



# Pollution inventory reporting - ferrous and non-ferrous metals guidance note

Environmental Permitting (England and Wales) Regulations 2010

Regulation 60(1)

LIT 7670 and 1220\_10

Version 4 December 2012

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We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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# Contents

<b>1. Introduction</b> .....	<b>4</b>
<b>2. Emissions to air</b> .....	<b>4</b>
2.1. Relevant pollutants .....	4
2.2. Emission sources .....	6
2.2.1. Point source emissions .....	6
2.2.2. Fugitive emissions .....	7
2.2.3. Fuel analysis, process stream data and normalisation .....	7
<b>3. Emissions to water</b> .....	<b>9</b>
3.1. Relevant pollutants and emission sources .....	9
<b>4. Off-site transfers</b> .....	<b>10</b>
4.1. Relevant wastes .....	11
4.1.1. Integrated steelworks .....	11
4.1.2. Hot and cold rolling mills .....	11
4.1.3. Non-ferrous metal processes .....	11
4.2. Quantification of emissions.....	12
4.3. Transboundary shipments of hazardous waste .....	12
Appendix A Normalisation of emission concentrations.....	13
Appendix B: Ferrous metals source factors .....	14
Emissions to air .....	15
Notes:.....	18
Releases to controlled waters and transfers in wastewater .....	19
Appendix C: Non- ferrous metals source factors.....	20
Emissions to air .....	21
Notes:.....	26
Releases to controlled waters and transfers in wastewater .....	27

# 1. Introduction

If we regulate your activity as an A1 installation under the Environmental Permitting (England and Wales) Regulations 2010 (EPR) you will need to submit data to the Pollution Inventory.

You need to report each year. The system opens for reporting on 1 January and the deadline for submitting is 28 February.

Our general guidance sets out how to report and provides information applicable to all business and industries.

In this guidance you will find helpful information specific to the metals sector.

If your operations include waste incineration or combustion please also read these guidance notes.

You can find additional information on the web:

Pollution Inventory Guidance and glossary: [www.environment-agency.gov.uk/pi](http://www.environment-agency.gov.uk/pi)

REPI: <http://www.environment-agency.gov.uk/business/topics/pollution/32272.aspx>ody text

## 2. Emissions to air

### 2.1. Relevant pollutants

The main air emissions from ferrous and non-ferrous metals production and processing activities are shown in Tables 2.1 and 2.2. Use the tables as a guide only and check that there are no other pollutants emitted from your process. See appendices B and C for a summary of currently used RETs and guidance for releases of substances to air from various sources.

**Table 2.1 Main air pollutants emitted by ferrous metal and related activities and their main sources**

Main air pollutants	Main sources
CO <sub>2</sub>	Sinter plant, hot blast stoves, blast furnaces, BOS blowing and charging operations, arc furnace melting and refining, arc furnace and ladle treatment scarfing, coke ovens re-heating
CO	Sinter plant, hot blast stoves, blast furnaces, BOS blowing and charging operations, arc furnace melting & refining, scarfing, emergency venting, re-heat furnaces
NO <sub>x</sub>	Sinter plant, hot blast stoves, arc furnace charging, melting and refining, nitric acid pickling, coke oven under-firing, emergency flaring, ammonia incinerator tail gas
Particulate matter (including PM10)	Raw material handling, sinter plant, coal pulverisation, stockpiles, blast furnaces, desulphurisation plant, BOS/electric arc primary & secondary extraction charging and tapping operations, ingot casting, scarfing, skull burning, coke oven door leakage/underfiring/charging/pushing, emergency venting, emergency

	flaring, quenching ammonia incinerator tail gas
<b>SO<sub>2</sub></b>	Sinter plant, hot blast stoves, arc furnace charging, melting and refining, slag processing, coke oven underfiring, ammonia incinerator tail gas, blast furnace casthouse extraction, re-heating
<b>VOCs</b>	Sinter plant, coke oven charging emissions, door leakage & by-products plant, decanters and storage tank vents
<b>NH<sub>3</sub></b>	Coke oven charging emissions/door leakage
<b>HCl</b>	Sinter plant, hydrochloric acid pickling
<b>HCN</b>	Coke oven charging/door and top leakage
<b>Fluorine and inorganic compounds – as HF</b>	Sinter plant, arc furnace melting and refining, ladle treatments, electro slag remelting
<b>Metals</b>	Sinter plant, BOS charging and tapping operations, arc furnace charging, melting & refining
<b>Dioxins and furans</b>	Sinter plant, arc furnace steel making
<b>CH<sub>4</sub></b>	Sinter plant, coke oven door leakage,
<b>PCBs</b>	Sinter plant, electric arc furnace steel making
<b>BTX</b>	Coke oven door leakage, emergency venting, decanters & storage tank vents
<b>PAHs*</b>	Sinter plant, electric arc furnace steel making, coke oven door & top leakage
<b>Phenols</b>	Coke oven door and top leakage, emergency venting, decanters & storage tank vents, coke oven by-product plant

