

Colorcoat HPS200 Ultra[®] pre-finished steel



Environmental Product Declaration (in accordance with EN 15804 and ISO 14025)

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

Declaration Number: EPD-TS-2019-002

Date of Issue: 21st June 2019

Valid until: 20th June 2024

Owner of the Declaration: Tata Steel Europe
Programme Operator: Tata Steel UK Limited, 30 Millbank, London, SW1P 4WY

The CEN standard EN 15804:2012+A1:2013 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 EN ISO 14025:2010 <input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Author of the Life Cycle Assessment: Tata Steel UK Third Party verifier: Olivier Muller, PricewaterhouseCoopers, Paris

1 General Information

Owner of EPD	Tata Steel Europe
Product	Colorcoat HPS200 Ultra®
Manufacturer	Tata Steel Europe
Manufacturing sites	Port Talbot, Llanwern and Shotton
Product applications	Building Envelope (construction)
Declared unit	1 tonne of pre-finished steel
Date of issue	21 st June 2019
Valid until	20 th June 2024

This environmental product declaration is for Colorcoat HPS200 Ultra® pre-finished steel manufactured by Tata Steel in the UK. The environmental indicators are for products manufactured at Shotton with feedstock supplied from Port Talbot and Llanwern.

The information in the environmental product declaration is based on production data from 2013 and 2016

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



Olivier Muller, PwC Stratégie - Développement Durable, PricewaterhouseCoopers Advisory, 63, rue de Villiers, 92208 Neuilly-sur-Seine, France

2 Product Information

2.1 Product Description

Colorcoat HPS200 Ultra® pre-finished steel has been developed to perform in demanding environments – both external and internal. It has been subjected to comprehensive natural and accelerated testing, often way beyond the required standards [8]. Colorcoat HPS200 Ultra® is used in a wide range of industrial and commercial buildings and provides exceptional performance and corrosion resistance for building envelope applications namely roof and wall cladding using single skin, built-up or composite panel construction.

Confidex® Guaranteed for up to 40 years [9] it is backed up with even more extreme testing [8] and real world global data to demonstrate the best combination of excellent colour stability, gloss retention and outstanding durability.

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	Hot Rolled Coil	Tata Steel	UK
Llanwern	Cold Rolled Coil	Tata Steel	UK
Shotton	Hot dip galvanised coil	Tata Steel	UK
Shotton	Pre-finished steel	Tata Steel	UK

The process of steel coil 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 then 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 galvanised and coated.

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 organic coating process for Colorcoat HPS200 Ultra® a Galvalloy® 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 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 process is shown in Figure 1.

