A Tata Steel Enterprise

THIRD PARTY VERIFIED ISO 14025 & EN 15804

# Catnic® Urban Profiles 514mm wide

## Environmental Product Declaration

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Catnic® Urban Profiles 514mm wide
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-2024-021
Date of Issue: 4th December 2024
Valid until: 3rd December 2029


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 ☐ External ☒

Author of the Life Cycle Assessment: Tata Steel UK
Third party verifier: René Kraaijenbrink LBP Sight, Netherlands

# 1 General information

| | |
|---|---|
| Owner of EPD | Tata Steel Europe |
| Product | Catnic® Urban profiles 514mm wide |
| Manufacturer | Catnic (a Tata Steel Enterprise) |
| Manufacturing sites | Shotton, Llanwern and Port Talbot |
| Product applications | Construction |
| Declared unit | 1m$^2$ of Catnic Urban profiles |
| Date of issue | 4th December 2024 |
| Valid until | 3rd December 2029 |

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

The information in this Environmental Product Declaration is based on production data from 2021 and 2022.

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].

Third party verifier

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# 2 Product information

## 2.1 Product description

Catnic® Urban profiles are specifically designed for rapid installation of roofing or cladding 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 wear.

An image of the products is shown in Figure 1 below.

**Figure 1 Catnic® Urban profiles**

## 2.2 Manufacturing

The manufacturing sites included in the EPD are listed in Table 1 below.

**Table 1 Participating sites**

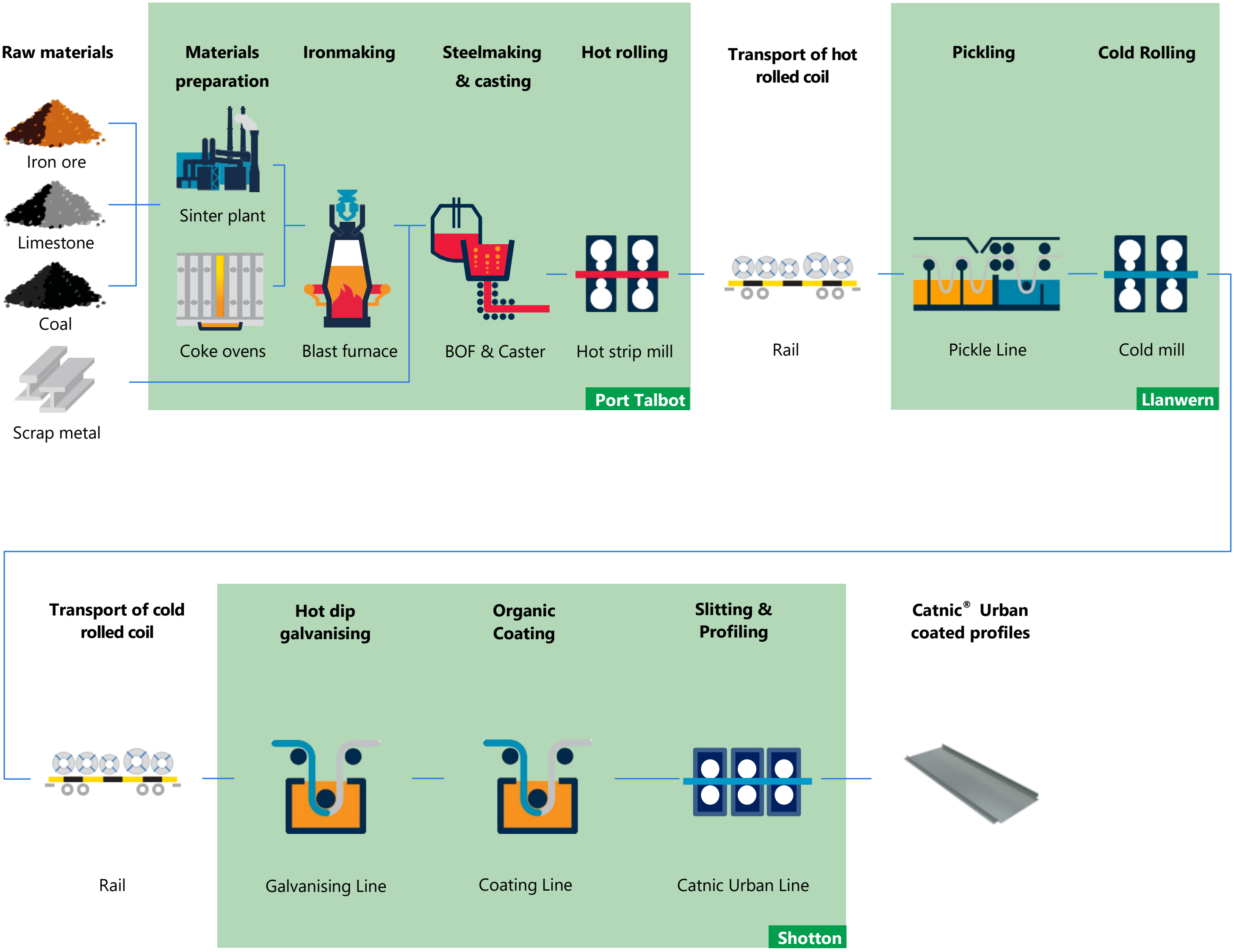
| Site name | Product | Manufacturer | Country |
|---|---|---|---|
| **Port Talbot** | Cold rolled coil | Tata Steel | UK |
| **Llanwern** | Galvanised coil | Tata Steel | UK |
| **Shotton** | Coated profiles | Tata Steel | UK |