\* Reference to PAHs is for collective convenience. See the PI Schedule for which PAHs you should report

**Table 2.2 Main air pollutants emitted by non-ferrous metal and related activities and their main sources**

<b>Main air pollutants</b>	<b>Main sources</b>
<b>CO<sub>2</sub></b>	Melting furnaces
<b>CO</b>	Shaft furnaces in copper processes, nickel & cobalt processes.
<b>NO<sub>x</sub></b>	Pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel

	and cobalt processes; carbon and graphite production
<b>Total Particulate matter (including PM10 as a % of total )</b>	Raw material storage and handling; pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel and cobalt processes; carbon and graphite production; residue handling storage and re-use; air abatement plant
<b>SO<sub>2</sub></b>	Pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel & cobalt processes; carbon and graphite production
<b>VOCs</b>	Pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel & cobalt processes; carbon and graphite production; air abatement plant
<b>NH<sub>3</sub></b>	Aluminium, precious metal, refractory metal processes
<b>HCl</b>	Aluminium and precious metal processes, pickling
<b>Fluorine and inorganic compounds – as HF</b>	Aluminium and precious metal processes, pickling
<b>Chlorine and inorganic compounds – as HCl</b>	Aluminium, lead, zinc, cadmium, precious metal, refractory metal, alkali and alkaline metal processes
<b>Dioxins &amp; furans</b>	Pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel & cobalt processes; carbon and graphite production; residue handling storage and re-use; air abatement plant
<b>PAHs*</b>	Aluminium processes, carbon and graphite production
<b>PFCs</b>	Aluminium processes
<b>Non-ferrous metals</b>	Raw material storage and handling; pre-treatment; copper, aluminium, lead, zinc, cadmium, precious metal, refractory metal, ferro alloy, alkali and alkaline metal, nickel & cobalt processes; carbon and graphite production; residue handling storage and re-use; air abatement plant

\* Reference to PAHs is for collective convenience. See the PI Schedule for which PAHs should be reported

## 2.2. Emission sources

### 2.2.1. Point source emissions

These emissions are exhausted via a stack or vent, that is, a single point source into the atmosphere. Abatement equipment, for example scrubbing units, fabric filters (bag house) can be incorporated into the exhaust system prior to discharge to atmosphere. Point source emissions will

be the most significant emission source for combustion activities taking place within metals processing and production sites. Other non-combustion point source emissions (sintering, coke making, smelting, refining, alloying, etc) arise from a wide range of ferrous and non-ferrous processes and activities.

### 2.2.2. Fugitive emissions

Fugitive emissions are those that are not released from a point source such as a stack. Only fugitive emissions that leave the site need to be reported to the PI. Contained spills do not need to be reported but you should report vapour emissions that may have dispersed.

#### **Ferrous metals**

Fugitive emissions from coke and iron and steel processes can be as significant as point source emissions. Some examples are:

- leakage of volatile materials through ascension pipe, door and lid seals on coke ovens
- open vessels (for example, coke oven by-product plant)
- cast house fume abatement systems overloaded; BOS primary and secondary fume collection;
- coal and ore stockpiles
- vehicle loading and unloading areas
- transferring material between vessels (for example, furnace, ladle, silos)
- conveyor systems
- pipework and ductwork systems (for example, pumps, valves, flanges)
- abatement equipment by-pass (e.g. coke side particulate collection hoods)
- accidental loss of containment from failed plant and equipment
- solvents
- miscellaneous unextracted combustion activities

#### **Non-ferrous metals**

At most sites where non-ferrous metals processes are carried out, fugitive emissions to air give rise to a significant proportion of the overall environmental impact. Some examples are:

- smelting and melting and refining furnaces and their associated extraction systems
- transfer operations involving molten metal
- casting and associated activities
- handling and storage of dusty raw materials such as concentrates, foundry sand, drosses
- handling, storage and disposal of wastes such as drosses, slags and skimmings
- fume treatment plant
- ladle heating stations
- vehicle loading and unloading areas

### 2.2.3. Fuel analysis, process stream data and normalisation

The use of fuel analysis and process stream data to determine emissions is similar to the use of emission factors.