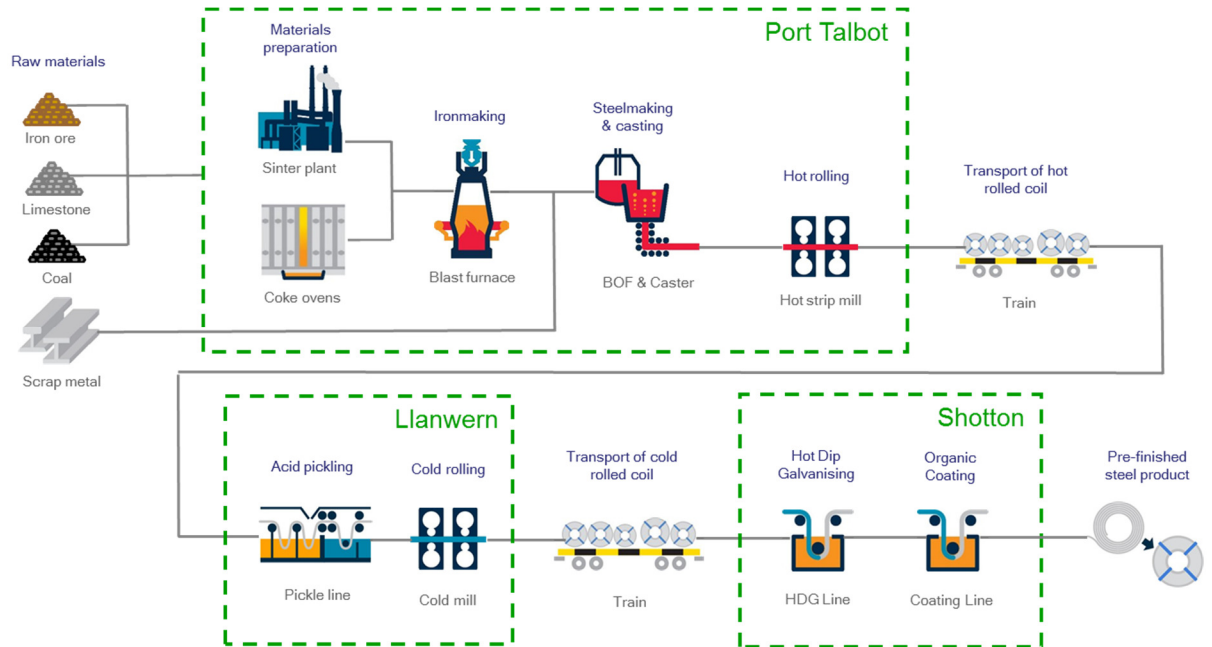


Figure 1 Process overview from raw materials to pre-finished steel

Process data for the manufacture of hot and cold rolled coil at Port Talbot and Llanwern was gathered as part of the latest worldsteel data collection. For Port Talbot and Llanwern, and Colorcoat® 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 technical specifications of the product are shown in Table 2.

Table 2 Technical specification of the pre-finished steel

	Colorcoat HPS200 Ultra® pre-finished steel
Metallic coating	Colorcoat HPS200 Ultra® is supplied with Galvalloy® metallic coating which is manufactured using a mix of 95% Zinc and 5% Aluminium that conforms to EN 10346:2015 ^[10]
Paint coating (organic)	Colorcoat HPS200 Ultra® Fully REACH ^[11] compliant and chromate free
Certification	Certifications applicable to Tata Steel Shotton site are; ISO 9001 ^[12] , ISO 14001 ^[13] , OHSAS 18001 ^[14] BES 6001 certification ^[15] , BBA certification ^[16] , Volatile organic compounds (VOC) against ISO 16000-9 A+ rating ^[17] RC5, Ruv4, CPI5 certificates in accordance with EN 10169 ^[18]

2.4 Packaging

The coils are secured with plastic strapping, and additional steel, cardboard and plastic packaging is used to protect them during delivery to the customer.

2.5 Reference service life

A reference service life for pre-finished steel is not declared because the construction application is not part of the LCA study. To determine the full service life of pre-finished steel, all factors would need to be included, such as details of the final product, and its location and environment.

However, Colorcoat HPS200 Ultra® is designed to withstand even the most demanding and aggressive environment and is used in a wide range of industrial and commercial buildings, providing super durability and corrosion resistance.

Tata Steel offer a Confidex® Guarantee directly to the industrial/ commercial building owner for the weather side of the pre-finished steel. Confidex® offers the most comprehensive guarantee for pre-finished steel available in Europe. Colorcoat HPS200 Ultra® is guaranteed for up to 40 years. The exact length of the guarantee is project specific and depends upon the building location, use and colour. Appropriate inspection and maintenance can significantly extend the functional life of the cladding system beyond this period. Further details of the Confidex® Guarantee are available at www.colorcoat-online.com

3 LCA methodology

3.1 Declared unit

The unit being declared is 1 tonne of pre-finished steel.

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)

C2-C4: End-of-life (Transport, processing for recycling & reuse and disposal)

D: Reuse, recycling and recovery

The life cycle stages are explained in more detail in Figure 2.