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 transported by rail, from Port Talbot to Llanwern where they are pickled and cold rolled. Following cold rolling the coil is then transported by train to Shotton where the strip is hot dip metallic coated and painted.

Pre-finished steel comprises a number of paint layers and treatments which are applied to the steel in an automated and carefully controlled process with each layer of the product having a particular function. It is the combined effect of all these layers that give the product its overall performance and ensures a material that is robust and offers the specifier a choice of colour and effect. During the coating process for Colorcoat® pre-finished steel, a zinc based metallic coating is first applied to the steel coil. A pre-treatment is applied and then a primer before adding the final top coat layer(s) in the form of liquid paint. For the vast majority of pre-finished steel products, the above topcoats are applied on the top surface only, while the reverse or back side of the strip is produced with a high performing backing coat. These are cured at elevated temperatures before being recoiled prior to use in the manufacture of building envelope products.

The coated coils are then slit and profiled at the Catnic® Urban Line in Shotton and the process 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 cold rolled coil feedstocks from Port Talbot and Llanwern were gathered as part of the latest worldsteel data collection. For Port Talbot and Llanwern, and Colorcoat® and Catnic® Urban profile manufacture at Shotton, the data collection was not only organised by site, but also by each process line within the site. In this way it was possible to attribute resource use and emissions to each process line, and using processed tonnage data for that line, also attribute resources and emissions to specific products.

## 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 CE and UKCA marked.

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

| | Catnic® profiles |
|---|---|
| **Length (m)** | 2 to 12.5 |
| **Width (mm)** | 514 |
| **Weight (kg/m²)** | 6.80 |

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

| | Catnic® Urban profiles |
|---|---|
| **Metallic Coating** | Colorcoat Prisma® and Colorcoat HPS200 Ultra® are supplied with a Galvalloy® metallic coating which is manufactured using a mix of 95% zinc and 5% aluminium that conforms to EN 10346 [8] |
| **Paint coating (organic)** | Colorcoat Prisma® or Colorcoat HPS200 Ultra®<br>All pre-finished steel products are fully REACH [9] compliant and chromate free |
| **Certification** | Certifications applicable to Tata Steel Shotton site are;<br>ISO 9001[10] , ISO 14001[11], ISO 45001[12]<br>BBA certification (Colorcoat)[13]<br>BES 6001 certification[14], ISO 50001[15]<br>Volatile organic compounds (VOC) against ISO 16000-9 A+ rating[16]<br>RC5, Ruv4, CPI5 certificates in accordance with EN 10169 [17] |

## 2.4 Packaging

Catnic® profiles are supplied in protective packs banded onto timber bearers and the mass of this packaging is shown in Table 4.