The basic equation used, for example, in fuel analysis emission calculations is:

$$(1) E = Q_f \times [\text{Op hours}] \times [\text{PC}_f/100] \times (\text{MM}_p / \text{EM}_f)$$

Where:

E = emission of pollutant, kg/yr

$Q_f$  = fuel use (kg/hr)

$\text{PC}_f$  = pollutant concentration in the fuel (%)

Op hrs = operating hours per year, hr/yr

$\text{MM}_p$  = molar mass of pollutant as emitted after combustion

$\text{EM}_f$  = relative atomic mass of polluting element as present in fuel

Equation 1 is the method usually used for calculating  $\text{SO}_2$  emissions where it is normally assumed that all the sulphur in the fuel is converted to  $\text{SO}_2$ .

Where the pollutant concentration in the fuel is consistent over the averaging period (that is, one year), equation 1 can be written as:

$$(2) E = M \times [\text{PC}_f/100] \times (\text{MM}_p / \text{EM}_f)$$

Where:

E = emission rate of pollutant in kg/yr

M = mass of fuel burnt in one year (kg/yr)

$\text{PC}_f$  = pollutant concentration in the fuel (%)

$\text{MW}_p$  = molar mass of pollutant as emitted after combustion

$\text{EW}_f$  = relative atomic mass of polluting element as present in fuel

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**Example 4:  $\text{SO}_2$  emissions calculated from oil combustion, based on fuel analysis results and fuel flow information. It is assumed that the facility operates burning waste oil for 150 hours per year and that abatement of  $\text{SO}_2$  does not occur.**

$Q_f$  = 2000 kg/hr

$\text{PC}_f$  = 1.17%

$\text{MM}_p$  = 64

$\text{EM}_f$  = 32

Op hours = 150 hr/yr

$$\begin{aligned} E &= Q_f \times \text{PC}_f \times (\text{MW}_p / \text{EW}_f) \times [\text{Op hours}] \\ &= [(2000) \times (1.17 / 100) \times (64/32) \times 150] \text{ kg/yr} \\ &= 7.0 \times 10^3 \text{ kg/year} \end{aligned}$$


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You can also use equation 1 for volatile elements such as fluorine and chlorine as well as trace metallic pollutants, although some of these latter species are retained in the plant, either in the ash or in abatement equipment. You need to apply appropriate retention factors.

When you use equation 1 or equation 2, you need to be aware that the amounts of pollutants present in the fuel or process stream can vary significantly.

Care should be taken, in all calculations, to ensure that the emission concentration and flow rate are compatible. For example, normalised emission concentrations should be multiplied by



normalised volumetric flow rates or actual, measured emission concentrations multiplied by actual, measured volumetric flow rates. Normalised emission rates are quoted in terms of a standard oxygen concentration, and are usually dry gas, at a temperature of 273K and a pressure of 101.3 kPa. Formulae for conversion between normalised and actual emission concentrations are contained in appendix A of this note.

Note that many ferrous and non-ferrous processes are carried out as batch processes, for example anode baking in the primary aluminium industry. Data should be generated using measurements taken over the entire period of the batch production process to ensure representative (total mass) data are obtained.

## 3. Emissions to water

Emissions of substances to water can be either direct to controlled waters or indirect, following transfer to off-site effluent treatment plant. See the pollution inventory reporting guidance document for what constitutes an emission or a transfer.

We recognise that you may experience difficulty disaggregating EPR and non-EPR releases of substances to water where both pass through a common monitoring point as a combined effluent. Use the combined effluent value where it is not possible to estimate the individual contributions.

### 3.1. Relevant pollutants and emission sources

Water discharges from ferrous and non-ferrous metals processes can be contaminated by a variety of polluting substances. Tables 3.1 and 3.2 illustrate the main substances emitted to water and their main sources. Use the tables as a guide only and check that there are no other pollutants emitted from the process. Suspended solids, and oils and greases, are not PI reportable substances, but you may need to take account of other substances that are being emitted in association with such materials. See Appendices B and C for a summary of currently used RETs and guidance for releases of substances to water from various sources.

