

Environmental Product Declaration



EPD of multiple products, based on the average results of the product group in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Recovered and refurbished steel tubulars from waste oil and gas pipelines and pipeline projects

from

Cleveland Steel & Tubes Ltd.



Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-13668
Publication date:	2024-05-24
Valid until:	2029-05-23

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

Programme:	The International EPD [®] System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): Construction Products. PCR 2019:14. Version 1.3.3 Valid Until: 2024-12-20
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/
Life Cycle Assessment (LCA)
LCA accountability: Undertaken by LCA practitioners: Mark Dowling and Rob Holdway Giraffe Innovation Ltd, Contact r.holdway@giraffeinnovation.com +44(0)7788423399
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by individual verifier. Third-party verifier: Matt Fishwick, Fishwick Environmental. Approved by: The International EPD [®] System
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/declared units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

EPDs of construction products may not be comparable if they do not comply with EN 15804+A2.

Company information

Owner of the EPD: Cleveland Steel and Tubes Ltd (CST).

Contact: Roy Fishwick, Managing Director. Dalton Industrial Estate, Thirsk, North Yorkshire, YO7 3JN, United Kingdom. sales@cleveland-steel.com.

Description of the organisation:

Established in 1973, Cleveland Steel and Tubes (CST) are one of the largest stockholders of steel tubes in Europe with 88,000 tonnes of material held at their 100-acre facility in North Yorkshire, UK.

CST are founder members of the multinational Bianco Group¹, with associate companies worldwide. This means customers have access to over 250,000 tonnes of material held in stock within our group at any one time.

CST business is based on supplying customers with steel tubulars that meet their requirements at highly competitive prices. Depending on the source and conditions of purchase, CST stock is divided into two broad categories: Uncertified/Non-Prime and Certified/Prime. CST stock profile includes 40% of certified material, complementing our more cost-effective uncertified material, which can always be issued with independent test reports based on your needs.

The directors, management, and staff of CST remain committed to on-going environmental sustainability improvements. Our policies on these subjects can be found on our website: <https://www.cleveland-steel.com/sustainability>.

CST is a member of the British Constructional Steelwork Association. The manufacturing site is accredited to ISO 9000 and practices certified to BSEN1090-01, and BSEN1090-02.

Product certification – The products are certified to API 5L 2020 and then BSEN 10210 and BSEN 10219. This is followed by BS4360, EN10225, DIN2448, EN10224 and API 5CT.

Name and location of production site

Cleveland Steel & Tubes Ltd
Dalton Industrial Estate
Thirsk,
North Yorkshire,
YO7 3JN,
United Kingdom.

Product information

Product name and identification: Recovered and refurbished steel tubulars from used oil and gas pipelines and from pipeline projects.

Product description:

Each welded refurbished tube range in size, but the average is 12 metres long with a 610mm diameter and 16mm wall thickness. Uncoated this weighs 2.879 tonnes.

There are 5 versions of the recovered tube with 4 different types of coatings and an uncoated tube.

- Concrete coated - Coated with 2 tonnes of concrete and 144 kg of polyethylene;
- Plastic coated - Coated with 144 kg of polyethylene;
- Epoxy coated - Coated with ~21 kg of epoxy;
- Bitumen coated - Coated with 192 kg of bitumen; and
- Uncoated.

The pipes are from recovered pipelines or waste from oil and gas pipeline projects and are collected from sites across Europe and West Asia.

¹ <https://www.bianco-international.com/about-us-2/>

During refurbishment, in most instances the coatings are removed by CST, and the tube shot blasted if required. In some instances, the coatings are left in place as they offer superior performance for certain applications. This EPD is predicated upon the removal of 4 types of coatings and an uncoated pipe. These are then predominantly supplied to the UK market.