**Table 4 Packaging per declared unit**

| | Packaging declaration |
|---|---|
| **Declared unit (m²)** | 1.0 |
| **Steel banding (kg)** | 0.009 |
| **Plastic (kg)** | 0.002 |
| **Cardboard (kg)** | 0.003 |
| **Timber (kg)** | 0.004 |

## 2.5 Reference service life

A reference service life for Catnic® Urban profiles is in excess of 40 years in line with the durability life declared by the British Board of Agrément Certificate (BBA) [14].

Tata Steel offer a Confidex® Home guarantee directly to the homeowner for the weather side of this pre-finished steel product. Confidex® offers the most comprehensive guarantee for pre-finished steel available in Europe. Colorcoat Prisma® and Colorcoat HPS200 Ultra® are guaranteed for 25 years. Further details of the Confidex® Guarantee are available at 25 year Confidex® Home guarantee | Catnic Urban | Catnic

## 2.6 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 5 below.

**Table 5 Biogenic carbon content at the factory gate**

| | Catnic® Urban 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 1m$^2$ of profile product and the material composition of the profile is detailed in Table 6.

### 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 6 Material composition of profile per declared unit**

| | Material declaration |
|---|---|
| **Declared unit (m$^2$)** | 1.0 |
| **Product Mass (kg)** | 6.80 |
| **Metallic Coating Mass (kg)** | 0.31 |
| **Organic Coating Mass (kg)** | 0.21 |
| **Steel (kg)** | 6.29 |
| **Galvanised fixings (kg)** | 0.03 |

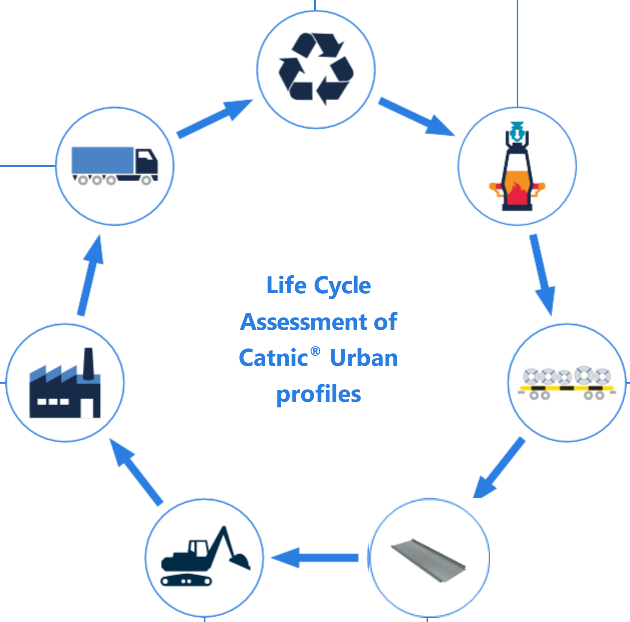
**Figure 3 Life Cycle Assessment of Catnic® Urban profile**

**Module D: Benefits & loads beyond the system boundary**
Includes impacts from;
- Reuse (10%) and recycling (89%) of the profiles

**Module C: End-of-life stage**
Includes impacts from:
- Deconstruction of steel profiles
- Transport from site to end-of-life
- Processing of profiles for reuse or recycling
- Disposal to landfill of steel (1%)

**Module B: Use stage**
Impacts assumed to be zero from:
- Use or application of the steel profiles on a building
- Maintenance, repair, replacement, refurbishment of the profiles

**Modules A4 & A5: Construction process stage**
Includes impacts from;
- Delivery of profiles to site
- Installation of steel profiles at construction site (2% loss)




**Module A1: Product stage (primary processing)**
Includes impacts from;
- Raw material extraction and processing (iron ore, coal)
- Steelmaking, casting, and production of cold rolled coil at Port Talbot and Llanwern
- Preparation of recycled scrap
- Production of paints for coatings
- Responsible sourcing of materials to BES 6001 standard

**Module A2: Product stage (transport)**
Includes impacts from;
- Transport of cold rolled steel coils from Llanwern to Shotton

**Module A3: Product stage (profile manufacture)**
Includes impacts from;
- Hot dip metallic coating at Shotton
- Organic coating of HDG coils
- Manufacture of the profiles on the Catnic Urban line

### 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 coated profiles, the Sphera LCA for Experts software System for Life Cycle Engineering (formerly GaBi) is used [18]. The LCAfE database contains consistent and documented datasets which can be viewed in the online Managed LCA Content (MLC) documentation [19].

