Department for Environment Food & Rural Affairs

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Process Guidance Note 2/05(13)

Statutory guidance for cold blast cupolas

Revised: July 2013

Llywodraeth Cymru
Welsh Government

DOE
Department of the Environment
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The Scottish Government

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Defra would like to acknowledge the work of the Environment Agency's Local Authority Unit in the drafting of this guidance note.

Revision of the guidance

The electronic version of this publication is updated from time to time with new or amended guidance. **Table 0.1** is an index to the latest changes (minor amendments are generally not listed).

Table 0.1 - Revision of the guidance

Date of change	Section/ paragraph where change can be found	Nature of change - what paragraphs have been inserted, deleted or amended - what subject matter is covered by the change
July 2013	Throughout	Addition of colour coding to tables

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1. Introduction

Legal basis

1.1 This note applies to the whole of the UK. It is issued by the Secretary of State, the Welsh Government, the Scottish Government and the Department of the Environment in Northern Ireland (DoE NI) to give guidance on the conditions appropriate for the control of emissions into the air from cold blast cupolas and rotary furnaces. It is published only in electronic form and can be found on the Defra website. It supersedes PG2/05(04) to the extent stated in paragraphs 2.3, 2.4 and 5.14.

1.2 This guidance document is compliant with the Code of Practice on Guidance on Regulation page 6 of which contains the "golden rules of good guidance". If you feel this guidance breaches the code or you notice any inaccuracies within the guidance, please contact us.

1.3 This is one of a series of statutory notes giving guidance on the Best Available Techniques (BAT). The notes are all aimed at providing a strong framework for consistent and transparent regulation of installations regulated under the statutory Local Air Pollution Prevention and Control (LAPPC) regime in England and Wales, Scotland and Northern Ireland. The note will be treated as one of the material considerations when determining any appeals against a decision made under this legislation. Further guidance on the meaning of BAT can be found for England and Wales (in chapter 12 of the General Guidance Manual), Scotland, and Northern Ireland, (in chapter 9).

1.4 In general terms, what are BAT for one installation in a sector are likely to be BAT for a comparable installation. Consistency is important where circumstances are the same. However, in each case it is, in practice, for regulators (subject to appeal) to decide what are BAT for each individual installation, taking into account variable factors such as the configuration, size and other individual characteristics of the installation, as well as the locality (e.g. proximity to particularly sensitive receptors).

1.5 The note also, where appropriate, gives details of any mandatory requirements affecting air emissions which are in force at the time of publication, such as those contained in Regulations or in Directions from the Government. In the case of this note, at the time of publication, there were no such mandatory requirements.

1.6 In **Section 4** and **Section 5**, arrows are used to indicate the matters which should be considered for inclusion as permit conditions. It is important to note, however, that this should not be taken as a short cut for regulators to a proper determination of BAT or to disregard the explanatory material which accompanies the arrows. In individual cases it may be justified to:

- include additional conditions;
- include different conditions;
- not include conditions relating to some of the matters indicated.

In addition, conditions will need to be derived from other parts of the note, in particular to specify emission limits, compliance deadlines and mandatory requirements arising from directions or other legislation.

Who is the guidance for?

1.7 This guidance is for:

Regulators

- local authorities in England and Wales, who must have regard to this statutory guidance when determining applications for permits and reviewing extant permits;
- the Scottish Environment Protection Agency (SEPA) in Scotland, and district councils or the Northern Ireland Environment Agency (NIEA), in Northern Ireland;

Operators who are best advised also to have regard to it when making applications and in the subsequent operation of their installation;

Members of the public who may be interested to know what the Government considers, in accordance with the legislation, amounts to appropriate conditions for controlling air emissions for the generality of installations in this particular industry sector.

Updating the guidance

1.8 The guidance is based on the state of knowledge and understanding, at the time of writing, of what constitute BAT for this sector. The note may be amended from time to time to keep up with developments in BAT, including improvements in techniques, changes to the economic parameters, and new understanding of environmental impacts and risks. The updated version will replace the previous version on the Defra website and will include an index to the amendments.

1.9 Reasonable steps will be taken to keep the guidance up-to-date to ensure that those who need to know about changes to the guidance are informed of any published revisions. However, because there can be rapid changes to matters referred to in the guidance – for example to legislation – it should not be assumed that the most recent version of this note reflects the very latest legal requirements; these requirements apply.

Consultation

1.10 This note has been produced in consultation with relevant trade bodies, representatives of regulators including members of the Industrial Pollution Liaison Committee and other potentially-interested organisations.

Policy and procedures

1.11 General guidance explaining LAPPC and setting out the policy and procedures is contained in separate documents for England and Wales, Scotland and Northern Ireland.

When to use another note rather than PG2/05

1.12 Many metals installations use more than one PG Note as they may have several listed activities.

1.13 Where an activity is covered by more than one PG note, then the more stringent emission limits and provisions should be applied to that activity.

