

PROCESS GUIDANCE NOTE
JANUARY 2005

Process Guidance Note
NIPG 6/31 (Version 2)

Powder Coating Including Sherardizing and Vitreous Enamelling Dry

ENVIRONMENT (NI) ORDER 2002
POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003
INDUSTRIAL POLLUTION CONTROL (NI) ORDER 1997
IPC (PRESCRIBED PROCESSES AND SUBSTANCES) REGULATIONS (1998)

GUIDANCE FOR PROCESSES PRESCRIBED FOR
AIR POLLUTION CONTROL
AND
AIR POLLUTION PREVENTION AND CONTROL
BY DISTRICT COUNCILS



Department of the
Environment

www.doeni.gov.uk

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Environment
Agency

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1 Introduction

- 1.1 This Note is issued by the Department of the Environment to give guidance on the conditions appropriate for the control of emissions into the air from processes / installations¹ for powder coating including sherardizing and vitreous enamelling dry. It supersedes guidance note NIPG 6/31 (Version 1) that issued in March 1998.
- 1.2 This is one of a series of notes giving guidance on Best Available Techniques (BAT) and Best Available Techniques Not Entailing Excessive Cost (BATNEEC)². The notes are all aimed at providing a strong framework for consistent and transparent regulation of processes and installations.
- 1.3 This note is for use under both Local Air Pollution Control (LAPC) established by the Industrial Pollution Control (NI) Order 1997, and Local Air Pollution Prevention and Control (LAPPC) established by the Environment (NI) Order 2002³. It constitutes statutory guidance to regulators under regulation 38 of The Pollution Prevention and Control Regulations (NI) 2003. To the extent it provides guidance on techniques, it also constitutes statutory guidance to regulators under section 7(11) of the 1997 Order, and in any event regulators are expected to have regard to it. The note will be treated as one of the material considerations when determining any appeals against a decision under either the 1997 or 2002 Orders.
- 1.4 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 Directions from the Department.

Site specific BAT/ BATNEEC

- 1.5 All processes are subject to BAT/ BATNEEC. In general terms, what is BAT/ BATNEEC for one process in a sector is likely to be BAT/ BATNEEC for a comparable process; but in each case it is, in practice, for regulators (subject to appeal) to decide what is BAT/ BATNEEC for the individual process and the regulator should take into account variable factors (such as configuration, size and other individual characteristics of the process) and the locality (such as proximity of particularly sensitive receptors⁴). Ultimately, therefore, what constitutes BAT/ BATNEEC is site specific but this guidance note comprises guidance for the generality of processes in the sector and careful regard should be had to it, in order to maximise consistency of permits as appropriate.

Who is affected

- 1.6 This guidance is for:
 - regulators: who must have regard to the guidance when determining applications and reviewing extant authorisations and permits
 - operators: who are best advised also to have regard to it when making applications, and in the subsequent operation of their process
 - 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 processes in this particular industry sector

1. The term "process(es)" is used in the remainder of the note to mean both "processes" under the Industrial Pollution Control (NI) Order and "installations" and "activities" under the Environment (NI) Order 2002.
2. BATNEEC is the formulation used in the Industrial Pollution Control (NI) Order and BAT is used in the Environment (NI) Order 2002. For the purposes of this guidance note, the two concepts are regarded as having essentially the same effect.
3. In accordance with Part 2 of Schedule 3 to the PPC (NI) Regulations, SR 2003/46: Coating activities, printing and textile treatment processes transfer from regulation under the 1997 Order to the 2002 Order from 1 April 2006.
4. Guidance on the relationship between BAT/BATNEEC and air quality objectives is contained in the General Guidance Manual on policy and procedures for Part C installations.

- 1.7 The guidance is based on the state of knowledge and understanding at the time of writing of:
- powder coating sector including sherardizing and vitreous enamelling dry
 - their potential impact on the environment and
 - what constitutes BAT/ BATNEEC for preventing and reducing air emissions
- 1.8 The note may be amended from time to time in order to keep abreast with developments in BAT/BATNEEC including improvements in techniques and new understanding of environmental impacts and risks. Such changes may be issued in a complete revision of this document, or in separate additional guidance notes which address specific issues. (It may not always be possible to issue amending guidance quickly enough to keep in absolute step with rapid changes, which is another circumstance where paragraph 1.5 above might apply.)
- 1.9 Steps will be taken to ensure that those who need to know about changes are informed. Operators (and their advisers) are, however, strongly advised to check with the regulator whether there have been any changes before relying on this note for the purposes of making an application under the 1997 or 2002 Orders or making any other decisions where BAT/ BATNEEC may be a consideration.

Consultation

- 1.10 This note has been produced in consultation with relevant trade bodies and representatives of regulators including members of the Industrial Pollution Liaison Committee and the NI Industrial Pollution Liaison Group.