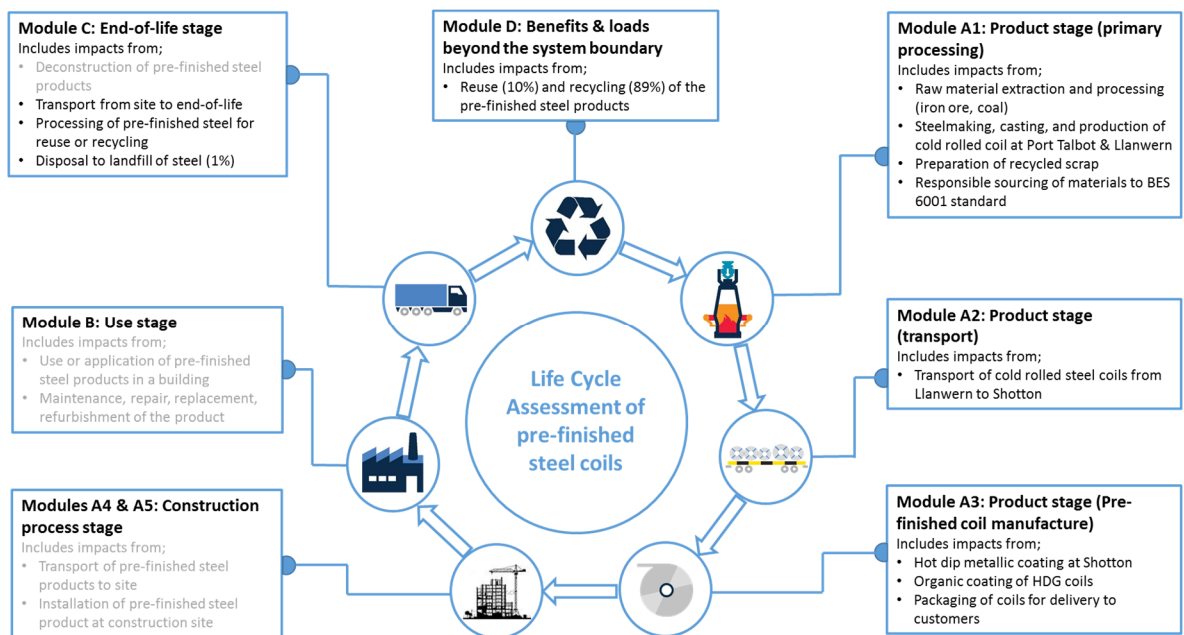


Figure 2 Life cycle assessment of pre-finished steel

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 pre-finished steel 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 the steel, the GaBi Software System for Life Cycle Engineering is used ^[19]. The GaBi database contains consistent and documented datasets which can be viewed in the online GaBi documentation ^[20].

Where possible, specific data derived from Tata Steel's own production processes were the first choice to use where available. Data was also obtained directly from the relevant suppliers, such as the paint which is used in the coating process.

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

3.5 Data quality

The data from Tata Steel's own production processes are from 2013 and 2016, 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 GaBi software database, and the last revision of all but two of these data sets took place less than 10 years ago. However, the contribution to impacts of both of these datasets is small and relatively insignificant, and therefore, the study is considered to be based on high 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 ^[21]. 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 ^[22]. 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 amount of paint applied was considered, based upon the thickness of the coating.

3.7 Additional technical information

The main scenario assumptions used in the LCA are detailed in Table 3. The end-of-life percentages are taken from a Tata Steel/EUROFER recycling and reuse survey of UK demolition contractors for steel cladding carried out in 2014 ^[23].

The environmental impacts presented in the 'LCA Results' section (4) are expressed with the impact category parameters of Life Cycle Impact Assessment (LCIA) using characterisation factors. The LCIA method used is CML 2001-April 2013 ^[24].