1.14 **PG2/03** covers electric furnaces.

1.15 **PG2/04** covers making of moulds, in ladle operations, casting, grinding and fettling, finishing and other foundry operations.

1.16 PG notes **2/06, 2/07, 2/08** and **2/10** address the melting of aluminium, zinc, copper and magnesium, and their alloys.

2. Timetable for compliance and reviews

Existing cupolas and rotary furnaces

2.1 It is not expected that existing cold blast cupolas or rotary furnaces will be replaced like for like. Replacement is likely to be by electric furnace, to which PG2/03 applies. Should an existing cupola or rotary furnace be replaced with new, it must comply with the requirements of **Table 2** in PG2/05(04).

2.2 This note has been simplified to cover existing plant only, of which there are believed to be around 10, and it is believed that all plant in the UK that this note covers are fitted with simple wet spark arrester abatement, or are without abatement.

Table 2.1 - Compliance timetable

Guidance	Relevant paragraph/row in this note	Compliance date
There are no new provisions in this note likely of themselves to result in a need to vary existing permit conditions. For a full list of changes made by this note, excluding very minor ones, see **Table 6.1**.		

2.3 Where provisions in the preceding guidance note have been deleted or relaxed, permits should be varied as necessary as soon as reasonably practicable. There are not known to be any PG2/05 plant with more than simple wet arrestment; if there are any PG2/05 plant with numerical emission limit values, then this relaxation does not apply to those plant.

New or replacement cupolas and rotary furnaces

2.4 If, despite current expectations, new cold blast cupolas, new Part B or C hot blast cupolas or rotary furnaces are built, then regulators should use the abatement provisions for new plant in PG2/05(04) and drybag filtration is likely to be required.

Permit reviews

2.5 Under LAPPC, the legislation requires permits to be reviewed periodically but does not specify a frequency. It is considered for this sector that a frequency of once every eight years ought normally to be sufficient for the purposes of the appropriate Regulations. Further guidance on permit reviews is contained in the appropriate Guidance Manual for England and Wales, Scotland, Practical guide section 10 and Northern Ireland Part B Guidance page 9, Northern Ireland Part C Guidance chapter 17. Regulators should use any opportunities to determine the variations to permits necessitated by paragraph 2.2 above in conjunction with these reviews.

2.6 Conditions should also be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

3. Activity description

Regulations

3.1 This note applies to LAPPC installations for the cold blast cupolas and rotary furnaces. The activities for regulation are listed in **Table 3.1**.

Table 3.1 - Regulations listing activities

LAPPC	Activity	England and Wales	Scotland	Northern Ireland
		EPR Schedule 1 reference	PPC Schedule 1 reference	PPC Schedule 1 reference
Part A	See paragraph 3.3	Section 2.1 Part A	Section 2.1 Part A	Section 2.1 Part A
Part B	See paragraph 3.2	Section 2.1 Part B	Section 2.1 Part B	n/a
Part C	See paragraph 3.2	n/a	n/a	Section 2.1 Part C
The links are to the original version of the Regulations. A consolidated version is not available on www.legislation.gov.uk.				

3.2 This note applies only to those cold blast cupolas and rotary furnaces carrying out activities listed in Part B or Part C of the Regulations in **Table 3.1** and applies to emissions to air.

3.3 This note does not apply to Part A of the Regulations in **Table 3.1** which applies integrated pollution prevention and control to:

- producing pig iron or steel (including continuous casting) in a plant with a production capacity of more than 2.5 tonnes per hour;
- casting ferrous metal at a foundry with a production capacity of more than 20 tonnes a day.

3.4 Metal treatments undertaken in the ladle or other post furnace treatment vessels have been moved from this note to PG2/04. Such treatments include **nodularisation** with magnesium to produce ductile iron, and can include **carburisation** using a carbon source and **desulphurisation** which may typically use calcium carbide or soda ash.

3.5 Metal treatments in the primary melting furnace are still covered by this note (NB it is not unusual for a holding furnace to be used after the primary melting furnace to assist production requirements & to enable treatment to take place).

Cupola

3.6 The cupola consists of a vertical cylindrical steel shell lined internally with refractory material. It is closed at the bottom to form a "well" in which the molten metal collects, and fitted with "tuyeres" near the base, through which enters the air necessary for combustion. Pig iron (and/or scrap), coke and limestone are charged from the charging door near the top of the cupola and the coke is burned in the melting zone by a blast of air blown in through the tuyeres. As the iron melts it collects in the well, and is tapped off either continuously or intermittently, whilst fresh charges of pig iron, coke, and limestone are added through the charging door to maintain continuity of operation. The limestone functions as a flux, reacting with the ash, sand, etc to form a slag which, floating on top of the molten cast iron, is run off through the slag hole situated below the tuyere level. Since the rate at which coke is burned in the cupola varies with the rate of supply of air it is possible to control the melting rate of the pig iron.