The tubulars will be used in the construction sector such as building foundation pilings and last as long as the building remains in place. At end of life the life of the building the tubulars are left in situ. Theoretically the tubulars could be tested and reused in situ for the next building or extracted and recycled (scrap metal), however, this is judged to be currently unlikely and is outside the control of CST.

This EPD also provides the alternative scenario analysis for tubulars used in structural applications (above ground) such as members in buildings where reuse and recycling are much more likely at end of life. The analysis for structural members is given in the 'Additional Information' section of this EPD.

Further technical information can be obtained on CST website <https://cleveland-steel.com/>. The tubulars cover a range of different specifications.

UN CPC code: 4128

Geographical scope: The tubulars are recovered from as far away as West Asia (e.g., Dubai) and across Europe and recovered to United Kingdom for refurbishment and predominantly sold to the UK market.

Further product information: <https://cleveland-steel.com/>

LCA information

EPD type: The EPD type is an EPD of multiple products, based on the average results of the product group. Allocation of different sizes was carried out on a mass basis, so there is no difference in per tonne impact. The EPD covers (A1-A3) with modules C1-C4 and module D. (A1-A3+C1-C4+D).

Declared unit: The declared unit is 1 tonne of recovered and refurbished steel tube. This is an aggregated data set based upon numbers of tubulars recovered and refurbished in 2022 and includes tubulars that were coated with bitumen, concrete, epoxy, polyethylene and uncoated tubulars.

Reference service life: A reference service life for steel tubulars is not declared because they can be used in a variety of different forms of construction, and the final construction application is not defined. To determine the full service life, all factors would need to be included such as location and environment, corrosion and fire protection.

Time representativeness: Covers one year for 1st January 2022 to 31st December 2022.

Database(s) and LCA software used: ecoinvent v3.9.1 (cutoff), World Steel Association (WSA), and SimaPro 9.4.0.1.

LCA methodology: EN 15804 reference package based on EF 3.0 was used.

Description of system boundaries: Cradle to gate (A1-A3) with modules C1-C4 and module D (A1-A3 +C1-C4+D). The EPD includes the initial recovery and refurbishment of a tube that has been recovered as a waste used pipeline product from the oil and gas industry.

The system boundary starts at the dockside where the recovered tubular is deemed as burden free, as it is waste from the oil and gas pipelines. At this point all the impacts are with the waste producer.

The tubulars coatings are removed and the outer surface cleaned as required. The tubulars are then supplied to the customer, installed and then either left in situ if used as foundation piling. For above ground structural applications, the tubes are recycled or reused at end of life.

System diagram:

