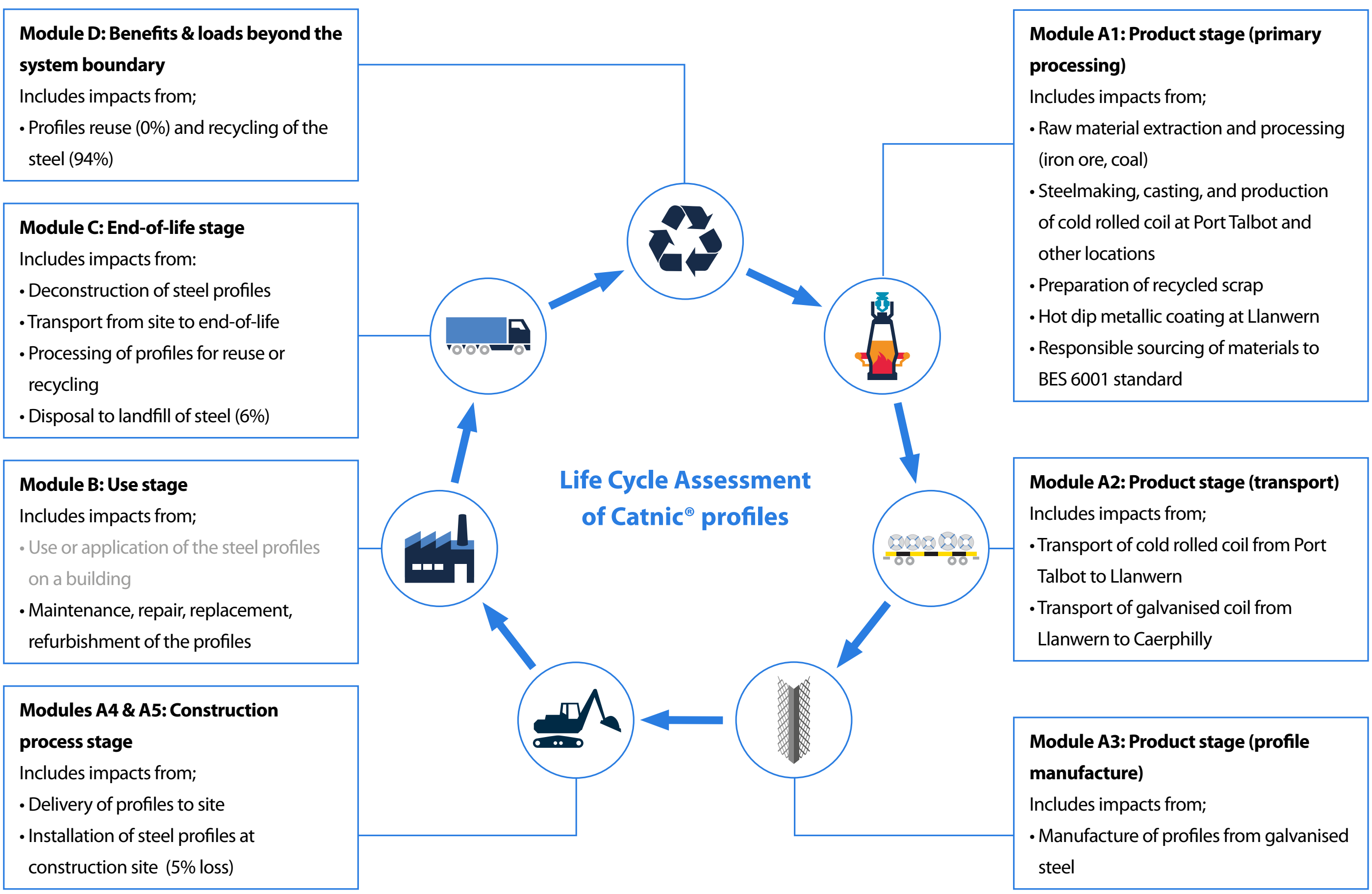
A1-A3: Production stage (raw material supply, transport to production site, manufacturing)
A4-A5: Construction stage (transport to construction site, construction site installation)
B1-B5: Use stage (related to the building fabric including maintenance, repair, replacement)
C1-C4: End-of-life (demolition/deconstruction, transport, processing for recycling and disposal)
D: Reuse, recycling and recovery

The life cycle stages are explained in more detail in Figure 3, but where the text is in light grey, the impacts from this part of the life cycle are not considered for this particular product.