**Table 3.1 Main water pollutants generated by ferrous metal and related activities**

Main air pollutants	Main sources
<b>Oils and greases</b>	Steel scrap storage and handling, residue handling, storage & re-use, continuous casting, rolling mills
<b>NH<sub>3</sub></b>	Blast furnace primary gas cleaning, effluent plant, coke oven by-products
<b>Cyanides – as CN</b>	Blast furnace primary gas cleaning, effluent plant, coke oven by-products
<b>PAHs</b>	Coke oven by-products
<b>Suspended solids</b>	Raw material storage and handling, residue handling, storage and re-use, effluent plant, blast furnace & BOS gas cleaning, rolling mills
<b>Metals</b>	Effluent treatment discharge
<b>TOC</b>	Steel scrap storage and handling, residue handling, storage and re-

	use, continuous casting, rolling mills, by-products plant
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**Table 3.2 Main water pollutants generated by non-ferrous metal and related activities**

<b>Main air pollutants</b>	<b>Main sources</b>
<b>Oils and greases</b>	Steel scrap storage and handling, residue handling, storage & re-use, continuous casting, rolling mills
<b>NH<sub>3</sub></b>	Blast furnace primary gas cleaning, effluent plant, coke oven by-products
<b>Cyanides – as CN</b>	Blast furnace primary gas cleaning, effluent plant, coke oven by-products
<b>PAHs</b>	Coke oven by-products
<b>Suspended solids</b>	Raw material storage and handling, residue handling, storage and re-use, effluent plant, blast furnace and BOS gas cleaning, rolling mills
<b>Suspended solids</b>	Raw material storage and handling, residue handling, storage and re-use, effluent plant,
<b>PFCs</b>	Aluminium processes
<b>Cd</b>	Raw material storage and handling, effluent plant
<b>Hg</b>	Raw material storage and handling, effluent plant
<b>Other metals</b>	Effluent treatment discharge

The resulting discharges of the above substances depend on the 'in process' preventative measures (good housekeeping, re-use) and the presence and technical standards of waste water treatment facilities.

## 4. Off-site transfers

Wastes must be classified by the List of Wastes Regulations 6-digit code(s) and by the relevant Waste Framework Directive disposal or recovery code(s) (D&R).

There is no reporting threshold for hazardous wastes, which are indicated by an asterisk in the EWC. For all other EWC/D&R code combinations, a reporting threshold of 5 tonnes applies.

Any transfer of waste off-site to a third party is covered by the Duty of Care provisions of the Environmental Protection Act 1990. This includes the requirement to describe the waste and record the quantity. You should use data generated in compliance with Duty of Care requirements to complete the PI return.

## 4.1. Relevant wastes

### 4.1.1. Integrated steelworks

The management of residues in an integrated steelworks is characterised by advanced techniques for extracting value from recycling most of the residues in the sinter plant, BOS plant and coke ovens. The iron and steel sector is an important recycler of materials. All the ferrous scrap arising in the UK is recycled, the bulk of it by the UK steel industry. Only small parts of the overall quantity of wastes are landfilled, including the following:

- fine dust from blast furnace gas cleaning
- rubble
- fine dust from basic oxygen furnace gas scrubbing (where wet cleaning is used)
- alkali metal chlorides and heavy metal chlorides from electrostatic precipitators
- refractory waste
- general, for example, packaging

### 4.1.2. Hot and cold rolling mills

Hot rolling operations generate the following waste products which are sent off-site:

- Metal bearing wastes (for example, oily mill scale)
- dusts from scarfing and rolling
- oily and non-oily mill scale
- water treatment and mill scale sludge
- oil and greases (can be used as secondary fuel in blast furnace or coke ovens)

Cold rolling operations generate the following waste products which are sent off-site:

- acid neutralisation sludges
- oily sludges

### 4.1.3. Non-ferrous metal processes

The production of non-ferrous metals from primary and secondary raw materials gives rise to the generation of a wide variety of by-products, intermediate products and residues, for example: skimmings

- tars/carbon-containing wastes from anode manufacture
- flue gas dust
- gas treatment sludges
- lining & refractory waste
- wastewater treatment sludge
- waste oils
- absorbents and filter materials

## 4.2. Quantification of emissions

Do not report wastes that are temporarily stored on site by yourself but you do need to report waste transferred to third parties (even if stored on your site).