3.7 The cupola shell is continued above the charging floor level thus constituting a chimney to facilitate the removal of the products of combustion. Within the cupola, conditions tend to result in the incomplete combustion of the coke with the consequent formation of carbon monoxide. This excess carbon monoxide may be observed burning with a bluish flame on top of the charge, the air for its combustion entering by way of the charging door. The hot combustion gases rising through the cupola shaft serve to heat the descending charge material.

3.8 It is possible to balance the air supply between the main and the auxiliary tuyeres to give almost complete combustion of the coke. The air from the tuyeres is at atmospheric temperature in a cold blast cupola.

3.9 Hot blast cupolas are not covered by PG2/05(12). And no Part B (Part C in NI) hot-blast cupolas are known to be in operation. If there were to be any, they should use PG2/05(04).

3.10 **Alternative fuels** may be used, e.g. oil or gas, which are supplied directly to the lower part of the shaft. In these circumstances carbon is added to the charge. **Oxygen** may also be introduced to the furnace. Supplementary firing of cold blast cupolas using natural gas has been reported to reduce plume visibility due to the reduced coke requirement and the higher temperatures achieved in the stack gases.

Some cupola terminology

3.11 **"Blow down"** period - oxidising conditions and higher temperatures, therefore more iron oxide released so emissions have brown coloration.

3.12 **"Drop the bottom"** 1200-1300^{o}C - open the doors at bottom of cupola and drop remaining charge into a properly designed skip which can be covered for transfer. During the drop there should be protection around the base of the cupola to contain the dropped material.

3.13 **"Bridging"** - occurs in the cupola shaft where the melt and charge rates have not been controlled sufficiently or where large scrap pieces and coke form a bridge preventing further charge moving down the cupola shaft to the melt zone.

"**Putting the wind on**" = "Blast on" = "Wind on" - tuyeres opened and air being blown into cupola by fan, as opposed to "Blast off" or "wind off".

Rotary furnace

3.14 A rotary furnace consists of a horizontal cylindrical steel shell mounted on rollers and lined with refractory material. The furnace is fired from one end usually using gas or oil as the fuel. Air-fuel or oxy-fuel burner systems may be used. The products of combustion leave the opposite end passing to a recuperator or pre heater where some of the heat is transferred to the air supply necessary for the fuel burner. The furnace body is slowly rotated during melting thus bringing the underside of the metal bath into contact with the hot refractory lining. This action prevents the lining becoming overheated by the flame and reduces the melting time to about half that of the stationary furnace.

3.15 The furnace is charged from one end the burner or the exhaust box being temporarily removed for the purpose. The plug is removed from the tapping hole when melting is complete and the furnace slowly rotated until the hole reaches the level of the bath, when the metal runs out into the waiting ladle.

3.16 Melting takes place out of contact with the fuel in an atmosphere which may be controlled. In addition since the molten bath is protected by a layer of slag, the oxidation of iron and other elements is minimised. There is no carbon or sulphur pick up, in contrast with the cupola melting. The rotary furnace is a batch melter, so metal compositions may be accurately controlled and the charge may be super heated to high temperatures. The efficient melting conditions allow the use of light scrap which is unsuitable for melting in a cupola.

3.17 Rotary furnaces are also used for holding and superheating metal previously melted in a cupola.

3.18 It is expected that an afterburner can achieve between 80% and 98% efficiency for burning of combustible particulates emitted from the rotary furnace. Hot gases from the afterburner can be ducted through a recuperator and contribute to pre-heating the combustion air to the main furnace burner. Recuperators offer an energy saving of up to 15 percent. Oxygen enrichment used in conjunction with a recuperator generally achieves a 30% energy saving. Additionally the higher combustion temperature assists in reducing overall emissions. Exhaust gas volume is also reduced. Full oxy/fuel firing may offer an energy saving of up to 50% and reduce exhaust gas volume by up to 72%.

3.19 For ferrous rotary furnaces operating with simple air/fuel burners, emissions peak at about 250 mg/m^3 for short periods (between 3 seconds continuously and intermittently over a period of a minute) during the solid phases of the melt cycle and thereafter, once the charge starts to become liquid, reduce to less than 30 mg/m^3 during normal running. Emissions may remain as high as 150 mg/m^3 - 200 mg/m^3 continually during the solid phase of the melt. 40% combustible emissions is common. Peak emissions from rotary furnaces consist of at least 80% unburned fuel and occur during charging operations when the main furnace burner is extinguished and then re-lit. Emissions from the furnace should at all times, including during charging, be ducted via the afterburner which should be fully operational.

Carburisation

3.20 In-ladle, and post primary furnace, carburisation are no longer covered by this note. See PG2/04(12)

3.21 In-furnace carburisation is covered by this note. –Carburisation is carried out to diffuse carbon into steel. Steels are usually categorised on the basis of their carbon (normally less than 1.5%) and alloy content. Alloys containing more than 2.5% carbon are termed cast iron. Powdered graphite is added to the melt (often in a ladle, although graphite injection into a rotary furnace may be used). Artificially created turbulence within the metal is required to achieve contact between the reactant and the metal.