**Table 5 Material composition of profile per declared unit**

| | Material declaration |
|---|---|
| **Declared unit (kg)** | 1.0 |
| **Steel (kg)** | 1.0 |

**Figure 3 Life Cycle Assessment of Catnic® profiles**



### 3.3 Cut-off criteria

All information from the data collection process has been considered, covering all used and registered materials, and all fuel and energy consumption. On-site emissions were measured and those emissions have been considered. Data for all relevant sites were thoroughly checked and also cross-checked with one another to identify potential data gaps. No processes, materials or emissions that are known to make a significant contribution to the environmental impact of the profiles have been omitted. On this basis, there is no evidence to suggest that input or outputs contributing more than 1% to the overall mass or energy of the system, or that are environmentally significant, have been omitted. It is estimated that the sum of any excluded flows contribute less than 5% to the impact assessment categories. The manufacturing of required machinery and other infrastructure is not considered in the LCA.

### 3.4 Background data

For life cycle modelling of steel profiles, the Sphera LCA for Experts software System for Life Cycle Engineering (formerly GaBi) is used [15]. The LCA FE database contains consistent and documented datasets which can be viewed in the online Managed LCA Content (MLC) documentation [16].

Where possible, specific data derived from Tata Steel's own production processes were the first choice to use where available. Galvanised steel coils sourced from Tata Steel Distribution were modelled using the latest worldsteel European Average HDG Steel, and those sourced from other UK steel stockholders, were modelled using the latest worldsteel Global Average HDG Steel, both available in the Sphera MLC.

To ensure comparability of results in the LCA, the basic data of the Sphera MLC were used for energy, transportation and auxiliary materials.

### 3.5 Data quality

The data from Tata Steel's own production processes are from 2017 and 2019, and the technologies on which these processes were based during that period, are those used at the date of publication of this EPD. All relevant background datasets are taken from the Sphera MLC, and the last revision of these datasets took place less than 10 years ago. The study is considered to be based on good quality data.

### 3.6 Allocation

To align with the requirements of EN 15804, a methodology is applied to assign impacts to the production of slag and hot metal from the blast furnace (co-products from steel manufacture), that was developed by the World Steel Association and EUROFER [17]. This methodology is based on physical and chemical partitioning of the manufacturing process, and therefore avoids the need to use allocation methods, which are based on relationships such as mass or economic value. It takes account of the manner in which changes in inputs and outputs affect the production of co-products and also takes account of material flows that carry specific inherent properties. This method is deemed to provide the most representative method to account for the production of blast furnace slag as a co-product.

Economic allocation was considered, as slag is designated as a low value co-product under EN 15804. However, as neither hot metal nor slag are tradable products upon leaving the blast furnace, economic allocation would most likely be based on estimates. Similarly BOF slag must undergo processing before being used as a clinker or cement substitute. The World Steel Association and EUROFER also highlight that companies purchasing and processing slag, work on long term contracts which do not follow regular market dynamics of supply and demand.

Process gases arise from the production of the continuously cast steel slabs at Port Talbot, and are accounted for using the system expansion method. This method is also referenced in the same EUROFER document and the impacts of co-product allocation, during manufacture, are accounted for in the product stage (module A1).

End-of-life assumptions for recovered steel and steel recycling are accounted for as per the current methodology from the World Steel Association 2017 Life Cycle Assessment methodology report [18]. A net scrap approach is used to avoid double accounting, and the net impacts are reported as benefits and loads beyond the system boundary (module D).

### 3.7 Additional technical information

The main scenario assumptions used in the LCA are detailed in Table 6. The end-of-life percentages are taken from a Tata Steel / EUROFER recycling and reuse survey of UK demolition contractors carried out in 2012 [19].