Publication

- 1.11 This and other published guidance in this series are available, free of charge, via the Department at www.doeni.gov.uk/epd.
- 1.12 General guidance explaining policy and setting out LA-PPC policy and procedures is contained in the Department's "General Guidance Manual on Policy and Procedures for Part C Installations" available from www.doeni.gov.uk/epd and referred to in this document as the "General Guidance Manual". This is designed for operators and members of the public as well as district council regulators.
- 1.13 In addition to the General Guidance Manual referred to above, explanation or clarification of certain terms used in this sector guidance note can be found in a general guidance note issued under the Industrial Pollution Control (NI) Order 1997: "Interpretation of terms used in process guidance notes" that issued in March 1998 (NIGG4). Where there is any conflict between NIGG4 and the guidance issued in this note or in the General Guidance Manual, the latter two documents should prevail, as should any subsequent guidance issued in relation to LAPPC.
- 1.14 The application of powders as a wet slurry is not covered by this note as it is not the application of coating in a dry form.
- 1.15 For digital printing, use NIPG6/16(Version 2) Printing processes. This note (NIPG6/31(Version 2)) does not cover digital printing, which can use powder inks and fuse them by heat but also may use wet inks and other fusing techniques eg heat/pressure, pressure alone, chemicals or light.
- 1.16 For guidance on the removal of coatings from jigs and product by heat, use NIPG2/9(Version 2). The Waste Incineration Directive may apply to these processes.
- 1.17 For guidance on degreasing using solvents, use NIPG6/45(Version 2). The Solvent Emission Directive applies in some cases, and takes precedence over this note
- 1.18 Other NIPG notes are provided for wet paint, varnish and other coatings and for applying metal coatings by spraying in molten form. See [Appendix 3](#) for a list of them. The Solvent Emission Directive applies in some cases and takes precedence over this note, for instance when applying coatings with a solvent consumption over 5 tonnes (How the Solvent Emission Directive applies and the definition of solvent consumption are given in the relevant coating PG notes)

2 Timetable for compliance and reviews

Existing processes or activities

2.1 The previous guidance advised that upgrading to that standard should usually have been completed by 1 January 2005. Requirements still outstanding from any existing upgrading programme should be completed to the timescale of that programme.

Upgrading for this note

2.2 The new provisions of this note and the dates by which compliance with these provisions is expected are listed in the table below, together with the paragraph number where the provision is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Authorisations/permits should be varied as necessary, having regard to the changes and the timetable.

Table 1: Compliance timetable

Provision	Relevant paragraph/row in this note	Compliance date
Monitoring for external vents with a flow rate less than 50m ³ /minute, (or vent internally)	Table 2 Row 1	12 months from the publication of this note.
30mg/m ³ emission limit for hydrogen chloride arrestment plant	Table 2 Rows 2 and 3	12 months from the publication of this note.
All other provisions	-	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note.

2.3 Replacement plant should normally be designed to meet the appropriate standards specified for new installations or activities.

Relaxation of conditions

2.4 Where provisions in the preceding guidance note have been deleted or relaxed, authorisations should be varied as necessary as soon as reasonably practicable. [Section 7](#) provides a summary of all changes.

New processes or activities

2.5 For new processes or activities, the authorisation/permit should have regard to the full standards of this guidance from the first day of operation.

Substantially changed processes or activities

2.6 For substantially changed processes or activities, the authorisation/permit should normally have regard to the full standards of this guidance with respect to the parts of the process that have been substantially changed and any part of the process affected by the change, from the first day of operation.

Permit reviews

Reviewing permits

2.7 Under LAPC the requirement is to review conditions in authorisations at least every four years. (Article 6(6) Industrial Pollution Control (NI) Order 1997)

2.8 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 six years ought normally to be sufficient for the purposes of Regulation 15(1) of Pollution Prevention and Control Regulations (NI) 2003.

More frequent review may be necessary in individual cases for the reasons given in Regulation 15(2). Further guidance on permit reviews is contained in the General Guidance Manual available on www.doeni.gov.uk/epd. Regulators should use any opportunities to determine the variations to authorisations/permits necessitated by paragraph 2.2 above in conjunction with these reviews.

- 2.9 Under both LAPC and LAPPC, conditions should be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

3 Process description

Regulations

- 3.1 Powder Coating including Sherardizing and Vitreous Enamelling Dry processes/ installations are prescribed for:
- Local air pollution control, LAPC, under section 6.5 of Schedule 1 to the IPC Prescribed Processes and Substances) Regulations 1998, SR 28.
 - Local air pollution prevention and control, LAPPC, under section 6.4 of Schedule 1 of the Pollution Prevention and Control Regulations (NI) 2003 SR 46.
- 3.2 This note refers to processes that apply dry coating powders to substrates, cure or fuse them thermally or by UV, and use more than 20 tonnes of coating powder in any period of 12 months.

Process or activity

- 3.3 In the context of this note, "process" or activity comprises the whole process from receipt of raw materials via production of intermediates to dispatch of finished products, including the treating, handling and storage of all materials and wastes relating to the process.
- 3.4 Typical processes are
- Powder coating which uses organic powders
 - Sherardizing, which uses zinc powder
 - Vitreous enamelling (sometimes known as porcelain enamelling), which uses glass powders

Sherardizing

- 3.5 **Sherardizing** is the coating of iron or steel with zinc/iron alloy. Items are slowly rotated in the presence of zinc dust, and an inert operating medium, for a few hours at temperatures of 320-500°C, often about 385°C. The zinc dust can pass through a 75micron sieve.
- 3.6 There is a 'triviality' exemption from Part C control. The following questions might be useful to regulators when considering whether a sherardizing activity is exempt. A positive answer to all of the following questions tends to support exemption.
- Is the fuel natural gas or electricity?
 - Are only products of combustion vented externally?
 - If there is any acid pre-treatment, is it at ambient temperature?
 - Are there no justifiable air pollution complaints against the sherardizing activity within the last two years or so?
- 3.7 Sherardizing can consist of the following steps
- Pre-treatment can be acid pickling at ambient or raised temperatures
 - Coffins (the production vessels) are:
 - charged with the items to be coated, recycled sand and dust, fresh zinc/ alloy dust
 - indirectly heated, rotated and the products of combustion vented externally
 - unloaded and the product is separated from the sand and residual zinc dust on a shaking table. The table has extraction to control particulate matter which may vent back into the workplace after filtration
 - Sand and dust are recycled
- 3.8 **Mechanical Plating** (mechanical galvanising) is similar to sherardizing except that the process is carried out at room temperature.
- 3.9 There is a 'triviality' exemption from Part C control. The following questions might be useful to regulators when considering whether a mechanical plating activity is exempt. A positive answer to all of the following questions tends to support exemption.
- Is nothing vented externally?