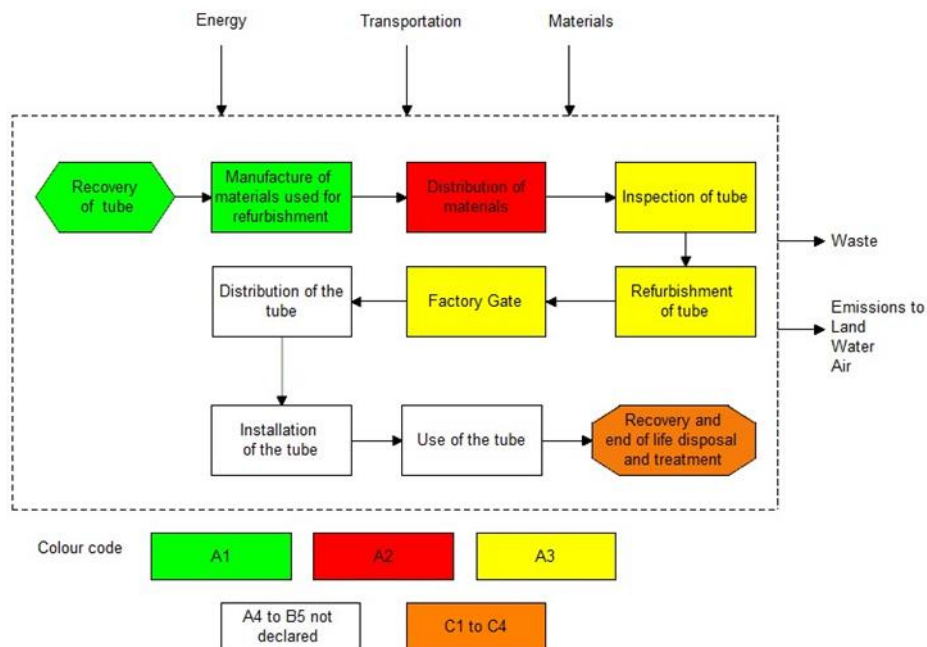


Figure 1: System boundary

All the tubulars are supplied from across Europe and West Asia. Based upon the tonnage collected in 2022 and the distance travelled by ship and road the following tables shows the average distance and mode of transport.

Table 1: Transport to CST (A2)

Scenario information	Unit
Vehicle used	32t Euro 5 lorry
Fuel type	Diesel
Average distance to CST	163.04 km
Ship used	Container ship
Average distance to UK dock	3755.43 km
Bulk density and capacity utilisation	Varies considerably so tkm fromecoinvent was used for each relevant mode of transport

At end of life the life of the building the tubulars are left in situ. Theoretically the tubulars could be tested and reused in situ for the next building or extracted and recycled (scrap metal), however, this is judged to be currently unlikely and is outside the control of CST.

Table 2: C4 disposal

End of life Scenario information	Unit
Left it situ	1 tonne of tube

The average impact is based upon the percentage by weight of each type of tubular that was recovered in 2022. The percentages for each type are as follows:

- Concrete coated 2%
- Plastic coated 7%
- Epoxy coated 8%
- Bitumen coated 2%
- Uncoated 81%

The residual grid mix for the UK was used for electricity used. This equates to 0.477 kgCO₂eq per kWh, and the reference year was 2022.

Details of products refurbished:

This section details the products refurbished. As the coatings vary in thickness and difficulty in removal an average data set is used for each type of coating.

Concrete tubular

The concrete coating is removed with a concrete breaker impact tool on a JCB.



Figure 2: Concrete coated tubular

Plastic coated tubular

The polyethylene (PE) coating is removed by a lathe and then by a flamer. The surface is then shot blasted if required. The waste plastic is collected and sold for recycling.



Figure 3: Plastic coated tubular



Figure 4: Plastic coating removal

Epoxy coated tubular

The epoxy coating is removed by a lathe and then by a flamer. The surface is then shot blasted if needed. The waste epoxy is collected, and sent to landfill.



Figure 5: Shot blasted tubular.

Bitumen coated tubular

The bitumen coating is softened by the flamer and scrapped off. The surface is then shot blasted if needed. The waste bitumen is collected, and sent to landfill.

Uncoated tubular

The uncoated tubular is inspected for quality.

Assumption and estimates

The average distance to collect a tubular is calculated from data supplied by CST for 2022 and is 163.04 km by road and 3755.43 km by container ship.

Allocation

It is assumed that the tubular is burden free as it recovered as waste. All of the production waste is allocated in module A3. The polyethylene (PE) is sent for recycling. The bitumen and epoxy are both sent to landfill and the concrete reused on site. The allocation of different sizes of tubulars was carried out on a mass basis, so there is no difference in per tonne impact.

Cut off rules.

When building a life cycle inventory (LCI), it is typical to exclude items considered to have a negligible contribution to results. To do this in a robust manner there must be confidence that the exclusion is fair and reasonable. Therefore, cut-off criteria are defined, which allow items to be neglected if they meet the criteria. In this study exclusions could be made if they were expected to be within the below criteria:

- The LCI data shall be a minimum of 95% of total inflows (mass and energy) per module (e.g., A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D)
- This EPD applies the expanded cut-off rule of ISO 21930, which says that at least 95% of the environmental impact per module shall be included as well. Plausibility assessments and expert judgement can be used to demonstrate compliance with these criteria.