For all indicators the characterisation factors from the EC-JRC are applied, identified by the name EN_15804, and based upon the EF Reference Package 3.0 [20]. In LCA FE, the corresponding impact assessment is used, denoted by EN 15804 +A2.

### 3.8 Comparability

Care must be taken when comparing EPDs from different sources. EPDs may not be comparable if they do not have the same functional unit or scope (for example, whether they include installation allowances in the building), or if they do not follow the same standard such as EN 15804. The use of different generic data sets for upstream or downstream processes that form part of the product system may also mean that EPDs are not comparable.

Comparisons should ideally be integrated into a whole building assessment, in order to capture any differences in other aspects of the building design that may result from specifying different products. For example, a more durable product would require less maintenance and reduce the number of replacements and associated impacts over the life of the building, or, a higher strength product may require less material for the same function.

**Table 6 Main scenario assumptions**

| Module | Scenario assumptions |
|---|---|
| **A1 to A3 – Product stage** | Manufacturing data from Tata Steel's site(s) at Port Talbot and Llanwern are used. |
| **A2 – Transport to the galvanising and profile manufacturing sites** | Cold rolled coils are transported from Port Talbot to Llanwern by rail. The Catnic® profile manufacturing facility is located at Caerphilly in South Wales and the galvanised coils are transported there a distance of 30km from Llanwern, 201km from Tata Steel Distribution, and 219km from UK steel stockholders, by road on a 26 tonne capacity truck with a utilisation of 46% to allow for empty returns. |
| **A4 – Transport to construction site** | A transport distance of 225km by road on a 26 tonne capacity truck was considered representative of a typical UK installation and a utilisation factor of 58% was assumed (no empty returns). A total road transport distance of 665km was considered representative of a typical mainland Europe installation and a utilisation factor of 100% was assumed (no empty returns). The mainland Europe installation also includes a 40km channel ferry crossing. |
| **A5 – Installation at construction site** | The impact from installing the profiles on site was assumed to be zero because they are sufficiently light to be manually lifted into position, although a 5% loss from cutting of and damage to profiles during installation was included. Timber packaging is assumed to be reused while the plastic packaging is assumed to be sent to landfill. |
| **B1 to B5 – Use stage** | This stage includes any maintenance or repair, replacement or refurbishment of the profiles over the life cycle. This is not required for the duration of the life of the profiles. |
| **C1 – Deconstruction and demolition** | The deconstruction impacts are assumed to be zero because the profiles can be manually removed from the building at end-of-life. |
| **C2 – Transport for recycling, reuse, and disposal** | A total transport distance of 150km to landfill is assumed. For profiles that are recycled, a total distance of 200 km to the steel plant via a shredding plant is assumed. All transport is on a 26 tonne capacity truck with the following utilisations assumed to account for empty returns – transport of profiles 0.20, transport of shredded steel scrap 0.30. |
| **C3 – Waste processing for reuse, recovery and/or recycling** | The profiles that are recycled are processed in a shredder. |
| **C4 – Disposal** | At end-of-life, 6% of the steel is lost to landfill, based upon the findings of an NFDC survey. |
| **D – Reuse, recycling, and energy recovery** | At end-of-life, 94% of the steel is recycled based upon the findings of an NFDC survey. The recycling rate is based upon the best data available, but it is acknowledged that for this particular product, the rate may be optimistic because the context in which it is used increases the likelihood of it being disposed in mixed construction waste. |

Please note that in the LCA FE software, an empty return journey is accounted for by halving the load capacity utilisation of the outbound journey.