Table 3 Main scenario assumptions

Module	Scenario assumptions
A1 to A3 – Product stage	Manufacturing data from Tata Steel sites at Port Talbot, Llanwern and Shotton are used
A2 - Transport to the pre-finished steel manufacturing site	The Colorcoat® manufacturing facilities are located on the Shotton site. The cold rolled steel coils are transported to Shotton by rail from Llanwern, a distance of 336km. A utilisation factor of 45% was assumed to account for empty returns.
C2 – Transport for recycling, reuse, and disposal	A transport distance of 100km to landfill or to a recycling site is assumed, while a distance of 250km is assumed for reuse. Transport is on a 25 tonne load capacity lorry with 20% utilisation to account for empty returns
C3 – Waste processing for reuse, recovery and/or recycling	Steel that is recycled is processed in a shredder. There is no additional processing of material for reuse
C4 - Disposal	At end-of-life, 1% of the steel is disposed in a landfill, in accordance with the findings of an NFDC survey
D – Reuse, recycling, energy recovery	At end-of-life, 89% of the steel is recycled and 10% is reused, in accordance with the findings of an NFDC survey

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, 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.

4 Results of the LCA

DESCRIPTION OF THE SYSTEM BOUNDARY (X = Included in LCA; MND = module not declared)

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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

ENVIRONMENTAL IMPACT: 1 tonne of Colorcoat HPS200 Ultra® pre-finished steel

Parameter	Unit	A1 – A3	C2	C3	C4	D
GWP	kg CO ₂ eq	2.80E+03	1.87E+01	1.04E+01	1.49E-01	-1.52E+03
ODP	kg CFC11 eq	1.00E-04	3.07E-15	4.50E-10	8.64E-16	-3.08E-06
AP	kg SO ₂ eq	6.23E+00	5.05E-02	3.09E-02	8.92E-04	-3.06E+00
EP	kg PO ₄ ³⁻ eq	6.85E-01	1.28E-02	2.94E-03	1.01E-04	-2.51E-01
POCP	kg Ethene eq	1.04E+00	-1.81E-02	2.13E-03	6.96E-05	-6.78E-01
ADPE	kg Sb eq	1.74E-01	1.43E-06	4.26E-06	5.47E-08	-2.10E-02
ADPF	MJ	3.22E+04	2.52E+02	1.49E+02	2.08E+00	-1.51E+04
Caption	GWP = Global warming potential; ODP = Depletion potential of stratospheric ozone layer; AP = Acidification potential of land & water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources					

RESOURCE USE: 1 tonne of Colorcoat HPS200 Ultra® pre-finished steel

Parameter	Unit	A1 – A3	C2	C3	C4	D
PERE	MJ	2.15E+03	1.47E+01	6.23E+01	2.73E-01	5.83E+02
PERM	MJ	4.86E+00	0.00E+00	0.00E+00	0.00E+00	-4.86E-01
PERT	MJ	2.15E+03	1.47E+01	6.23E+01	2.73E-01	5.83E+02
PENRE	MJ	3.48E+04	2.71E+02	2.31E+02	2.32E+00	-1.53E+04
PENRM	MJ	1.40E+03	0.00E+00	0.00E+00	0.00E+00	-1.40E+02
PENRT	MJ	3.62E+04	2.71E+02	2.31E+02	2.32E+00	-1.54E+04
SM	kg	1.30E+02	0.00E+00	0.00E+00	0.00E+00	-7.85E+02
RSF	MJ	2.08E-02	0.00E+00	0.00E+00	0.00E+00	-7.92E-03
NRSF	MJ	1.99E-01	0.00E+00	0.00E+00	0.00E+00	-6.61E-02
FW	m ³	5.41E+00	2.83E-01	1.35E-01	1.29E-02	-7.76E+00
Caption	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: 1 tonne of Colorcoat HPS200 Ultra® pre-finished steel

Parameter	Unit	A1 – A3	C2	C3	C4	D
HWD	kg	3.21E+00	0.00E+00	0.00E+00	0.00E+00	-3.22E-01
NHWD	kg	1.70E+02	0.00E+00	0.00E+00	1.00E+01	-1.70E+01
RWD	kg	4.26E-01	3.43E-04	2.76E-02	2.89E-05	-4.21E-02
CRU	kg	0.00E+00	0.00E+00	1.00E+02	0.00E+00	0.00E+00
MFR	kg	1.22E+00	0.00E+00	8.90E+02	0.00E+00	0.00E+00
MER	kg	5.11E-01	0.00E+00	0.00E+00	0.00E+00	-5.11E-02
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy					

5 Interpretation of results

Figure 3 shows the relative contribution per life cycle stage for each of the seven environmental impact categories for 1 tonne of Tata Steel's Colorcoat HPS200 Ultra® pre-finished steel. 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 all impact categories are A1-A3 (burdens) and D (benefits beyond the system boundary).