The energy use in the offices at the production site and any consumables have been excluded as this will be considerably less than 1% of the key impact categories.

The strapping used during transporting of the tubulars is reused numerous times and this will be considerably less than 1% of the key impact categories.

Data quality indicators (DQIs)

To ensure data quality, checks were completed on key data parameters using data quality indicators (DQIs) which are applied to key data parameters to ensure fit for purpose. Key data parameters are assessed against a data quality matrix. The data quality matrix used in this study is shown below and the scoring for the data is highlighted in grey.

Table 3: Data quality indicators

Score	Very good	Good	Fair	Poor	Very poor
Reliability of the source	Verified data based on measurements	Verified data partly based on assumptions or unverified data based on measurements	Non-verified data partly based on assumptions	Qualified estimate (e.g., by industrial expert)	Non-qualified estimate
Representative	Representative data from sufficient sample of sites over an adequate period to even out normal fluctuations	Representative data from a smaller number of sites but for adequate periods	Representative data from an adequate number of sites but from shorter periods	Representative data but from a smaller number of sites and shorter periods or incomplete data from an adequate number of sites and periods	Representativeness unknown or incomplete data from a smaller number of sites and/or from shorter periods
Temporal correlation	Less than three years of difference to year of study	Less than six years of difference	Less than 10 years of difference	Less than 15 years of difference	Age of data unknown or more than 15 years of difference
Geographical correlation	Data from area under study	Average data from larger area in which the area under study is included	Data from area with similar production conditions	Data from area with slightly similar production conditions	Data from unknown area or area with very different production conditions
Technological correlation	Data from enterprises, processes and materials under study	Data from processes and materials under study but from different enterprises	Data from processes and materials under study but from different technology	Data on related processes or materials but same technology	Data on related processes or materials but different technology

Life cycle stages that have been omitted from the scope of the study include the following:

- Human energy inputs to processes;
- Infrastructure and capital goods; and
- Transport of employees to and from their normal place of work.

Additional information: optional, any additional information about the underlying LCA-based information, such as assumptions, cut-off rules, data quality, and allocation.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

Table 4: Modules declared

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	GB	-	-	-	-	-	-	-	-	-	GB	GB	GB	GB	GB
Specific data used	10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X included in LCA - ND: module not declared - NR: module not relevant N/A not applicable

Product and packaging information

Table 5: Product and packaging information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Hot rolled steel	1000	100%	0

The wood and straps are used multiple times and account for significantly less than 1% of the carbon footprint (Module A1).

The product does not contain any substances from the Candidate List of Substances of Very High Concern (SVHC) for authorisation in amounts greater than 0.1%.

The carbon intensity of the tubular per tonne is 0 kgCO₂eq as it is 100% post-consumer scrap product.

Results of the environmental performance indicators

The environmental performance of one tonne of recovered and refurbished steel tubulars from used oil and gas pipeline and pipeline projects is declared and reported using the parameters and units as specified in PCR 2019:14 v1.3.3. These life cycle impact assessment results and other environmental results are presented in the tables below per declared unit, broken down by module. As specified in EN 15804:2012+A2:2019/AC:2021 and the PCR 2019:14 v1.3.3, the environmental impacts are declared and reported using the baseline characterisation factors from the EC-JRC.

Mandatory impact category indicators according to EN 15804

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Product average for 5 types of steel tubulars 4 of which have different coatings and 1 uncoated.