# 4 Results of the LCA

## Description of the system boundary

| Product stage | | | Construction stage | | Use stage | | | | | | | End-of-life stage | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw material supply | Transport | Manufacturing | Transport | Installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse Recovery Recycling |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | X | X | X | X | X | X | X | ND | ND | X | X | X | X | X |

X = Included in LCA; ND = module not declared

## Environmental impact:

**1kg of steel profiles**

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **GWP-total** | kg $CO_2$ eq | 2.77E+00 | 2.87E-02 | 1.60E-04 | 0.00E+00 | 0.00E+00 | 2.35E-02 | 1.08E-02 | 8.27E-04 | -1.54E+00 |
| **GWP-fossil** | kg $CO_2$ eq | 2.78E+00 | 2.92E-02 | 1.62E-04 | 0.00E+00 | 0.00E+00 | 2.37E-02 | 1.08E-02 | 8.51E-04 | -1.54E+00 |
| **GWP-biogenic** | kg $CO_2$ eq | -1.44E-02 | -5.19E-04 | -1.70E-06 | 0.00E+00 | 0.00E+00 | -2.21E-04 | -1.00E-04 | -2.52E-05 | 7.86E-04 |
| **GWP-luluc** | kg $CO_2$ eq | 5.59E-04 | 7.97E-05 | 7.04E-08 | 0.00E+00 | 0.00E+00 | 3.28E-07 | 5.13E-05 | 1.57E-06 | -3.18E-05 |
| **ODP** | kg CFC11 eq | 1.72E-12 | 3.33E-15 | 1.96E-16 | 0.00E+00 | 0.00E+00 | 3.08E-15 | 2.46E-13 | 2.00E-15 | -3.37E-15 |
| **AP** | mol $H^+$ eq | 7.88E-03 | 9.86E-05 | 4.85E-07 | 0.00E+00 | 0.00E+00 | 9.00E-05 | 3.48E-05 | 6.03E-06 | -3.31E-03 |
| **EP-freshwater** | kg P eq | 1.07E-06 | 4.56E-08 | 2.69E-08 | 0.00E+00 | 0.00E+00 | 4.75E-09 | 3.75E-08 | 1.44E-09 | -2.79E-07 |
| **EP-marine** | kg N eq | 1.76E-03 | 4.61E-05 | 1.22E-07 | 0.00E+00 | 0.00E+00 | 4.34E-05 | 6.46E-06 | 1.54E-06 | -5.82E-04 |
| **EP-terrestrial** | mol N eq | 1.88E-02 | 5.10E-04 | 1.34E-06 | 0.00E+00 | 0.00E+00 | 4.76E-04 | 6.91E-05 | 1.69E-05 | -5.11E-03 |
| **POCP** | kg NMVOC eq | 6.22E-03 | 9.92E-05 | 3.58E-07 | 0.00E+00 | 0.00E+00 | 8.35E-05 | 1.85E-05 | 4.69E-06 | -2.36E-03 |
| **ADP-minerals&metals** | kg Sb eq | 1.51E-05 | 2.23E-09 | 1.11E-11 | 0.00E+00 | 0.00E+00 | 1.47E-09 | 3.89E-09 | 8.72E-11 | -3.84E-06 |
| **ADP-fossil** | MJ net calorific value | 2.97E+01 | 3.81E-01 | 2.28E-03 | 0.00E+00 | 0.00E+00 | 3.11E-01 | 2.19E-01 | 1.11E-02 | -1.41E+01 |
| **WDP** | $m^3$ world eq deprived | 1.11E+00 | 1.55E-04 | -1.40E-06 | 0.00E+00 | 0.00E+00 | 3.08E-05 | 2.11E-03 | 9.33E-05 | -2.86E-01 |
| **PM** | Disease incidence | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **IRP** | kBq U235 eq | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **ETP-fw** | CTUe | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **HTP-c** | CTUh | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **HTP-nc** | CTUh | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **SQP** | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of stratospheric ozone layer
AP = Acidification potential, Accumulated Exceedance
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication potential, Accumulated Exceedance
POCP = Formation potential of tropospheric ozone

ADPE = Abiotic depletion potential for non-fossil resources
ADPF = Abiotic depletion potential for fossil resources
WDP = Water (user) deprivation potential, deprivation-weighted water consumption
PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235
ETP-fw = Potential Comparative Toxic Unit for ecosystems
HTP-c = Potential Comparative Toxic Unit for humans
HTP-nc = Potential Comparative Toxic Unit for humans
SQP = Potential soil quality index

The following indicators should be used with care as the uncertainties on these results are high or as there is limited experience with the indicator : ADP-minerals&metals, ADP-fossil, and WDP.