Desulphurisation

3.22 In ladle, and post primary furnace, desulphurisation are no longer covered by this note. See PG2/04(12)

3.23 To reduce sulphur levels in iron melts, especially from cupolas, calcium carbide is often used.

Nodularisation

3.24 Is no longer covered by this note. See PG2/04(12).

Figure 3.1 - cupola with post combustion unit

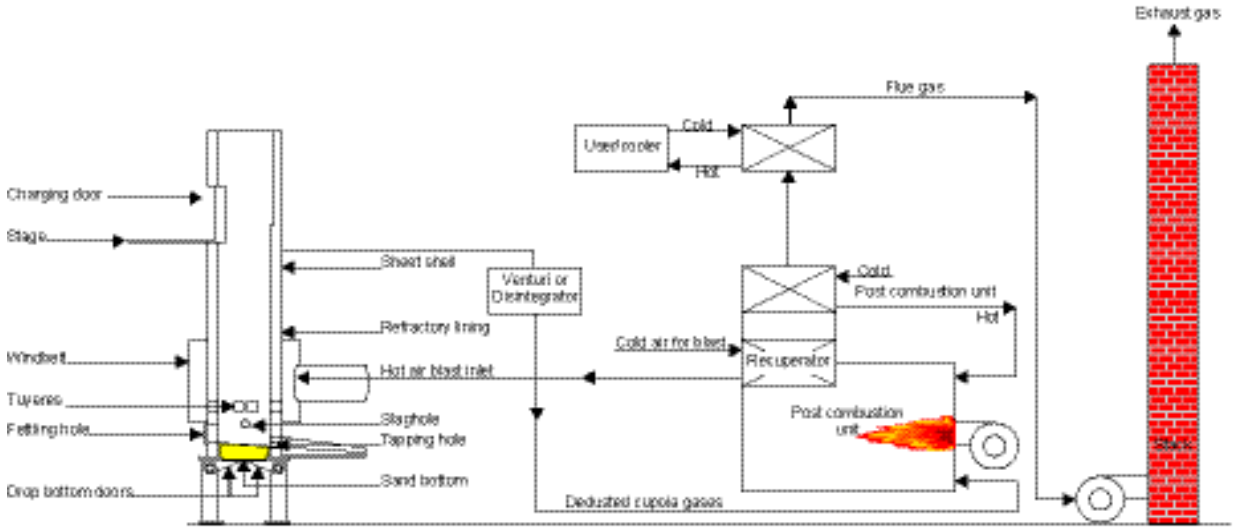
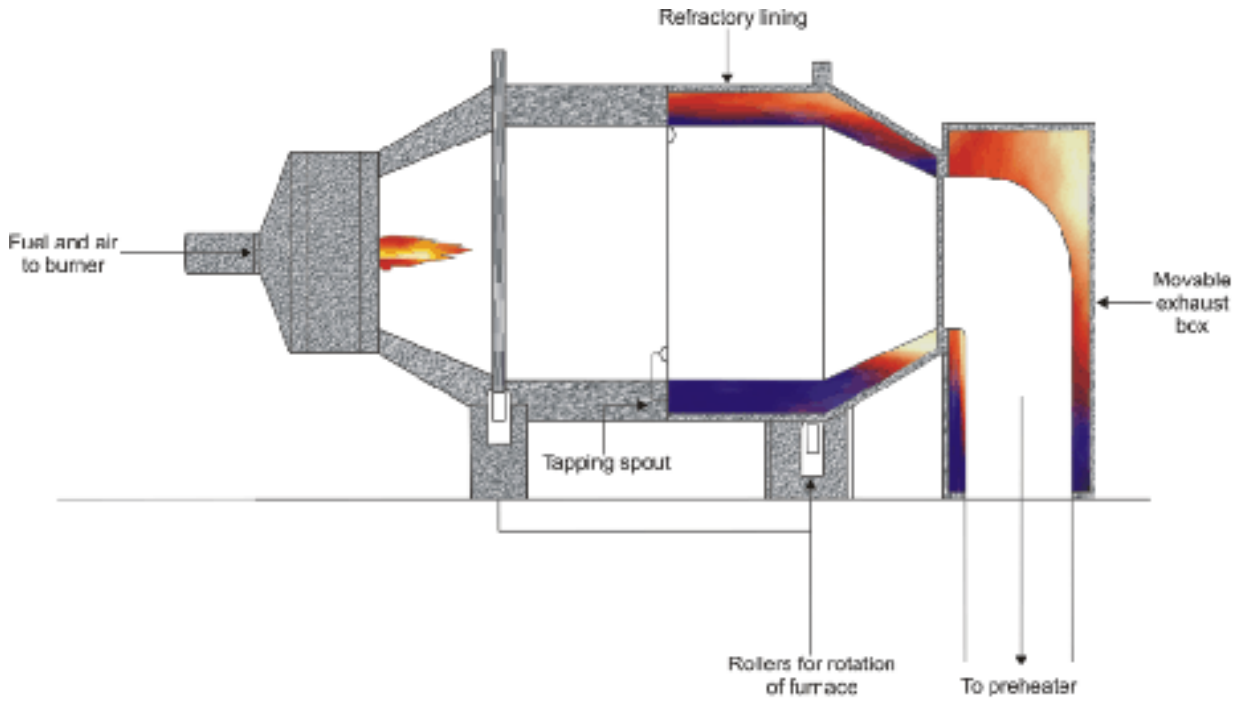