## 4.3. Transboundary shipments of hazardous waste

You must report the annual quantities of any transboundary hazardous waste shipments taking place to the PI.

## Appendix A Normalisation of emission concentrations

In many cases, pollutant emission concentrations to air are reported as normalised concentrations, the actual measured emission concentration having been adjusted to a normalised temperature (273K), oxygen, pressure and/or water vapour concentration. In calculating mass emissions to air, it is important that either the actual release concentration is multiplied by the actual volumetric flowrate, or the normalised concentration is multiplied by the normalised volumetric flowrate

The following equations can be used to correct measured concentrations and flowrates for temperature, oxygen, pressure and water vapour content.

### Concentrations

#### To correct for moisture concentration to dry (0% oxygen)

$$C_d = C_m \times (100/(100 - \%H_2O))$$

Where:  $C_d$  is the dry concentration

$C_m$  is the measured concentration  
 $\%H_2O$  is the measured water vapour percentage

#### To correct the % oxygen to dry basis (if required – may already be measured dry)

$$O_{2(dry)} = O_{2m} \times (100/(100 - \%H_2O))$$

Where:  $O_{2(dry)}$  is the dry oxygen percentage  
 $O_{2m}$  is the measured oxygen percentage

#### To correct to normalised oxygen concentration

$$C_{corr} = C_d \times (20.9 - O_{2norm})/(20.9 - O_{2(dry)})$$

Where:  $C_{corr}$  is the corrected concentration for oxygen concentration  
 $O_{2norm}$  is the stated normalised oxygen percentage

#### To correct for temperature

$$C_{normT} = C_{corr} \times ((273 + T_m)/273)$$

Where:  $C_{normT}$  is the normalised concentration for temperature  
 $T_m$  is the measured temperature in degrees centigrade

#### To correct for pressure

$$C_{norm} = C_{normT} \times (101.3/P_m)$$

Where:  $C_{norm}$  is the normalised concentration  
 $P_m$  is the measured pressure in kPa

### Volumetric flowrates

#### To correct for moisture concentration to dry (0% oxygen)

$$Q_d = Q_m \times ((100 - \%H_2O)/100)$$

Where:  $Q_d$  is the dry volumetric flowrate  
 $Q_m$  is the measured volumetric flowrate  
 $\%H_2O$  is the measured water vapour percentage

#### To correct the % oxygen to dry basis (if required – may already be measured dry)

$$O_{2(\text{dry})} = O_{2m} \times (100/(100 - \%H_2O))$$

Where:  $O_{2(\text{dry})}$  is the dry oxygen percentage  
 $O_{2m}$  is the measured oxygen percentage

#### To correct to normalised oxygen concentration

$$Q_{\text{corr}} = Q_d \times (20.9 - O_{2(\text{dry})}) / (20.9 - O_{2\text{norm}})$$

Where:  $Q_{\text{corr}}$  is the corrected volumetric flowrate for oxygen concentration  
 $O_{2\text{norm}}$  is the stated normalised oxygen percentage

#### To correct for temperature

$$Q_{\text{normT}} = Q_{\text{corr}} \times (273 / (273 + T_m))$$

Where:  $Q_{\text{normT}}$  is the normalised volumetric flowrate for temperature  
 $T_m$  is the measured temperature in degrees centigrade

#### To correct for pressure

$$C_{\text{norm}} = C_{\text{normT}} \times (P_m / 101.3)$$

Where:  $C_{\text{norm}}$  is the normalised volumetric flowrate  
 $P_m$  is the measured pressure in kPa

## Appendix B: Ferrous metals source factors

This appendix will help you compile Pollution Inventory (PI) submissions from ferrous metals processes, and covers the major categories of emission sources; process emissions (including integrated iron and steel processes, coke making and rolling mills), combustion emissions (heaters, boilers and so forth), fugitive emissions, wastewater, and so forth. It also includes emission factors where available. The table below addresses all the pollutants we consider potentially emitted from typical ferrous metal processes. For pollutants not contained within this table in most cases we expect a return of not applicable (n/a) to indicate that this pollutant is not knowingly discharged by the site.