Where possible, specific data derived from Tata Steel's own production processes were the first choice to use where available. 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 2021 and 2022, 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 [20]. 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 [21]. 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).

In order to avoid allocation between different coatings produced from the same line, specific data for the manufacture of each paint type was obtained, and the mass of paint applied was considered, based upon the thickness of the coating. The values presented in the results are representative of both coating types. The deviation between the coating types across most of the impact categories is less than 3%.

### 3.7 Additional technical information

The main scenario assumptions used in the LCA are detailed in Table 7. The end-of-life percentages are taken from a Tata Steel /EUROFER recycling and reuse survey of UK demolition contractors carried out in 2012 [22].

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 3.1 [23]. In LCAfE, 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, Llanwern and Shotton are used.. |
| **A2 – Transport to the galvanising and profile manufacturing sites** | Cold rolled coils are transported from Llanwern to Shotton by rail distance was assumed to be 100km. Utilisation for this was assumed to be 50%. Transport across the Shotton site to the Catnic Urban line is assumed to be 5km by road. |
| **A4 – Transport to construction site** | A transport distance of 100km by road on a 25 tonne capacity truck was considered representative of a typical UK installation and a utilisation factor of 15% was assumed (no empty returns). |
| **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 2% 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 assumed to be zero for the duration of the life of the profiles. |
| **C1 – Deconstruction and demolition** | Energy consumption estimated based upon published data for the dismantling of steel constructions in Germany [24] |
| **C2 – Transport for recycling, reuse, and disposal** | A total transport distance of 100km to landfill is assumed. For profiles that are recycled, a total distance of 100 km to the steel plant via a shredding plant is assumed. For reuse, a distance of 250km 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. 10% of the product is reused. |
| **C4 - Disposal** | At end-of-life, 1% 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, 89% 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 LCAfE 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 | MND | MND | X | X | X | X | X |

X = Included in LCA; MND = module not declared

## Environmental impact:

1m² of 514mm Catnic® Urban profile

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq | 2.20E+01 | 5.66E-02 | 8.89E-02 | 0.00E+00 | 2.88E-02 | 5.54E-02 | 7.04E-02 | 9.96E-04 | -1.20E+01 |
| GWP-fossil | kg $CO_2$ eq | 2.25E+01 | 5.68E-02 | 8.86E-02 | 0.00E+00 | 2.94E-02 | 5.57E-02 | 7.08E-02 | 9.97E-04 | -1.21E+01 |
| GWP-biogenic | kg $CO_2$ eq | -5.27E-01 | -2.30E-04 | 2.14E-04 | 0.00E+00 | -8.51E-04 | -2.26E-04 | -7.30E-04 | -6.87E-06 | 1.10E-01 |
| GWP-luluc | kg $CO_2$ eq | 4.37E-03 | 2.39E-06 | 7.99E-05 | 0.00E+00 | 2.36E-04 | 2.34E-06 | 3.41E-04 | 5.99E-06 | -1.74E-03 |
| ODP | kg CFC11 eq | 1.48E-07 | 8.92E-15 | 1.18E-13 | 0.00E+00 | 1.95E-13 | 8.74E-15 | 1.63E-12 | 2.69E-15 | -1.45E-08 |
| AP | mol $H^+$ eq | 1.81E-01 | 5.39E-05 | 2.51E-04 | 0.00E+00 | 6.88E-05 | 5.28E-05 | 2.31E-04 | 7.08E-06 | -4.20E-02 |
| EP-freshwater | kg P eq | 2.87E-04 | 1.19E-08 | 1.91E-06 | 0.00E+00 | 1.08E-07 | 1.17E-08 | 2.49E-07 | 2.27E-09 | -3.05E-05 |
| EP-marine | kg N eq | 7.75E-02 | 1.92E-05 | 5.72E-05 | 0.00E+00 | 2.35E-05 | 1.88E-05 | 4.29E-05 | 1.82E-06 | -1.15E-02 |
| EP-terrestrial | mol N eq | 8.44E-01 | 2.19E-04 | 6.21E-04 | 0.00E+00 | 2.60E-04 | 2.15E-04 | 4.59E-04 | 2.01E-05 | -1.18E-01 |
| POCP | kg NMVOC eq | 2.10E-01 | 6.08E-05 | 1.97E-04 | 0.00E+00 | 8.01E-05 | 5.96E-05 | 1.23E-04 | 5.58E-06 | -3.63E-02 |
| Resource use, mineral and metals | kg Sb eq | 5.04E-04 | 1.84E-09 | 8.33E-07 | 0.00E+00 | 3.37E-09 | 1.81E-09 | 2.58E-08 | 6.46E-11 | -1.05E-04 |
| Resource use, fossils | MJ net calorific value | 6.03E+02 | 7.53E-01 | 1.11E+00 | 0.00E+00 | 6.77E-01 | 7.38E-01 | 1.45E+00 | 1.32E-02 | -1.57E+02 |
| Water use | $m^3$ world eq deprived | 1.44E+01 | 7.75E-05 | -7.36E-03 | 0.00E+00 | 2.78E-03 | 7.59E-05 | 1.40E-02 | 1.14E-04 | -2.08E+00 |
| 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