Table 6: Mandatory impact results

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	4.46E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+03
GWP-biogenic	kg CO ₂ eq.	1.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-01
GWP-luluc	kg CO ₂ eq.	2.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-01
GWP-total	kg CO ₂ eq.	4.47E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+03
ODP	kg CFC 11 eq.	1.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-12
AP	mol H ⁺ eq.	8.08E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E+00
EP-freshwater	kg P eq.	2.69E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.12E-04
EP-marine	kg N eq.	1.96E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.31E-01
EP-terrestrial	mol N eq.	2.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.29E+00
POCP	kg NMVOC eq.	5.52E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E+00
ADP minerals & metals*	kg Sb eq.	8.96E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-03
ADP-fossil*	MJ	8.28E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E+04
WDP*	m ³	1.69E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.99E+02

Acronyms

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 the 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; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

The use of the results of modules A1-A3 without considering the results of module C is discouraged as end of life may vary for other reuse applications.

Additional mandatory and voluntary impact category indicators

Table 7: Additional results

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG ²	kg CO ₂ eq.	4.46E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+03
Ionising radiation*	kBq U-235 eq	5.37E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E+04
Particulate matter	disease inc.	2.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.55E-05
Human toxicity, non-cancer**	CTUh	3.69E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-05
Human toxicity, cancer**	CTUh	2.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.59E-07
Ecotoxicity, freshwater**	CTUe	5.14E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E+00
Land use	Pt	3.54E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E+02

Disclaimers

*This impact category deals mainly with the eventual impact of low dosing ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, nor due to radiative waste in underground facilities. Potential ionizing radiation from soil, from radon and from some materials is also not measured by this indicator.

** The results of these environmental impact indicators should be used with care as the uncertainties of these results are high or as there are limited experiences with the indicator.

² This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Resource use indicators

Table 8: Resource use indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	9.49E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+02
PERT	MJ	9.49E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E+02
PENRE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRM	MJ	1.03E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+04
PENRT	MJ	1.03E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+04
SM	kg	1.00E+03	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	6.42E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E+00

Acronyms

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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Waste indicators

Table 9: Waste indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	5.56E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flow indicators

Table 10: Output flows indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	5.01E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional environmental information

This EPD also provides the alternative scenario analysis for tubulars used in structural applications (above ground) such as members in buildings where the recovery reuse and recycling are much more likely at end of life.

For this alternative end of life scenario, it was assumed that the tubulars are removed from a demolition site and that 2.555 kg (11kWh) of diesel is used per tonne of extracted tubular (Erlandsson, M., & Pettersson, D. (2015)).

It was also assumed that a local contractor removes the tubular, and it travels 50 km for end-of-life treatment of which 466 kg (46.6%) are reused, 466 kg (46.6%) are recycled and 68 kg (6.8%) are landfilled. This is based upon the Defra data for the recovery of steel by the construction industry (2020)³.

Mandatory impact category indicators according to EN 15804

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Product average for 5 types of steel tubulars 4 of which have different coatings and 1 uncoated.

Table 11: Mandatory impact results

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	4.46E+01	2.40E+00	9.48E+00	8.55E-01	4.31E-01	1.12E+02
GWP-biogenic	kg CO ₂ eq.	1.30E-01	5.77E-03	2.45E-02	5.42E-02	9.28E-04	2.28E-13
GWP-luluc	kg CO ₂ eq.	2.95E-02	5.84E-04	4.60E-03	1.87E-03	2.53E-04	8.35E+02
GWP-total	kg CO ₂ eq.	4.47E+01	2.40E+00	9.51E+00	9.11E-01	4.32E-01	2.06E-01
ODP	kg CFC 11 eq.	1.22E-05	2.16E-07	2.01E-07	1.60E-08	1.20E-08	4.05E-06
AP	mol H ⁺ eq.	8.08E-01	9.67E-03	2.02E-02	5.05E-03	3.11E-03	1.78E-06
EP-freshwater	kg P eq.	2.69E-03	1.29E-04	6.57E-04	7.15E-04	3.44E-05	3.35E-08
EP-marine	kg N eq.	1.96E-01	1.95E-03	5.09E-03	1.02E-03	1.20E-03	2.71E-01
EP-terrestrial	mol N eq.	2.02E+00	1.70E-02	5.18E-02	9.88E-03	1.28E-02	5.19E-05
POCP	kg NMVOC eq.	5.52E-01	1.99E-02	3.13E-02	3.15E-03	4.46E-03	5.34E-02
ADP minerals & metals*	kg Sb eq.	8.96E-05	1.53E-06	3.02E-05	9.39E-06	5.74E-07	5.32E-01
ADP-fossil*	MJ	8.28E+02	1.33E+02	1.31E+02	1.79E+01	1.03E+01	2.06E-01
WDP*	m ³	1.69E+00	1.69E-01	5.48E-01	1.97E-01	4.55E-01	3.90E+01