Figure 3.2 - rotary furnace



4. Emission limits, monitoring and other provisions

4.1 Emissions of the substances listed in **Table 4.1** should be controlled.

4.2 The emission limits and provisions described in this section are achievable using the best available techniques described in **Section 5**.

4.3 All activities should comply with the emission limits and provisions with regard to releases in **Table 4.1**

Table 4.1 should be considered in conjunction with the monitoring paragraphs found later in this section

Table 4.1 - Emission limits, monitoring and other provisions

	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
Total particulate matter	From all cupolas and furnaces, including those fitted with wet arrestment equipment but where emissions are not ducted to a stack	Provisions relating to visible emissions (see Note a)	Scrubber and scrubber liquor flow (see note a) Plus Visual assessments as described in paragraph 4.7	(see Note a) Plus Daily

Note (a): Where a wet scrubber is used to abate emissions:

- A visual inspection of the equipment should be made at least once a week to ensure correct functioning of the equipment including adequate liquor circulation. The result of each inspection should be recorded.
- Scrubber liquor flow should be continuously monitored, triggering an alarm and stand-by pump in the event of pump failure.

Monitoring, investigating and reporting

4.4 The operator should monitor emissions, and make inspections of the activity.

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. Records should be:
  - kept on site;
  - kept by the operator for at least two years; **and**
  - made available for the regulator to examine.
- If any records are kept off-site they should be made available for inspection within one working week of any request by the regulator.

Information required by the regulator

4.5 The regulator needs to be informed of monitoring to be carried out and the results. The results should include process conditions at the time of monitoring.

- Adverse results from any monitoring activity should be investigated by the operator as soon as the monitoring data has been obtained. The operator should:
  - identify the cause and take corrective action;
  - clearly record as much detail as possible regarding the cause and extent of the problem, and the remedial action taken;
  - re-test to demonstrate compliance as soon as possible; **and** inform the regulator of the steps taken and the re-test results.

Visible emissions

4.6 The aim should be to prevent any visible airborne emission from any part of the process. This aim includes all sites regardless of location. Monitoring to identify the origin of a visible emission should be undertaken and a variety of indicative techniques are available.

- where off-site monitoring is carried out it may also be appropriate for the regulator to specify recording of wind direction and strength;

4.7 Emissions from combustion processes in normal operation should be free from visible smoke. During start up and shut down the emissions should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742.

- All other releases to air, other than condensed water vapour, should be free from persistent visible emissions.

- All emissions to air should be free from droplets.

Where there are problems that, in the opinion of the regulator, may be attributable to the installation, such as local complaints of visual emissions or where dust from the installation is being detected beyond the site boundary, the operator should investigate in order to find out which part of their operation(s) is the cause.

If this inspection does not lead to correction of the problem then the operator should inform the regulator who will determine whether ambient air monitoring is necessary. Ambient monitoring may either be by a British Standard method or by a method agreed with the regulator.

Whilst problems are ongoing, a visual check should also be made at least once per day/shift, by the operator, when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Emissions of odour

4.8 The overall aim should be that all emissions are free from offensive odour outside the site boundary, as perceived by the regulator. However, the location of the installation will influence the assessment of the potential for odour impact as local meteorological conditions may lead to poor dispersion conditions. Where the site has a low odour impact due to its remoteness from sensitive receptors, the escape of offensive odour beyond the installation would be unlikely to cause harm.

4.9 Where there are problems that, in the opinion of the regulator, may be attributable to the installation, such as local complaints of odour or where odour from the installation is being detected beyond the site boundary, the operator should investigate in order to find out which part of their operation(s) is the cause.

4.10 Whilst problems are ongoing, a boundary check should also be made at least once per day/shift, by the operator, when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Abnormal events

4.11 The operator should respond to problems which may have an adverse effect on emissions to air.

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator should:
  - investigate and undertake remedial action immediately;
  - adjust the process or activity to minimise those emissions; **and**
  - promptly record the events and actions taken.
- The regulator should be informed without delay, whether or not there is related monitoring showing an adverse result:
  - if there is an emission that is likely to have an effect on the local community; **or**
  - in the event of the failure of key arrestment plant, for example, bag filtration plant or scrubber units.
- The operator should provide a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects.