- If there is any acid pre-treatment, is it at ambient temperature?
- Are there no justifiable air pollution complaints against the mechanical plating activity within the last two years or so

Vitreous Enamel

- 3.10 **Vitreous enamel** (called porcelain enamel in the USA) is a glass like coating fused, usually to metal. It can be applied as a powder or mixed with water (if it is applied wet then this note is not relevant see paragraph 1.13). Usually two coats are applied and then fired once between 750 - 860°C. On aluminium/silicon coated steel (ALUSI) only one coat is required.
- 3.11 Vitreous enamel products include white goods, and, at a smaller scale of operation, London Underground signs, industrial parts, jewellery and craft items.
- 3.12 A much fuller process description 'Powder Coater's Manual' is available on the web at www.coatings.de/pcmanual.cfm.

Powder Coating

- 3.13 **Powder coating** systems using organic powders can be divided into thermosetting which react chemically once heated, and thermoplastic which melt each time they are heated. UV (ultraviolet) cured powders are also available.
- 3.14 Thermoplastic powder coating systems include
- Nylon
 - Vinyls including PVC, PVDF (Polyvinylidene fluoride)
 - Polyolefines eg polyethylene, polypropylene
 - Polyesters
- 3.15 Thermosetting powder coating systems include
- Polyester, (various cross linkers)
 - Epoxy
 - Acrylic
 - Hybrids
- 3.16 Powder coating substrates include; metals, wood including reconstituted wood, ceramics and plastics. The range of powder coated products is wide and includes industrial, laboratory and consumer goods Examples include office and garden furniture, bicycles and cars, wooden surfaces such as kitchen units and skirting boards, white goods, and pipe and valve coatings .
- 3.17 Pretreatment of the substrate can be mechanical or chemical. Mechanical cleaning includes abrasive blasting, ultrasonic cleaning and vibratory or tumbling methods. Chemical pretreatment includes alkaline, acid (including pickling in strong acid), or neutral cleaning, and conversion (phosphating or chromating), followed by drying.
- 3.18 Application techniques for the powder include fluidized bed, and electrostatic spraying. The parts to be coated are suspended on batch carts or conveyors
- 3.19 Fluidized beds are often used for thermoplastic powders. In a conventional fluidized bed dip process, preheated parts are dipped into the fluidized powder hopper and may need a short post-cure cycle eg.4 minutes. In an electrostatic fluidized bed, the powder is charged and adheres to the part, which then needs to be cured in the oven
- 3.20 In electrostatic spray application, a spray gun imparts an electrostatic charge to the powder which is then attracted to a grounded workpiece. Powder is picked up from the feed hopper and transported by compressed air to the application gun. A generator supplies the charge on the gun. A control console allows the settings for the powder supply, the charge and the air pressure, to be controlled and monitored. The guns direct the spray pattern towards the articles being coated, which are earthed.

- 3.21 Manual guns are sometimes fed from a box to make colour changing easier. Automatic guns are usually fed from hoppers (75-125 kgs capacity). Types of automatic gun include powder bells and discs.
- 3.22 Booths contain the spraying operation (an air velocity of 0.5 to 0.75 metres per sec into booth openings is common), whilst keeping the powder concentration safely below the Lower Explosive Limit (LEL). Some booths can be moved on and off the production line. Some recover overspray for reuse.
- 3.23 The booth is provided with air extraction and this extracted air, containing overspray powder, is carried over into filters, belt, cyclones or hybrid systems where the overspray powder is collected. As a large proportion of overspray will fall to the bottom of the booth by gravity, extraction is also provided at the bottom of the booth. The overspray powder is collected, sieved and can be reused, usually by mixing with fresh powder in the feed hopper. A final or afterfilter, is fitted at the end of the air extraction system before air is discharged to outside or inside the factory. Particularly for short runs of many colours, spray-to-waste might be used, where recovered powder is not recycled.
- 3.24 The powder adheres by electrostatic forces and, coated with dry powder, the article can be transported to the oven without the powder falling off. It is then stoved and the powder is converted to a continuous film.
- 3.25 Ovens cure the coated powder by convected heat or infra-red radiation(IR). Curing time and temperature depend on the powder and substrate but broadly are within the range of 120-230°C. Temperatures throughout the oven are expected to be within $\pm 6^{\circ}\text{C}$ of the set point.
- 3.26 Oven flues discharge products of combustion above the factory roof.