## Resource use:

**1kg of steel profiles**

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **PERE** | MJ | 2.24E+00 | 1.93E-02 | 1.77E-04 | 0.00E+00 | 0.00E+00 | 1.24E-02 | 6.25E-02 | 1.67E-03 | 8.91E-01 |
| **PERM** | MJ | 1.82E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **PERT** | MJ | 2.42E+00 | 1.93E-02 | 1.77E-04 | 0.00E+00 | 0.00E+00 | 1.24E-02 | 6.25E-02 | 1.67E-03 | 8.91E-01 |
| **PENRE** | MJ | 2.96E+01 | 3.83E-01 | 2.28E-03 | 0.00E+00 | 0.00E+00 | 3.12E-01 | 2.19E-01 | 1.12E-02 | -1.41E+01 |
| **PENRM** | MJ | 9.76E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **PENRT** | MJ | 2.97E+01 | 3.83E-01 | 2.28E-03 | 0.00E+00 | 0.00E+00 | 3.12E-01 | 2.19E-01 | 1.12E-02 | -1.41E+01 |
| **SM** | kg | 5.41E-02 | 0.00E+00 | -5.00E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **RSF** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **NRSF** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **FW** | $m^3$ | 2.70E-02 | 1.37E-05 | 2.78E-08 | 0.00E+00 | 0.00E+00 | 1.86E-06 | 8.99E-05 | 2.83E-06 | -6.46E-03 |

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM = Use of renewable primary energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total use of non-renewable primary energy resources
SM = Input of secondary material
RSF = Use of renewable secondary fuels
NRSF = Use of non-renewable secondary fuels
FW = Use of net fresh water

## Output flows and waste categories:

**1kg of steel profiles**

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **HWD** | kg | 9.51E-04 | 1.42E-12 | 3.16E-13 | 0.00E+00 | 0.00E+00 | 8.13E-13 | 2.01E-09 | 5.73E-13 | -1.09E-10 |
| **NHWD** | kg | 1.58E-01 | 4.36E-05 | 4.06E-03 | 0.00E+00 | 0.00E+00 | 2.49E-05 | 1.20E-04 | 1.14E-01 | 2.14E-01 |
| **RWD** | kg | 1.97E-04 | 6.39E-07 | 2.55E-08 | 0.00E+00 | 0.00E+00 | 4.92E-07 | 2.77E-05 | 1.24E-07 | 1.76E-06 |
| **CRU** | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **MFR** | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.93E-01 | 0.00E+00 | 0.00E+00 |
| **MER** | kg | 3.10E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **EEE** | MJ | 1.33E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **EET** | MJ | 1.31E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

HWD = Hazardous waste disposed
NHWD = Non-hazardous waste disposed
RWD = Radioactive waste disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported electrical energy
EET = Exported thermal energy

# 5 Interpretation of results

Figure 4 shows the relative contribution per life cycle stage for selected environmental impact categories for a 1kg of Catnic® profiles. Each column represents 100% of the total impact score, which is why all the columns have been set with the same length. A burden is shown as positive (above the 0% axis) and a benefit is shown as negative (below the 0% axis). The main contributors across the impact categories are A1-A3 (burdens) and D (benefits beyond the system boundary). The manufacture of hot dip galvanised coil during stage A1-A3 is responsible for at least 90% of each impact in most of the categories, specifically, the conversion of iron ore into liquid steel which is the most energy intensive part of the overall profiles manufacturing process.