## Emissions to air

Determinand	Method (see note 1)	Emission source	Reference	Factors and guidance
Benzene	C	Coke making		
Cd	M/C	Coke making		
	M	Sinter plant		
	M/C	Blast furnace		
	M	Steel making		
	C	1° & 2° rolling mills		
	M/C	Combustion		
CO	M/C	Combustion		
	M/C	Coke oven charging & door leakage		
	M/C	Coke oven pushing		
	M/C	Sinter plant wind box		
	C	BOS refining		
	C	EAF steel making		
	C	1° & 2° rolling mills		
	CO <sub>2</sub>	C	Site combustion and process sources	EU ETS
CH <sub>4</sub> (see note 2)	C	Combustion		
	C	Coke making		
Dioxins and Furans	M	Sinter plant		

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	M	EAF steel making		
HCl	M/C	Combustion		
	M/C	Sinter plant		
	M/C	Acid pickling		
HCN	M/C	Coke making		
Fluorine and inorganic compounds – as HF	M/C	Sinter plant		
	M/C	EAF steel making		
H <sub>2</sub> S (see note 3)	M/C	Coke making		
NH <sub>3</sub>	M/C	Coke oven charging		
	M/C	Coke oven door leakage		
	M/C	Coke oven pushing		
NMVOCs	C	1° & 2° rolling mills		
	M/C	Coke oven charging		
	M/C	Coke oven door leakage		
	M/C	Coke oven pushing		
NO <sub>x</sub>	M/C	Sinter plant		
	C	Combustion	EA	Site specific factors agreed for combustion plant
	M/C	Coke oven charging		
	M/C	Coke oven door leakage		
	C	EAF steel making		
N <sub>2</sub> O (see note 4)	M/C	Sinter plant		
	M/C	Blast furnace		
PAHs (see note 5)	C	1° & 2° rolling mills		
	C	Combustion		
	C	Combustion		
	M/C	Coke making		
PCBs as WHO TEQ	M/C	Sinter plant		
	M/C	Blast furnace		
	M	EAF steel making		
Phenol	M	Sinter plant		
	M/C	Coke making		
Total Particulate Matter	M/C	Sinter plant		
	C	Combustion		
PM <sub>10</sub> (also PM <sub>2.5</sub> )	C	Combustion		
	M/C	Coke oven charging		



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	M/C	Coke oven door leakage		
	M/C	Coke oven pushing		
	M/C	Coke oven flue gas		
	M/C	Sinter plant wind box		
	M/C	Sinter plant waste gas discharge		
	C	Blast furnace slips		
	C	Blast furnace cast house, furnace and tap hole/through		
	C	Hot metal desulphurisation		
	C	BOS refining		
	C	BOS charging		
	C	BOS tapping		
	C	BOS hot metal transfer		
	C	EAF steel making		
	C	Steel teeming		
	C	Steel casting		
	C	1° & 2° rolling mills		
SO <sub>x</sub>	C	Combustion	Industry experience	Fuel sulphur content x flow rate
	C	Sinter plant		
	M/C	Coke oven charging		
	M/C	Coke oven flue gas		
	C	Blast furnace		
Toluene	M/C	Coke making		
	M/C	Sinter plant		
	M/C	Blast furnace		
Xylene	M/C	Coke making		
	M/C	Sinter plant		
	M/C	Blast furnace		
Zn	M/C	Sinter plant		
<b>Other Metals</b>				
As	M			
Cu	M			
Cr	M			
Mn	M			
Ni	M			
Pb	M			
Sb	M			

**Notes:**

1. In method column M=measurement, C=calculation, E=estimation (engineering judgement).
2. It is anticipated that methane emissions will be included in future phases of the EU ETS – estimation methodologies may therefore require adaptation when EU monitoring and reporting decisions are published
3. Not stated on PI list of pollutants, but reportable as “Other individual acid forming gases”
4. It is anticipated that N<sub>2</sub>O emissions will be included in future phases of the EU ETS – estimation methodologies may therefore require adaptation when EU monitoring and reporting decisions are published.

## Releases to controlled waters and transfers in wastewater

Wherever possible data should be net of incoming cooling water quality but where this would result in a negative return (that is, removal of pollutants from incoming waters) a **n/a** return should be made unless alternative local arrangements have been made with us.