4 Potential releases

- 4.1 The key emissions from these processes/activities that constitute pollution for the purposes of the Industrial Pollution Control (NI) Order or the Pollution Prevention and Control Regulations (NI) 2003 and therefore warrant control are those consisting of **particulate matter, hydrogen chloride** and **odour**.
- 4.2 The following parts of the organic powder process may give rise to **particulate matter**:
- Handling powder or dust and waste dusts, bags and boxes
 - Fluidized bed for applying powder
 - Spraying powder
 - Collecting, handling and preparing overspray for reuse
 - Changing colour
 - Booth cleaning
- 4.3 The following parts of the process may give rise to **particulate matter including lead chromate**:
- Abrasive treatments of products and jigs
- 4.4 The following parts of the process may give rise to **particulate matter**:
- Dry plating drums
 - Separation tables for sheradizing and mechanical plating
- 4.5 The following parts of the process may give rise to other pollutants:
- Pretreatment of metal sheet with hydrogen chloride acid may give rise to **hydrogen chloride** and **odour** emissions
 - Ovens may give rise to **odour, carbon monoxide, smoke, volatile organic compounds**
 - Cooling zones after fluidized bed applicators may give rise to **odour**
 - PVC powder coated products may give rise to **hydrogen chloride** during post-heating (ie heating after the powder application)

5 Emission limits, monitoring and other provisions

5.1 The emission limit values and provisions described in this section are achievable using the best available techniques described in [Section 6](#). Monitoring of emissions should be carried out according to the method specified in this section or by an equivalent method agreed by the regulator. (See Ref. [\(f\)](#) (M1) and Ref. [\(g\)](#) (M2))

- ▶ The reference conditions for limits in [Table 2](#) are:
 - 273K, 101.3kPa, without correction for water vapour.

Table 2: Emission limits, monitoring and other provisions

Row	Source	Substance	Emission limits / provisions	Type of monitoring	Monitoring frequency (subject to paragraph 5.12)
1	External vent	Total particulate matter	10 mg/m ³	Indicative monitoring from vents over 50m ³ /min - Audible and visual alarms, see 5.7 and 5.8 plus - Manual extractive test	Continuous Annual
2	Hydrogen chloride	Hydrochloric acid pickling plant, where emissions are contained and extracted	30 mg/m ³ as 15 minute mean concentration	Manual extractive test See 5.12	Annual
3	Hydrogen chloride	Wet arrestment plant for hydrogen chloride		As Row 2, plus - Monitor of liquor flow - Visual inspection arrestment plant and record inspection results	Continuous Once a week or more

Monitoring, investigations and recording

5.2 The need for and scope of testing, and the frequency and time of sampling depend on local circumstances, operational practice and the scale of operation. As part of proper supervision the operator will monitor emissions, make tests and inspections of the process and keep records, in particular:

- ▶ The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. The records should be:
 - kept on site
 - kept by the operator for at least two years; and
 - made available for the regulator to examine

Information required by the regulator

5.3 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.

- ▶ 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.
- ▶ The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used.
- ▶ The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling.

- ▶ Adverse results from any monitoring activity (both continuous and non-continuous) should be investigated by the operator as soon as the monitoring data has been obtained/received. The operator should:
 - identify the cause and take corrective action
 - record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify the situation
 - re-test to demonstrate compliance as soon as possible; and
 - notify the regulator

Visible and odorous emissions

- 5.4 Visible and odorous emissions should be limited and monitored as follows. Abnormal emissions require action as described in paragraph 5.6 and 5.7.
- ▶ Emissions from combustion processes should in normal operation be free from visible smoke and in any case should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.
- 5.5 All reasonably practicable steps should be taken to minimise the duration and visibility of visible emissions during start-up and shut down, and cooling of product.
- ▶ All releases to air, other than condensed water vapour, should be free from persistent visible emissions.
 - ▶ All emissions to air should be free from droplets.
 - ▶ There should be no offensive odour beyond the process boundary, as perceived by the regulator.
- 5.6 In the event of complaints, a change of process, or poorer quality of equipment, then daily visual and olfactory assessments are likely to be needed. These are less likely when indicative monitoring of oven particulate is fitted, and with accurate temperature control of ovens
- ▶ Visual and olfactory assessments of emissions should be made frequently and at least once each day whilst the process is in operation. The time, location and result of these assessments should be recorded.

Abnormal events

- 5.7 The regulator needs to be notified about certain events, whether or not there is related monitoring showing an adverse result, and 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:
 - 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 abatement plant, for example, bag filtration plant or scrubber units that vent externally

Continuous monitoring

- 5.8 Continuous indicative monitoring can be used as a management tool. In conjunction with continuous recording it identifies any trends in emissions; for example, that emissions are gradually increasing, which may indicate a need for maintenance. It can also be used with or without continuous recording to trigger an alarm when there is a sudden increase in emissions; for example, if abatement plant fails. For a given concentration of particulate the output level varies with the instrument. It should be noted that not all monitors provide a linear response to an increase in particulate matter. The monitor should be set up to provide a baseline output when the plant is known to be operating under the best possible conditions; i.e. such that emissions are fully compliant with the provisions. The instrument manufacturer should be able to set an output level which corresponds to around

75% of the emission limit, to trigger the alarms. Thus the alarms are activated in response to this significant increase in particulate loading above the baseline, so that warning of the changed state is given before an unacceptable emission occurs.

- 5.9 All new continuous monitoring equipment should be designed for less than 5% downtime over any 3-month period. Where continuous monitoring is required, it should be carried out as follows:
- ▶ All continuous monitoring readings should be on display to appropriately trained operating staff.
 - ▶ Instruments should be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction.
 - ▶ The activation of alarms should be automatically recorded.
 - ▶ All continuous monitors should be operated, maintained and calibrated (or referenced) in accordance with the manufacturers' instructions, which should be made available for inspection by the regulator. The relevant maintenance and calibration (or referencing) should be recorded.
 - ▶ Purchasers of new or replacement monitoring equipment should specify the requirement for less than 5% downtime over any 3-month period, on ordering.