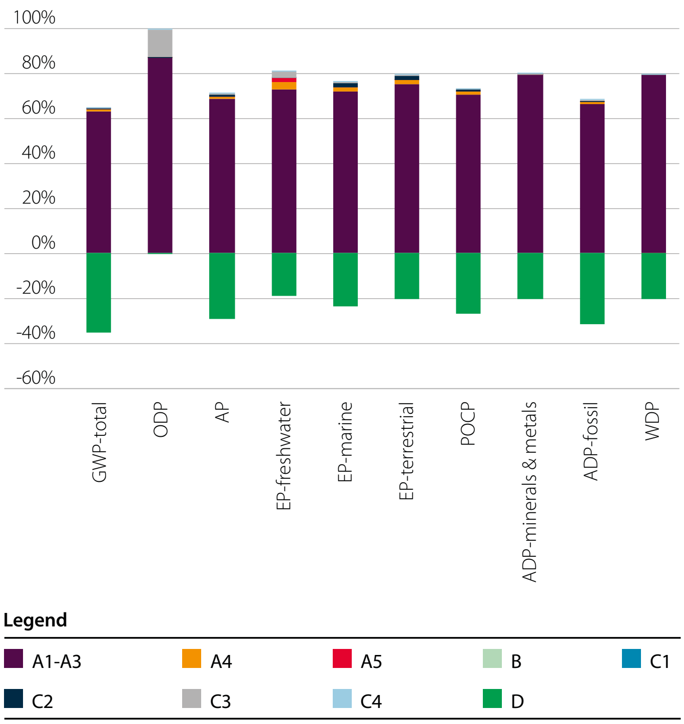
The primary site emissions come from the use of coal and coke in the blast furnace, and from the injection of oxygen into the basic oxygen furnace, as well as combustion of the process gases. These processes give rise to emissions of $CO_2$, which contributes more than 90% of the Global Warming Potential (GWP), and sulphur oxides, which are responsible for 58% of the impact in the Acidification Potential (AP) category.

In addition, oxides of nitrogen are emitted which contribute 41% of the A1-A3 Acidification Potential, almost all of the Eutrophication Potential (EP-marine and EP-terrestrial), and approximately 70% of the Photochemical Ozone indication (POCP). Carbon monoxide and a small mass of sulphur dioxide emissions also contribute to POCP. The contributions to the EP-freshwater indicator are mainly phosphate and phosphorous emissions across all processes.

Figure 4 clearly indicates the relatively small contribution to each impact from the other life cycle stages, which are A4, A5 and C1 to C4. The most notable of these are for the Eutrophication indicators in the transport stages A4 and C2, from nitrogen oxides to air from the combustion of diesel fuel that powers truck transport, and for the ODP category in C3, as a result of the shredding process which prepares the recovered steel profiles for recycling. However, it is important to note that direct emissions of ozone depleting substances do not arise from the shredding process itself. The reference year of the processing for recycling data is 2000, but its inclusion in the model was deemed to be better than not considering these impacts at all.

There is also a visible contribution to A5 in the Eutrophication (freshwater) indicator from phosphorus emissions to fresh water, the result of sending plastic packaging waste to landfill.

**Figure 4 LCA results for Catnic® profiles**




Module D values are largely derived using worldsteel's value of scrap methodology which is based upon many steel plants worldwide, including both BF/BOF and EAF steel production routes. At end-of-life, the recovered steel is modelled with a credit given as if it were re- melted in an Electric Arc Furnace and substituted by the same amount of steel produced in a Blast Furnace [18]. The specific emissions that represent the burden in A1-A3, are essentially the same as those responsible for this Module D credit. It is important that the life cycle of the steel product is considered here, because in most cases, the Module D credit provides significant benefits in terms of reducing the whole life environmental impacts.

Referring to the LCA results, the impact in Module D for the Use of Renewable Primary Energy indicator (PERT) is also different to the other impact categories, being a burden or load rather than a benefit. Renewable energy consumption is strongly related to the use of electricity, during manufacture, and as the recycling (EAF) process uses significantly more electricity than primary manufacture (BF/BOS), there is a positive value for renewable energy consumption in Module D but a negative value for non-renewable energy consumption.

# 6 References and product standards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7. EN 15804:2012+A2:2019, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
8. EN 10346:2015, Continuously hot-dip coated steel flat products for cold forming
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