The manufacture of the cold rolled coil during stage A1-A3 is responsible for between 75% and 80% 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 manufacturing process.

The primary site emissions come from the use of coal and coke in the blast and basic oxygen furnaces as well as combustion of the process gases. These processes give rise to emissions of CO₂, which contributes 94% of the Global Warming Potential (GWP), and sulphur oxides, which are responsible for almost two thirds of the impact in the Acidification Potential (AP) category. In addition, oxides of nitrogen are emitted which contribute one third of the A1-A3 Acidification Potential, and almost 80% of the Eutrophication Potential (EP), and the combined emissions of sulphur and nitrogen oxides, together with a relatively large emission of carbon monoxide, all contribute to the Photochemical Ozone indication (POCP).

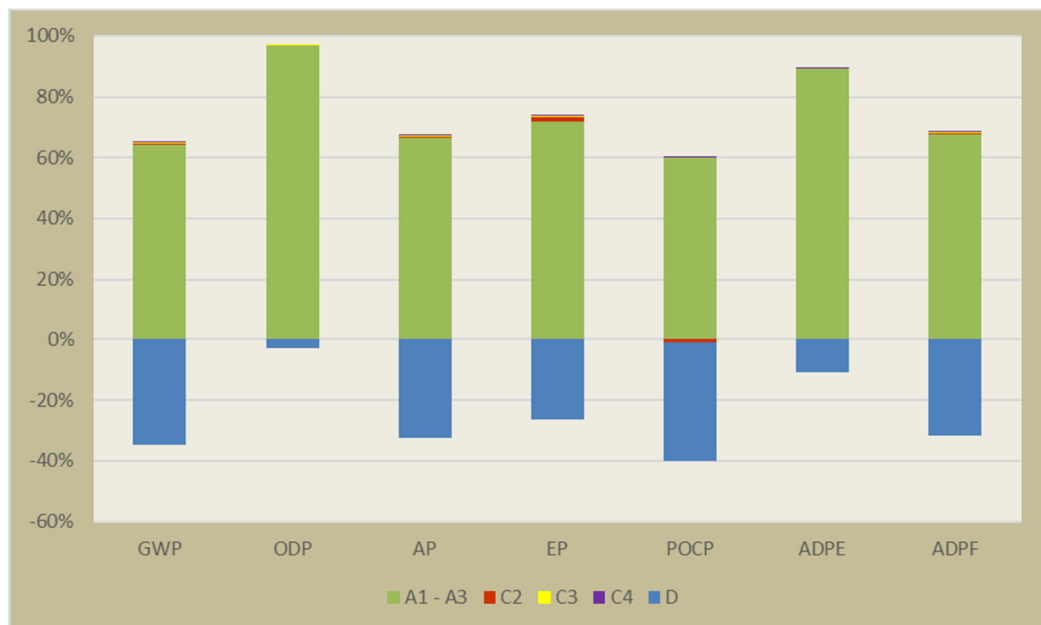


Figure 3 LCA results for the pre-finished steel

Figure 3 clearly indicates the relatively small contribution to each impact from the other life cycle stages, C2, C3 and C4. Of these stages, the most significant contribution is from stage C2 (transport to end-of-life) in the Acidification (AP) and Eutrophication (EP) Potential indicators, and this is mainly the result of nitrogen oxides emissions from the combustion of diesel fuel used in road transport.

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 coated 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 ^[22]. This contributes a significant reduction to most of the environmental impact category results, with the specific emissions that represent the burden in A1-A3, essentially the same as those responsible for the impact reductions in Module D.

Referring to the LCA results table, the impact in Module D for the Use of Renewable Primary Energy (PERT) is different to 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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