5. Control techniques

Summary of best available techniques

5.1 **Table 5.1** provides a summary of the best available techniques that can be used to control the process in order to meet the emission limits and provisions in **Section 4**. Provided that it is demonstrated to the satisfaction of the regulator that an equivalent level of control will be achieved, then other techniques may be used.

Table 5.1 - Summary of control techniques

Source	Substance	Control techniques
Raw material storage	Particulate matter	Potentially dusty materials should be stored in buildings or appropriate containers
Breakdown of contamination on scrap charge	Smoke Particulate matter	Careful examination and selection of scrap. No painted scrap. No oily scrap. Charge material should be substantially free from oil, paint and grease.
Cupola operations	Particulate matter	Do not overblow, measure blast flow rate (rate of air going into cupola).
Charging the cupola	Particulate matter	Charge level indicator to prevent overfilling or underfilling
Dusty additives	Particulate matter	Use pelleted additives
Lighting the cupola	Particulate matter	Use a smokeless method usually a gas poker. Do NOT use oily wood.
Cupola combustion and melting operations	Products of incomplete combustion of coke (soot and smoke)	Afterburner and charge level indicator (which helps with metal temperature control and protects the afterburner). A wet scrubber in conjunction with a tall stack where necessary to disperse odours.
Coke burning	Acid emissions from sulphur in coke	Additive to remove acid from the emission
Coke burning	Particulate matter	Where a spark arrestor is used: Regular dome inspection and replacement policy.
Dropping the bottom	Particulate matter	Not when cupola full. Reduce blast by 50% for last 20 minutes during blow down.
Cupola and rotary furnaces	Particulate matter including metallurgical fume (metallic oxides and silicates)	Dust arrestment by one of the following: • bag filters • high pressure venturi systems • simple wet arrestor

Techniques to control emissions from contained sources

Particulate matter, metals and their compounds

5.2 Emissions of particulate matter should be contained, extracted and abated if necessary to meet the visible emission provisions of **Table 4.1** for particulate matter. For cupolas, where simple wet arrestors do not provide sufficient arrestment then high energy wet scrubbers should be used and PG2/05(04) used as guidance, (For information, operators are more likely to change the melting technique than install high energy wet scrubbers). Where scrap metal is melted, care in assessing and selecting incoming scrap is required in order to minimise furnace emissions.

5.3 Only "clean" scrap should be melted. For this purpose, "clean" scrap should be taken to be scrap which is free from significant amounts of contamination such as dirt, foreign material, oily residues and grease, paint or other organic materials (e.g. rubber or plastic).

- Charge material should be substantially free from oil, paint and grease.

5.4 Emissions should be abated where necessary to meet the limits and requirements.

5.5 Where particulate matter emissions are abated using a wet scrubber, the scrubber should be regularly maintained. Action should be taken to deal with any blockages that occur due to accumulation of solids, for example adding flocculating agents to the liquor to settle the solids out.

5.6 Cupolas should be lit using gas.

5.7 Where a safety bypass of the arrestment plant fitted to a cupola is installed, the bypass should be closed before the blast is put on. All reasons for, and the time and duration of, opening of the bypass should be recorded.

5.8 A scrap control system should be put in place to ensure that only "clean" scrap is melted. Evidence should be provided to the regulator that the necessary assessment and selection system is operating, as well as details regarding who has been trained to operate it.

Oxides of sulphur in gas oil

5.9 Practically all the sulphur in a fuel is emitted as sulphur oxides (SO_x). Gas oil is limited by other legislation to 0.1% sulphur by mass, and is unlikely to need checking on site, and similarly for heavy fuel oil (1% sulphur).

Odour control

5.10 Dispersion of emissions from the cupola or rotary furnace, in conjunction with wet scrubbing where it is applied, should normally ensure that odour is reduced to an acceptable level. It may also be necessary to use a scrubber in conjunction with a high stack in order to disperse residual odour. Where necessary the stack should be designed so as to ensure dispersal of residual odour.

5.11 Where odorous emissions are abated using a wet scrubber, the scrubber should be regularly maintained. Action should be taken to ensure that the liquor is held at a suitable pH value (for example, 7 or higher) to enhance removal of sulphur dioxide for example by dosing with alkali.

5.12 Waste liquor from scrubbers should be stored in fully enclosed containers.

5.13 Emissions should, where necessary to avoid offensively odorous emissions, be ducted to a stack designed in accordance with **paragraph 5.25** of this note.

Techniques to control fugitive emissions

Fugitive emissions

5.14 Emissions from the operations covered by this note comprise very fine particulate matter, in the form of fume and smoke, as well as potentially coarser grit and dust. The control of fugitive emissions from these processes is mainly by the use of dilution to achieve the requirements described in **paragraph 4.6** with regard to visible emissions. Where the requirements are not met then fugitive emissions should be prevented or minimised by the use of containment and extraction, and the extracted emissions should be addressed as described in PG2/05(04).