Determinand	Method	Emissions Source	Reference	Factors and Guidance
As	M	Effluent Treatment Facilities		Effluent quality data
Cd	M	Effluent Treatment Facilities		Effluent quality data
Chlorides (as total Cl)	M	Effluent Treatment Facilities		Effluent quality data
Cr	M	Effluent Treatment Facilities		Effluent quality data
Cu	M	Effluent Treatment Facilities		Effluent quality data
Cyanides (as total CN)	M	Effluent Treatment Facilities		Effluent quality data
Fluorides (as total F)	M	Effluent Treatment Facilities		Effluent quality data
Hg	M	Effluent Treatment Facilities		Effluent quality data
NH <sub>3</sub>	M	Effluent Treatment Facilities		Effluent quality data
Ni	M	Effluent Treatment Facilities		Effluent quality data
Pb	M	Effluent Treatment Facilities		Effluent quality data
PAHs*	M	Effluent Treatment Facilities		<i>Effluent quality data</i>
Phenols (as C)	M	Effluent Treatment Facilities		<i>Effluent quality data</i>
TOC	M	Effluent Treatment Facilities		<i>Effluent quality data</i>
Zinc	M	<i>Effluent Treatment Facilities</i>		<i>Effluent quality data</i>

\* Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(123-cd)pyrene



## Appendix C: Non-ferrous metals source factors

This appendix will help you compile your Pollution Inventory (PI) submissions from non-ferrous metals processes, and covers the major categories of emission sources; process emissions, combustion emissions (heaters, boilers and so forth), fugitive emissions, wastewater, and so forth.

The table below addresses all the pollutants which we consider potentially emitted from typical nonferrous metal processes. For pollutants not contained within this table, in most cases we expect a return of not applicable (**n/a**), to indicate that this pollutant is not knowingly discharged by the site.

## Emissions to air

Determinand	Method (see note 1)	Emission source	Reference	Factors and guidance
Benzene				
Cd	M			
Chlorine and inorganic compounds – as Cl				
CO	M	Combustion		
CO <sub>2</sub>	C	Site combustion and process	EU ETS	Guidance from EU Commission– as part of EUETS
CH <sub>4</sub> (see note 2)	C	Combustion		
Dioxins & Furans	M	Process		
HCl	M			
Fluorine and inorganic compounds – as HF	C	Primary aluminium alumina reduction		
HFCs				
Hg	M			
NH <sub>3</sub>	M			
NMVOCs	M			
NO <sub>x</sub>	C	Combustion	EA	Site specific factors agreed for combustion plant
N <sub>2</sub> O (see note 3)	C	Combustion		
PAHs (see note	C	Combustion		

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4)	C	Primary aluminium alumina reduction		
PFCs				
Total Particulate Matter	C	Combustion		
	C	Primary aluminium anode production		
	C	Primary aluminium alumina reduction prebake cell		
	C	Secondary aluminium sweating furnace		
	C	Secondary aluminium smelting (crucible furnace)		
	C	Secondary aluminium smelting (reverberatory furnace)		
	C	Secondary aluminium chlorine demagging		
	C	Secondary aluminium refining		
PM <sub>10</sub>	C	Combustion		
	C	Secondary magnesium pot furnace		
	C	Primary zinc roasting		
	C	Primary zinc sinter plant		
	C	Primary zinc vertical retort		
	C	Primary zinc electric retort		
	C	Primary zinc electrolytic process		
	C	Secondary zinc reverberatory sweating		
	C	Secondary zinc Kettle pot		
	C	Secondary zinc calcining		
PM <sub>10</sub>	C	Secondary zinc electric resistance sweating		
	C	Secondary zinc muffle sweating		
	C	Secondary zinc kettle sweating		
	C	Secondary zinc rotary sweating		
	C	Secondary zinc retort & muffle distillation		
	C	Secondary zinc retort distillation/oxidation		
	C	Secondary zinc muffle distillation/oxidation		
	C	Secondary zinc retort reduction		
PM <sub>10</sub>	C	Secondary zinc fugitive emissions		