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 : Resource use, mineral and metals, Resource use, fossils, Water use.

## Resource use:

1m² of 514mm Catnic® Urban profile

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 3.41E+01 | 4.29E-02 | 1.07E-01 | 0.00E+00 | 1.45E-01 | 4.20E-02 | 4.15E-01 | 2.29E-03 | 5.46E-01 |
| PERM | MJ | 4.32E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -4.23E-01 |
| PERT | MJ | 3.84E+01 | 4.29E-02 | 1.07E-01 | 0.00E+00 | 1.45E-01 | 4.20E-02 | 4.15E-01 | 2.29E-03 | 1.25E-01 |
| PENRE | MJ | 5.98E+02 | 7.53E-01 | 1.11E+00 | 0.00E+00 | 6.77E-01 | 7.38E-01 | 1.45E+00 | 1.32E-02 | -1.57E+02 |
| PENRM | MJ | 5.37E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -5.26E-01 |
| PENRT | MJ | 6.04E+02 | 7.53E-01 | 1.11E+00 | 0.00E+00 | 6.77E-01 | 7.38E-01 | 1.45E+00 | 1.32E-02 | -1.57E+02 |
| SM | kg | 2.41E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -3.70E-02 |
| 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 | $m^3$ | 3.52E-01 | 4.36E-06 | -6.48E-05 | 0.00E+00 | 1.22E-04 | 4.27E-06 | 5.97E-04 | 3.49E-06 | -1.03E+00 |

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 = Use 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:

1m² of 514m Catnic® Urban profile

| Parameter | Unit | A1 – A3 | A4 | A5 | B | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 2.31E-02 | 3.63E-11 | 1.06E-08 | 0.00E+00 | 2.73E-10 | 3.56E-11 | 1.33E-08 | 3.27E-12 | -2.26E-03 |
| NHWD | kg | 7.09E-01 | 6.07E-05 | 3.64E-01 | 0.00E+00 | 2.08E-04 | 5.95E-05 | 7.97E-04 | 1.33E-01 | 1.12E+00 |
| RWD | kg | 5.07E-03 | 1.08E-06 | 1.43E-05 | 0.00E+00 | 2.90E-05 | 1.06E-06 | 1.84E-04 | 1.38E-07 | -4.86E-04 |
| CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.66E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR | kg | 1.68E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.69E+00 |
| MER | kg | 3.87E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -3.79E-05 |