5.15 Dusty wastes should be stored in closed containers and handled in a manner that avoids emissions of dust.

5.16 Internal transport of dusty materials should be carried out so as to prevent or minimise airborne dust emissions.

5.17 Stocks of dusty or potentially dusty materials and residues should be stored in such a manner as to prevent wind whipping, for example by covering or screening. Loading to and from stockpiles, handling and charging into the cupola of solid materials and slag removal should be carried out in a manner which will minimise emissions to air, for example by use of enclosed conveyors for charging and by minimising drop heights.

5.18 Charging of the cupola should be carried out in a manner which will minimise emissions to air, for example by use of enclosed conveyors.

5.19 Stocks of dusty or potentially dusty materials should be stored in such a way as to prevent wind whipping.

5.20 Adequate provision to contain liquid and solid spillage is needed.

5.21 All spillages should be cleared as soon as possible; solids by vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages should not be permitted.

5.22 A high standard of housekeeping should be maintained.

Air quality

Dispersion & dilution

5.23 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are deemed harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note (Dispersion) D1. The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure.

The calculation procedure of D1 is usually used to calculate the required stack height but alternative dispersion models may be used in agreement with the regulator. An operator may choose to meet tighter emission limits in order to reduce the required stack height.

5.24 Where an emission consists purely of air and particulate matter, (i.e. no products of combustion or any other gaseous pollutants are emitted) the above provisions relating to stack height calculation for the purpose of dispersion and dilution should not normally be applied. Revised stack height calculations should not be required as a result of publication of this revision of the PG note, unless it is considered necessary because of a breach or serious risk of breach of an EC Directive limit value or because it is clear from the detailed review and assessment work that the permitted process itself is a significant contributor to the problem.

5.25 Where offensive odour is likely outside the process site boundary the assessment of stack or vent height should take into account the need to render harmless residual offensive odour.

Ambient air quality management

5.26 In areas where air quality standards or objectives are being breached or are in serious risk of breach and it is clear from the detailed review and assessment work under Local Air Quality Management that the permitted process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the standard that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BAT to meet it. Decisions should be taken in the context of a local authority's Local Air Quality Management action plan. For example, where a permitted process is only responsible to a very small extent for an air quality problem, the authority should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. Paragraph 59 of the Air Quality Strategy 2007 [Volume 1] gives the following advice:

"...In drawing up action plans, local authority environmental health/pollution teams are expected to engage local authority officers across different departments, particularly, land-use and transport planners to ensure the actions are supported by all parts of the authority. In addition, engagement with the wider panorama of relevant stakeholders, including the public, is required to ensure action plans are fit-for-purpose in addressing air quality issues. It is vital that all those organisations, groups and individuals that have an impact upon local air quality, buy-in and work towards objectives of an adopted action plan."

Stacks, vents and process exhausts

5.27 Liquid condensation on internal surfaces of stacks and exhaust ducts might lead to corrosion and ductwork failure or to droplet emission. Adequate insulation will minimise the cooling of waste gases and prevent liquid condensation by keeping the temperature of the exhaust gases above the dewpoint. A leak in a stack/vent and the associated ductwork, or a build up of material on the internal surfaces may affect dispersion:

- Flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.

5.28 When dispersion of pollutants discharged from the stack (or vent) is necessary, the target exit velocity should be 15m/s under normal operating conditions, (but see paragraph below regarding wet plumes). In order to ensure dispersion is not impaired by either low exit velocity at the point of discharge, or deflection of the discharge, a cap, or other restriction, should not be used at the stack exit. However, a cone may sometimes be useful to increase the exit velocity to achieve greater dispersion.

5.29 An exception to the previous paragraph is where wet arrestment is used as the abatement. Unacceptable emissions of droplets could occur from such plant where the linear velocity in the stack exceeds 9m/s.

5.30 To reduce the potential of droplet emissions a mist eliminator should be used. Where a linear velocity of 9m/s is exceeded in existing plant consideration should be given to reducing this velocity as far as practicable to ensure such droplet entrainment and fall out does not happen.

Management

Management techniques

5.31 Important elements for effective control of emissions include:

- proper management, supervision and training for process operations;
- proper use of equipment;
- effective preventative maintenance on all plant and equipment concerned with the control of emissions to the air; **and**
- ensuring that spares and consumables - in particular, those subject to continual wear – are held on site, or available at short notice from guaranteed local suppliers, so that plant breakdowns can be rectified rapidly. This is important with respect to arrestment plant and other necessary environmental controls. It is useful to have an audited list of essential items.

Appropriate management systems

5.32 Effective management is central to environmental performance; it is an important component of BAT and of achieving compliance with permit conditions. It requires a commitment to establishing objectives, setting targets, measuring progress and revising the objectives according to results. This includes managing risks under normal operating conditions and in accidents and emergencies.

5.33 It is therefore desirable that installations put in place some form of structured environmental management approach, whether by adopting published standards (ISO 14001 or the EU Eco Management and Audit Scheme [EMAS]) or by setting up an environmental management system (EMS) tailored to the nature and size of the particular process. Operators may also find that an EMS will help identify business savings.