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	C	Primary lead ore crushing		
	C	Primary lead ore screening		
	C	Primary lead tetrahedrite dryer		
	C	Primary lead sinter machine		
	C	Primary lead sinter building fugitives		
	C	Primary lead blast furnace		
	C	Secondary lead fugitive emissions		
	C	Secondary lead sweating		
	C	Secondary lead reverberatory smelting		
	C	Secondary lead blast smelting cupola		
	C	Secondary lead kettle oxidation		
	C	Secondary lead casting		
	C	Secondary lead kettle refining		
	C	Primary copper reverberatory furnace followed by converter		
PM <sub>10</sub>	C	Primary copper multiple hearth roaster followed reverberatory furnace & converter		
	C	Primary copper fluid bed roaster followed by reverberatory furnace & converter		
	C	Primary copper concentrate dryer followed by electric furnace & converter		
	C	Primary copper fluid bed roaster followed by electric furnace & converter		
	C	Primary copper concentrate dryer followed by flash furnace, cleaning furnace & converter		
	C	Primary copper concentrate dryer followed by Noranda reactors & converter		
	C	Primary copper fugitive emissions		
	C	Secondary copper cupola		
	C	Secondary copper reverberatory furnace		
PM <sub>10</sub>	C	Secondary copper crucible & pot furnace		

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	C	Secondary copper electric arc furnace		
	C	Secondary copper electric induction		
	C	Secondary copper rotary furnace		
Phenol	C	Primary aluminium alumina reduction		
SOx	C	Combustion	Industry Experience	Fuel sulphur content x flow rate
	C	Flare	Industry Experience	Flared gas sulphur content x flow rate
	C	Primary copper reverberatory furnace followed by converter		
	C	Primary copper multiple hearth roaster followed reverberatory furnace & converter		
	C	Primary copper fluid bed roaster followed by reverberatory furnace & converter		
	C	Primary copper concentrate dryer followed by electric furnace & converter		
	C	Primary copper fluid bed roaster followed by electric furnace & converter		
	C	Primary copper concentrate dryer followed by flash furnace, cleaning furnace & converter		
	C	Primary copper concentrate dryer followed by Noranda reactors & converter		
	C	Primary copper fugitive emissions		
		C	Primary lead sinter machine	
	C	Primary lead blast furnace		
	C	Secondary lead blast smelting cupola		
	C	Secondary lead reverberatory smelting		
Toluene				
Trichloroethylene				
Xylene				
Zn	M			
<b>Other Metals</b>				
As	M			



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Cu	M			
Cr	M			
Mn	M			
Ni	M			
Pb	M/C	Secondary copper reverberatory furnace		
	C	Primary lead ore crushing		
	C	Primary lead ore screening		
	C	Primary lead tetrahedrite dryer		
	C	Primary lead sinter machine		
	C	Primary lead sinter building fugitives		
	C	Primary lead blast furnace		
	C	Secondary lead sweating		
	C	Secondary lead reverberatory smelting		
	C	Secondary lead blast smelting cupola		
	C	Secondary lead kettle refining		
	C	Secondary lead casting		
	C	Secondary lead smelting		
	C	Secondary lead kettle refining		
C	Secondary lead casting			
C	Secondary lead sweating			
Sb	M			

**Notes:**

1. In method column M=measurement, C=calculation, E=estimation (engineering judgement).
2. It is anticipated that methane emissions will be included in future phases of the EU ETS – estimation methodologies may therefore require adaptation when EU monitoring and reporting decisions are published
3. It is anticipated that N<sub>2</sub>O emissions will be included in future phases of the EU ETS – estimation methodologies may therefore require adaptation when EU monitoring and reporting decisions are published.

## Releases to controlled waters and transfers in wastewater

Wherever possible data should be net of incoming cooling water quality, however where this would result in a negative return (that is, removal of pollutants from incoming waters) a **n/a** return should be made unless alternative local arrangements have been made with us.

Determinand	Method	Emissions Source	Reference	Factors and Guidance
Cd	M	Effluent Treatment Facilities		Effluent quality data
Chlorides (as total Cl)	M	Effluent Treatment Facilities		Effluent quality data
Cyanides (as total CN)	M	Effluent Treatment Facilities		Effluent quality data
Fluorides (as total F)	M	Effluent Treatment Facilities		Effluent quality data
Hg	M	Effluent Treatment Facilities		Effluent quality data
NH <sub>3</sub>	M	Effluent Treatment Facilities		Effluent quality data
PAHs*	M	Effluent Treatment Facilities		Effluent quality data
TOC	M	Effluent Treatment Facilities		Effluent quality data
Zinc	M	Effluent Treatment Facilities		Effluent quality data

\* Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(123-cd)pyrene