Acronyms

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 the 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; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

The use of the results of modules A1-A3 without considering the results of module C is discouraged as end of life may vary for other reuse applications.

³ <https://www.gov.uk/government/statistics/uk-waste-data/uk-statistics-on-waste>

Additional mandatory and voluntary impact category indicators

Table 12: Additional results

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG ⁴	kg CO ₂ eq.	2.40E+00	9.48E+00	8.57E-01	4.31E-01	1.31E+01	1.12E+02
Ionising radiation*	kBq U-235 eq	5.86E-02	1.78E-01	4.68E-01	6.52E-03	7.07E-01	8.35E+02
Particulate matter	disease inc.	7.62E-08	5.46E-07	3.49E-08	6.63E-08	7.10E-07	4.05E-06
Human toxicity, non-cancer**	CTUh	2.38E-08	1.19E-07	1.6E-08	4.99E-09	1.60E-07	1.78E-06
Human toxicity, cancer**	CTUh	7.90E-10	4.21E-09	7.94E-10	1.76E-10	5.90E-09	3.35E-08
Ecotoxicity, freshwater**	CTUe	6.04E+01	6.95E+01	2.25E+00	5.05E+00	1.25E+02	2.06E-01
Land use	Pt	7.38E+00	7.92E+01	1.73E+01	2.04E+01	1.25E+02	3.90E+01

Disclaimers

*This impact category deals mainly with the eventual impact of low dosing ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, nor due to radiative waste in underground facilities. Potential ionizing radiation from soil, from radon and from some materials is also not measured by this indicator.

** The results of these environmental impact indicators should be used with care as the uncertainties of these results are high or as there are limited experiences with the indicator.

Resource use indicators

Table 13: Resource use indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	9.49E+00	4.76E-01	2.06E+00	3.67E+00	8.72E-02	7.58E+00
PERT	MJ	9.49E+00	4.76E-01	2.06E+00	3.67E+00	8.72E-02	7.58E+00
PENRE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRM	MJ	2.10E+02	1.42E+02	1.39E+02	1.88E+01	1.10E+01	1.16E+03
PENRT	MJ	2.10E+02	1.42E+02	1.39E+02	1.88E+01	1.10E+01	1.16E+03
SM	kg	1.00E+03	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	6.42E-01	6.65E-03	1.89E-02	1.34E-02	1.09E-02	2.70E-01

Acronyms

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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Waste indicators

Table 14: Waste indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	5.56E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E+01
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

⁴ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Output flow indicators

Table 15: Output flows indicators

Results per one tonne of recovered and reused steel tubular							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E+02
Material for recycling	kg	5.01E+01	0.00E+00	0.00E+00	0.00E+00	8.50E+02	4.66E+02
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

The tubulars covered in this EPD have been recovered as waste as a used pipeline product. As evidence of this they are purchased at near scrap value and handled as waste. As they are a waste product, they come burden free part from the shipping to CST and treatment.

The materials accounted for in A1 are the consumables used in removing any coatings and refurbishing the tube surfaces.

The transportation impacts in A2 are based upon 2022 data on weights of tubulars recovered from sites across Europe and West Asia.

All transportation is by <30t articulated lorry or container ship.

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