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

# 5 Interpretation of results

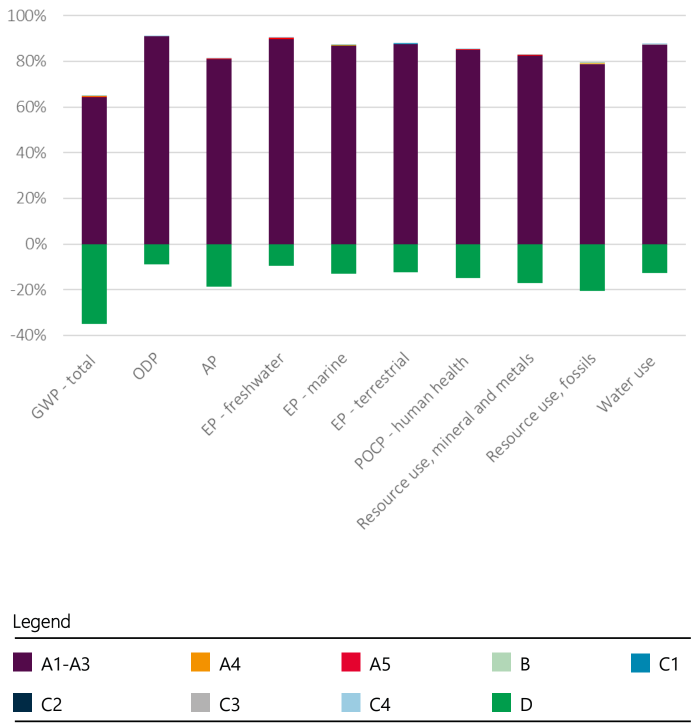
Figure 4 shows the relative contribution per life cycle stage for selected environmental impact categories for a 1m$^2$ of 514mm wide Catnic® Urban profiles. Each column represents 100% of the total impact score, which is why all the columns have been set with the same length. A burden is shown as positive (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 profile 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)-total. 80% of nitrogen oxide and 20% sulphur oxides are responsible of the impact in the Acidification Potential (AP) category. Two of the indicators are almost exclusively influenced by the manufacture of the paint used in the organic coating process, namely Ozone Depletion (ODP) and the Eutrophication Potential (EP) freshwater. Emissions of halogenated organic compounds drive the ODP indicator, while phosphate emissions contribute to the EP-freshwater category. It should be noted that the Water Use indicator is almost exclusively driven by paint manufacture and primary steel processing, while the ADP minerals and metals indicator impacts come mostly from the production of the metallic coating.

Oxides of nitrogen contribute to over 85% of the A1-A3 Acidification Potential, almost all of the Eutrophication Potential indicators (EP-marine and EP-terrestrial), and approximately all of the Photochemical Ozone indication (POCP). Carbon monoxide and a small mass of sulphur dioxide emissions also contribute to POCP. At around 80%, 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 considered. Of these stages, the most significant contributions are from stages A5 in the Eutrophication (EP) Potential – freshwater impact category from the waste generated at construction and installation. The EP-marine indicator also has a contribution from A5 due to nitrous oxides from diesel combustion. Inert matter that is put to landfill during construction and installation is the main contribution for EP-terrestrial. In terms of Resource Use - minerals and metals, A5 also has a contribution due to the use of galvanised fixings. A5 also has a small contribution to Resource Use-fossils mainly from emissions of nitrogen oxides (and sulphur dioxide) from the production and combustion of diesel fuel used for road transport. C2 also contributes to Resource Use, fossils due to the same reason.

**Figure 4 LCA results for 514mm Catnic® Urban profiles**




The Module D values are derived using worldsteel's value of scrap methodology which is based upon many steel plants worldwide, and includes both recognised steel production routes, namely BF/BOF and EAF. This is possible because the steel slabs produced from these two routes are functionally equivalent. At End-of-Life, the recovered steel is modelled with a credit given as if it were re-melted in an Electric Arc Furnace secondary steel plant and substituted by the same amount of steel which is produced in a Blast Furnace [21]. As mentioned previously, this usually results in a benefit or 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 overall environmental impacts across successive uses.

# 6 References and product standards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2. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 1, V2 January 2022

3. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 2 – Profiles and Light Structural Steels, V1 May 2023

4. ISO 14044:2006, Environmental management - Life Cycle Assessment - Requirements and guidelines

5. ISO 14025:2010, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

6. ISO 14040:2006, Environmental management - Life Cycle Assessment - Principles and framework

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

9. REACH, EU regulation for Registration, evaluation, authorisation and restriction of chemicals

10. ISO 9001:2015, Quality management systems

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12. ISO 45001:2018, Occupational health and safety management systems. Requirements with guidance for use

13. BBA Certification, British Board of Agrément product certification

14. BES 6001, Responsible sourcing of construction products

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16. ISO 16000-9:2024, Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method

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