Calibration and compliance monitoring

- 5.10 Calibration of quantitative instruments and compliance monitoring should meet the following provisions as appropriate:
- ▶ No result should exceed the emission concentration limits specified, except where either:
 - (a) data is obtained over at least 5 sampling hours in increments of 15 minutes or less; or
 - (b) at least 20 results are obtained where sampling time increments of more than 15 minute are involved; AND in the case of (a) or (b)
 - (c) no daily mean of all 15-minute mean emission concentrations should exceed the specified emission concentration limits during normal operation (excluding start-up and shut-down); and
 - (d) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits during normal operation (excluding start-up and shut-down).
 - ▶ Non-continuous emissions monitoring of particulate matter should be carried out according to the main procedural requirements of BS ISO 9096: 2003, with averages taken over operating periods, excluding start-up and shutdown.
 - ▶ Emissions monitoring of hydrogen chloride should be carried out in accordance with the CEN standard

- 5.11 Exhaust flow rates should be consistent with efficient capture of emissions, good operating practice and meeting the requirements of the legislation relating to the workplace environment.

Varying monitoring frequency

- ▶ The introduction of dilution air to achieve emission concentration limits should not be permitted:
- 5.12 Where non-continuous quantitative monitoring is required, the frequency may be varied. Where there is consistent compliance with emission limits, Regulators may consider reducing the frequency. When determining "consistent compliance" factors to consider include:
- (a) the variability of monitoring results, for example, results which range from 3 - 9 mg/m³, against an emission limit of 10 mg/m³ might not qualify for a reduction in monitoring.

(b) the margin between the results and the emission limit, for example, results which range from 9- 10 mg/m³ when the limit is 10 mg/m³ might not qualify for a reduction in monitoring.

Consistent compliance should be demonstrated using the results from at least;

- three or more monitoring exercises within two years; or
- two or more monitoring exercises in one year supported by continuous monitoring

Any significant process changes which might have affected the monitored emission should be taken into account.

5.13 The frequency of testing should be increased, for example, as part of the commissioning of new or substantially changed processes, or where emission levels are near to or approach the emission concentration limits.

5.14 Care is needed in the design and location of sampling systems in order to obtain representative samples. For example, BS ISO 9096:2003 calls for sampling within a straight section of flue, about 7 to 10 diameters in length.

- ▶ The operator should ensure that adequate facilities for sampling are provided on vents or ducts.
- ▶ Sampling points on new plant should be designed to comply with the British or equivalent standards.

6 Control techniques

Summary of best available techniques

6.1 The following table 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 5](#). 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 3: Summary of control techniques

Release source	Substance	Control techniques
Pretreatment with hydrochloric acid	Hydrogen chloride	Arrest if necessary
Coating removal by heat	Odour	Use purpose designed oven and arrestment (see PG2/9)
Product and jig abrasive treatment	Particulate matter	Contain, arrest if necessary
Powder handling, application,	Particulate matter	Contain, arrest if necessary
Powder overspray collection preparation and reuse		
Powder Colour change		
Heating of PVC	Hydrogen chloride	Control temperatures, if necessary contain and disperse
Dry plating drums	Particulate matter	Contain, arrest if necessary
Opening, cleaning equipment containing dry fine particles., inc arrestment plant	Particulate matter	Managed procedures
Flue gas	Smoke, carbon monoxide	Good combustion
	Sulphur oxides	Limit sulphur in fuel
	Odour, volatile organic compounds	Accurate temperature control, dispersion

Techniques to control emissions from contained sources

6.2 The control techniques described below address the sources of pollutants listed in [Table 3](#).

Particulate

- ▶ Emissions of particulate matter should be arrested if necessary to meet the emission limit.
- ▶ Abrasive blasting should be carried out in a specially designed booth and exhausts should be vented to suitable dust arrestment plant to meet the emission concentration limit specified in [Table 2](#) Row 1.

Pre-cleaning and acid pickling

- ▶ Where heated hydrochloric acid baths are used and mist or fume is emitted, emissions should be contained and vented to suitable arrestment plant, for example a scrubber, to meet the provisions of [Table 2](#) Row 2 of this note.
- ▶ Direct injection of steam into hydrochloric acid pickling baths should not be used.

Odour control 6.3 Odour emissions are minimised by good oven temperature control, acid fume control, and not using the curing oven to clean jigs.

Hydrogen chloride 6.4 Emissions of hydrogen chloride from PVC coated product, are controlled by good temperature control of post heating, not overheating at the preheat, and if necessary by containing emissions and dispersing effectively.

Techniques to control fugitive emissions

Dust and spillage control 6.5 Adequate provision to contain liquid and solid spillage is needed. Closed containers can prevent wind whipping of dusty, dry waste materials such as arising from particulate arrestment plant. therefore:

- ▶ Empty powder packaging and dusty wastes should be stored in closed containers and handled in a manner that avoids emissions.
- ▶ Cleaning of particulate matter arrestment plant, coating application plant, and extract ductwork which may contain finely divided materials, should be carried out so as to minimise emissions into the air. Such maintenance and cleaning outside of buildings needs particular care.
- ▶ Cleaning of powder application booths (eg during colour changes) should be carried out with the booth extract and arrestment kept running.
- ▶ 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.
- ▶ A high standard of housekeeping should be maintained.

6.6 If necessary, then

- ▶ Fume from the cooling zones after fluidized bed coaters should be captured and arrested.

Air quality

Ambient air quality management

6.7 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 Part C process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the emission limit that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BATNEEC/BAT to meet it. Decisions should be taken in the context of a district council's Local Air Quality Management action plan. For example, where a Part C process is only responsible to a very small extent for an air quality problem, the council should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. More guidance on this is provided in the revised Local Air Quality Management Technical Guidance, LAQM. TG (03) and in the Environment (NI) Order 2002 Local Air Quality Management Policy Guidance. Both of these documents are available from the Environment and Heritage Service website www.ehsni.gov.uk.