5.34 Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. Regulators are urged to encourage operators to have an EMS for all their activities, but it is outside the legal scope of an LAPPC permit to require an EMS for purposes other than LAPPC compliance. For further information/advice on EMS refer to the appropriate chapter of the appropriate Guidance Manual for England and Wales, Scotland and Northern Ireland.

Training

5.35 Staff at all levels need the necessary training and instruction in their duties relating to control of the process and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions. Training may often sensibly be addressed in the EMS referred to above.

- All staff whose functions could impact on air emissions from the activity should receive appropriate training on those functions. This should include:
  - awareness of their responsibilities under the permit;
  - steps that are necessary to minimise emissions during start-up and shutdown;
  - actions to take when there are abnormal conditions, or accidents or spillages that could, if not controlled, result in emissions.
- The operator should maintain a statement of training requirements for each post with the above mentioned functions and keep a record of the training received by each person. These documents should be made available to the regulator on request.

Maintenance

5.36 Effective preventative maintenance plays a key part in achieving compliance with emission limits and other provisions. All aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air should be properly maintained. In particular:

- The operator should have the following available for inspection by the regulator:
  - a written maintenance programme for all pollution control equipment; **and**
  - a record of maintenance that has been undertaken.

6. Summary of changes

The main changes to this note, with the reasons for the change, are summarised in **Table 6.1**. Minor changes that will not impact on the permit conditions e.g. slight alterations to the Process Description have not been recorded.

Table 6.1 - Summary of changes

Section/ paragraph/ row	Change	Reason	Comment
Whole note	Hot blast cupolas are no longer covered	No existing Part B hot blast cupolas are known, and no new ones expected.	Note can be much simpler without them
	Simplification of text	Make note clearer	
	Addition of links	Change to electronic format	Removes need for extensive footnotes/references
Table 4.1	Simple wet arrestment is the most required	Reflects existing plant, and allows simplification of the note. No new cupolas or rotary furnaces expected	Not many cupolas and perhaps only 1 rotary. Replacement for cupolas and rotary furnaces would be electric furnaces (PG2/03)
Section 4	Monitoring and calibration simplified	Less guidance needed for simple wet arrestment	No numerical emission limit values now
Sections 2, 3, 4 and 5	In ladle treatments of molten metal have been moved to PG2/04	No change in provisions, but allows simplification of this PG note	Sometimes they need numerical limits.
Section 5	Some text about enclosure and arrestment removed	Less text needed for simple wet arrestment	
Table 5.1	New text added about pelleted additives	BAT, prevents dust emissions (and saves waste)	Additives are expensive and less is needed if there is no dust blown out

7. Further information

Sustainable consumption and production (SCP)

Both business and the environment can benefit from adopting sustainable consumption and production practices. Estimates of potential business savings include:

- £6.4 billion a year UK business savings from resource efficiency measures that cost little or nothing;
- 2% of annual profit lost through inefficient management of energy, water and waste;
- 4% of turnover is spent on waste.

When making arrangement to comply with permit conditions, operators are strongly advised to use the opportunity to look into what other steps they may be able to take. Regulators may be willing to provide assistance and ideas, although cannot be expected to act as unpaid consultants.

Health and safety

Operators of installations must protect people at work as well as the environment:

- requirements of a permit should not put at risk the health, safety or welfare of people at work or those who may be harmed by the work activity;
- equally, the permit must not contain conditions whose only purpose is to secure the health of people at work. That is the job of the health and safety enforcing authorities.

Where emission limits quoted in this guidance conflict with health and safety limits, the tighter limit should prevail because:

- emission limits under the relevant environmental legislation relate to the concentration of pollutant released into the air from prescribed activities;
- exposure limits under health and safety legislation relate to the concentration of pollutant in the air breathed by workers;
- these limits may differ since they are set according to different criteria. It will normally be quite appropriate to have different standards for the same pollutant, but in some cases they may be in conflict (for example, where air discharged from a process is breathed by workers). In such cases, the tighter limit should be applied to prevent a relaxation of control.

Further advice on responding to incidents

The UK Environment Agencies have published guidance on producing an incident response plan to deal with environmental incidents. Only those aspects relating to air emissions can be subject to regulation via a Part B (Part C in NI) permit, but regulators may nonetheless wish to informally draw the attention of all appropriate operators to the guidance.

It is not envisaged that regulators will often want to include conditions, in addition to those advised in this PG note, specifying particular incident response arrangements aimed at minimising air emissions. Regulators should decide this on a case-by-case basis. In accordance with BAT, any such conditions should be proportionate to the risk, including the potential for harm from air emissions if an incident were to occur. Account should therefore be taken of matters such as the amount and type of materials held on site which might be affected by an incident, the likelihood of an incident occurring, the sensitivity of the location of the installation, and the cost of producing any plans and taking any additional measures.