Dispersion and dilution 6.8 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1) See Ref. (e). The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure. It is necessary that the assessment also take into account the relevant air quality standards that apply for the emitted pollutants.

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. D1 relies upon the unimpeded vertical emission of the pollutant. A cap or other restriction over the stack impedes the vertical emission and hinders dispersion. For this reason where dispersion is required such flow impeding devices should not be used. A cone may sometimes be useful to increase the exit velocity and achieve greater dispersion.

Revised stack height calculations should not be required unless it is considered necessary because of a breach or serious risk of breach of an EC Directive limit value and because it is clear from the detailed review and assessment work that the Part B process itself is a significant contributor to the problem.

An operator may choose to meet tighter emission limits in order to reduce the required stack height.

Stacks, vents and process exhausts

- 6.9 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. Stacks and ductwork should be leakproof.
- 6.10 The dispersion from all stacks and vents can be impaired by low exit velocity at the point of discharge, or deflection of the discharge. Unacceptable emissions of droplets could possibly occur from wet arrestment plant where the linear velocity within the associated ductwork exceeds 9 m/sec. The use of mist eliminators reduces the potential for droplet emissions.
- ▶ Where a linear velocity of 9 m/sec is exceeded in the ductwork of existing wet arrestment plant, it should be reduced to the extent that is practicable to ensure that droplet fallout does not occur.
 - ▶ Flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.
 - ▶ Exhaust gases discharged through a stack or vent should achieve an exit velocity which is normally greater than 15 m/sec during normal operating conditions to achieve adequate dispersion. A lower velocity may be acceptable provided it achieves adequate dispersion and dilution in accordance with paragraph 6.8 above.
 - ▶ Stacks or vents should not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

Management techniques

- 6.11 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
 - it is good practice to ensure that spares and consumables are available at short notice in order to rectify breakdowns 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.

- ▶ Spares and consumables - in particular, those subject to continual wear - should be held on site, or should be available at short notice from guaranteed local suppliers, so that plant breakdowns can be rectified rapidly.

Appropriate management systems

- 6.12 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. It is therefore desirable that processes 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.

Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. While authorities may wish to encourage wider adoption of EMS, it is outside the legal scope of an LAPC authorisation/LA-PPC permit to require an EMS for purposes other than LAPC/LA-PPC compliance. For further information/advice on EMS refer to EMS Additional Information in [Section 8](#).

Training

- 6.13 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.

- ▶ Training of all staff with responsibility for operating the process should include:
 - awareness of their responsibilities under the permit, in particular, how to deal with conditions likely to give rise to dust emissions, such as the event of spillage
 - minimising emissions on start up and shut down
 - action to minimise emissions during abnormal conditions
- ▶ The operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request.

Maintenance

- 6.14 Effective preventative maintenance should be employed on all aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air. In particular:
- ▶ A written maintenance programme should be provided to the regulator with respect to pollution control equipment; and
 - ▶ A record of such maintenance should be made available for inspection.

7 Summary of changes

Reasons for the main changes are summarised below.

Table 4: Summary of changes

Section and paragraph	Change	Reason	Comment
Emission limits, monitoring and other provisions			
Table 2 Rows 2 and 3	30mg/m ³ for HCl arrestment plant No limit if arrestment plant not needed	BAT	1- Tighter limit achievable 2- but not needed when HCl emissions do not need containment and arrestment
Paragraph 6.4 Bullet 1	Additional guidance re product cooling zones for fluidized bed coaters	BAT	

8 Definitions and further information

This guidance	Process Guidance Note NIPG 6/31 (Version 2)
Previous guidance	Process Guidance Note NIPG 6/31 (Version 1)
LAPC	explained in the Introduction of this guidance
LAPPC	explained in the Introduction of this guidance
Permit	the written permission to operate an installation prescribed for LAPPC – (the replacement for authorisation under LAPC)
Authorisation	the written authority to operate a process prescribed for LAPC - (will be replaced by permit under LAPPC)
Existing process	should be taken to have the following meaning: <ul style="list-style-type: none">• a process which was being carried on at some time in the 12 months immediately preceding the first day of the month following publication of this guidance note• a process which is to be carried on at a works, plant or factory or by means of mobile plant which was under construction or in the course of manufacture or in the course of commission on the first day of the month following publication of this guidance note, or the construction or supply of which was the subject of a contract entered into before that date
New process	not an existing process.
Installation	should be interpreted in accordance with the guidance contained in the the General Guidance Manual on Policy and Procedures for Part C installations.
Process	the term "process" has been used in this guidance note to refer to both "processes" under the Industrial Pollution Control (NI) Order 1997 and "installations" under the Environment (NI) Order 2002.

Health and safety

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

- requirements of a permit or authorisation should not put at risk the health, safety or welfare of people at work
- equally, the permit or authorisation 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 Industrial Pollution Control (NI) Order 1997 or the Environment (NI) Order 2002 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

EMS additional information

Further information/advice on EMS may be found from the following:

- Envirowise at www.envirowise.gov.uk and www.energy-efficiency.gov.uk and Environment and Energy Helpline freephone 0800 585794
- ISO 14001 www.bsi.org.uk or telephone BSI information centre (020 8966 7022)
- EU Eco Management and Audit Scheme (EMAS) www.emas.co.uk or telephone the Institute of Environmental Management and Assessment (01522 540069)

Regulators and process operators may also like to be aware of:

BS 8555: a new standard to help SMEs implement an EMS, by offering a five-phase approach, is contained in BS 8555 which was published in 2003 following on from work undertaken by the Acorn Trust. The Institute of Environmental Management and Assessment, which has taken over the Trust's activities, is developing a scheme of accredited recognition for companies achieving different phases of BS 8555. BS 8555 can be used to achieve ISO 14001 and registration to the higher standard, EMAS.

Some of the **High Street banks**, such as NatWest and the Coop, now offer preferential loan rates to organisations that can demonstrate they are committed to improving their environmental performance. The NatWest also produce a self help guide for SMEs, 'The Better Business Pack', focusing on waste, utilities, transport and supply chain issues. It gives tools, guidance and examples. Contact: WWF-UK on 01483 426444.

References

- (a) The Department's guide on LAPPC "General Guidance Manual on Policy and Procedures for Part C Installations", September 2003- available from the Department at www.doeni.gov.uk/epd.
- (b) Scottish Executive Guidance: The Practical Guide for Part B Activities Issue 1 - available from the SEPA web-site. www.sepa.org.uk/pdf/ppc/guidance/practical_guide_part_b_activities.pdf
- (c) Section 10 of NIGG2 "Authorisations" (issued March 1998) provides further advice on the assessment of odour.
- (d) Current air quality objectives are specified in: The Air Quality (NI) Regulations 2003 (2003 No 342)
- (e) HMIP Technical Guidance Note D1: "Guidelines on Discharge Stack Heights for Polluting Emissions", published by The Stationery Office, ISBN 0-11-752794-7.
- (f) M1 Sampling requirements for monitoring stack emissions to air from industrial installations, Environment Agency July 2002 ([EA website](#))
- (g) M2 Monitoring of stack emissions to air. Environment Agency May 2003 ([EA website](#))
- (h) BS 2742:1969: "Notes on the use of Ringelmann and miniature smoke charts".
- (i) A Powder Coater's Manual by Roger Talbert publ Curt R. Vincentz Publishing, Hannover, Germany, 159euros, or free to download at www.coatings.de/pcmanual.cfm
- (j) BCF Code of Safe Practice: Powder Coating HS 004 August 2002 published by British Coatings Federation (www.coatings.org.uk)

Web addresses

Web-site of the Department's Environmental Policy Division: www.doeni.gov.uk/epd

Web-site of the Department's Environment and Heritage Service: www.ehsni.gov.uk/

Energy saving and environmental management measures can increase industry profits. Envirowise (formerly E.T.B.P.P.) show how at www.envirowise.gov.uk (or freephone 0800 585 794)

Appendix 1: Extract from LAPC regulations

DEFINITION OF COATING PROCESSES IN SCHEDULE 1 OF THE INDUSTRIAL POLLUTION CONTROL (PRESCRIBED PROCESSES AND SUBSTANCES) REGULATIONS (NI) 1998

(The processes for district council air pollution control are listed under "Part C". The "Part A" and "B" processes are for Chief Inspector control.)

Section 6.5 Coating processes and printing

PART A

(a) The application or removal of a coating material containing one or more tributyltin compounds or triphenyltin compounds, if carried out at a shipyard or boatyard where vessels of a length of 25 metres or more can be built or maintained or repaired.

(b) The treatment of textiles if the process may result in the release into water of any substance described in Schedule 5 in a quantity which in any 12 month period exceeds the background quantity by more than the amount specified in relation to the description of the substance in column 2 of Schedule 5.

PART B

Processes, not described elsewhere in the Schedule, other than for the repainting or respraying of or of parts of road vehicles, involving:-

(a) the repainting or respraying of or of parts of aircraft or railway vehicles; or

(b) the application to a substrate of, or the drying or curing after such application of, printing ink or paint or any other coating material as, or in the course of, a manufacturing process;

where the carrying on of the process by the person concerned at the location in question may result in the release into the air of particulate matter or of any volatile organic compounds and is likely to involve the use in any 12 month period of -

(i) 400 tonnes or more applied in solid form of any printing ink, paint or other coating material; or

(ii) 400 tonnes or more of any metal coatings which are sprayed on in molten form; or

(iii) 200 tonnes or more of organic solvents.

PART C

Processes, not described elsewhere in the Schedule, other than for the repainting or respraying of or of parts of road vehicles, involving:-

- (a) the repainting or respraying of or of parts of aircraft or railway vehicles; or
- (b) the application to a substrate of, or the drying or curing after such applications of, printing ink or paint or any other coating material as, or in the course of, a manufacturing process;

where the carrying on of the process by the person concerned at the location in question may result in the release into the air of particulate matter or of any volatile organic compounds and is likely to involve the use in any 12 month period of -

- (i) greater than 20 tonnes but less than 400 tonnes applied in solid form of any printing ink, paint or other coating material;
- (ii) greater than 20 tonnes but less than 400 tonnes of any metal coatings which are sprayed on in molten form; or
- (iii) greater than 25 tonnes but less than 200 tonnes of organic solvents in respect of any cold set web offset printing process or any sheet fed offset litho printing process, or in respect of any other process, greater than 5 tonnes but less than 200 tonnes of organic solvents.

Any process for the repainting or respraying of or of parts of road vehicles if the process may result in the release into the air of particulate matter or of any volatile organic compound and the carrying on of the process by the person concerned at the location in question is likely to involve the use of 1 tonne or more of organic solvents in any 12 month period.

In this section

"aircraft" includes glider and missile;

"coating material" includes paint, printing ink, varnish, lacquer, dye, any metal oxide coating, any adhesive coating, any elastomer coating, any metal or plastic coating and any other coating material;

The amount of organic solvents used in a process shall be calculated as -

- (a) the total input of organic solvents into the process, including both solvents contained in coating materials and solvents used for cleaning or other purposes; less
- (b) any organic solvents that are removed from the process for re-use or for recovery for re-use.

Appendix 2: Extract from LAPPC regulations

DEFINITION OF COATING ACTIVITIES, PRINTING AND TEXTILE TREATMENTS IN SCHEDULE 1 TO THE POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003, 2003 No 46*.

(The processes for district council air pollution prevention and control are listed under "Part C". The "Part A" and Part "B" processes are for Chief Inspector control.)

SECTION 6.4

COATING ACTIVITIES, PRINTING AND TEXTILE TREATMENTS

Part A

(a) Applying or removing a coating material containing any tributyltin compound or triphenyltin compound, if carried out at a shipyard or boatyard where vessels of a length of 25 metres or more can be built, maintained or repaired.

(b) Pre-treating (by operations such as washing, bleaching or mercerization) or dyeing fibres or textiles in plant with a treatment capacity of more than 10 tonnes per day.

(c) Treating textiles if the activity may result in the release into water of any substance listed in paragraph 13 of Part 2 of this Schedule in a quantity which, in any period of 12 months, is greater than the background quantity by more than the amount specified in that paragraph in relation to that substance.

(d) Surface treating substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, in plant with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year.

Part B

Unless falling within Part A of this Section or paragraph (g) of Part A of Section 2.1, any activity (other than for the repainting or re-spraying of or of parts of road vehicles), involving -

(a) The repainting or respraying of or of parts of aircraft or railway vehicles; or

(b) The application to a substrate of, or the drying or curing after such applications of, printing ink or paint or any other coating material as, or in the course of, a manufacturing activity;

where the carrying on of the activity may result in the release into the air of particulate matter or of any volatile organic compound and is likely to involve the use in any period of 12 months of -

(i) 400 tonnes or more of printing ink, paint or other coating material which is applied in solid form;

(ii) 400 tonnes or more of any metal coating which is sprayed on in molten form;

Part C

(a) Unless falling within Part A or Part B of this Section or paragraph (g) of Part A of Section 2.1, any process (other than for the repainting or re-spraying of or of parts of aircraft or road or railway vehicles) for applying to a substrate, or drying or curing after such application, printing ink or paint or any other coating material as, or in the course of, a manufacturing activity, where the process may result in the release into the air of particulate matter or of any volatile organic compound and is likely to involve the use in any period of 12 months of -

- (i) 20 tonnes or more of printing ink, paint or other coating material which is applied in solid form;
- (ii) 20 tonnes or more of any metal coating which is sprayed on in molten form;
- (iii) 25 tonnes or more of organic solvents in respect of any cold set web offset printing activity or any sheet fed offset litho printing activity;
- (iv) 5 tonnes or more of organic solvents in respect of any activity not mentioned in subparagraph (iii).

(b) Unless falling within Part A of this Section, repainting or re-spraying road vehicles or parts of them if the activity may result in the release into the air of particulate matter or of any volatile organic compound and the carrying on of the activity is likely to involve the use of 1 tonne or more of organic solvents in any period of 12 months.

(c) Repainting or re-spraying aircraft or railway vehicles or parts of them if the activity may result in the release into the air of particulate matter or of any volatile organic compound and the carrying out of the activity is likely to involve the use in any period of 12 months of -

- (i) 20 tonnes or more of any paint or other coating material which is applied in solid form;
- (ii) 20 tonnes or more of any metal coatings which are sprayed on in molten form; or
- (iii) 5 tonnes or more of organic solvents.

Interpretation of Parts B and C

1. In this Part -

"aircraft" includes gliders and missiles;

"coating material" means paint, printing ink, varnish, lacquer, dye, any metal oxide coating, any adhesive coating, any elastomer coating, any metal or plastic coating and any other coating material.

2. The amount of organic solvents used in an activity shall be calculated as -

(a) the total input of organic solvents into the process, including both solvents contained in coating materials and solvents used for cleaning or other purposes; less

(b) any organic solvents that are removed from the process for re-use or for recovery for re-use.

*Every effort has been taken to ensure that this Appendix is correct at the date of issue of this Note, but readers should note that the Regulations are likely to be subject to periodic amendment, and this Appendix should not therefore be relied upon as representing the up-to-date position after the issue date.

Appendix 3: Process Guidance Notes for Wet Coatings and Molten Metal Coatings

NIPG2/9 (Version 2) Metal Decontamination Processes

NIPG6/7 (Version 2) Coating of Metal Packaging

NIPG6/8 (Version 2) Textile and Fabric Coating

NIPG6/13 (Version 2) Coil Coating

NIPG6/14 (Version 2) Film Coating

NIPG6/15 (Version 2) Coating in Drum Manufacturing and Reconditioning

NIPG6/17 (Version 2) Printing of Flexible Packaging

NIPG6/18 (Version 2) Paper Coating

NIPG6/20 (Version 2) Paint Application in Vehicle Manufacturing

NIPG6/23 (Version 3) Coating of Metal and Plastic

NIPG6/33 (Version 2) Wood Coating

NIPG6/34 (Version 2) Respraying of Road Vehicles

NIPG6/35 (Version 2) Metal and Other Thermal Spraying Processes

NIPG6/40 (Version 2) Coating and Recoating of Aircraft and Aircraft Components

NIPG6/41 (Version 2) Coating and Recoating of Rail Vehicles

NIPG6/45 (Version 1) Surface Cleaning