ENVIRONMENT AND HERITAGE SERVICE

GUIDANCE FOR PROCESSES PRESCRIBED FOR AIR POLLUTION CONTROL BY THE CHIEF INDUSTRIAL POLLUTION INSPECTOR

CHIEF INSPECTOR'S GUIDANCE
TO INSPECTORS
(PART B PROCESSES)

GLASS MANUFACTURING PROCESSES
(EXCLUDING LEAD GLASS)

B PROCESS GUIDANCE NOTE - GNB 3/4 VERSION 1

DATE OF ISSUE: MARCH 1998

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1. INTRODUCTION

This Note is issued by the Chief Industrial Pollution Inspector as one of a series providing guidance for processes prescribed for Air Pollution Control (APC) by the Chief Inspector in Regulations made under the Industrial Pollution Control (Northern Ireland) Order 1997.

A further series of Notes is produced by the Department of the Environment (NI) for those processes prescribed for air pollution and subject to regulations by the District Councils.

This Note provides a guide on standards and techniques to Inspectors in their assessment of an application for, or variation of, an APC authorisation under the Order.

This Note will also be of interest to operators of such processes, however it should be understood that whether an authorisation is granted, and on what conditions, will depend on the particular circumstances of each application. Parameters such as individual process characteristics and site location may influence the nature of the conditions that are included in an authorisation.

A key objective of the legislation is to ensure that, in carrying on a prescribed process, the best available techniques not entailing excessive cost (BATNEEC) will be used -

(i) for preventing the release of prescribed substances into the air or, where that is not practicable by such means, for reducing the release of such substances to a minimum and for rendering harmless any such substances which are so released; and

(ii) for rendering harmless any other substance which might cause harm if released into the air.

This Note comprises guidance in relation to new and existing processes and is based on an assessment of best available techniques as qualified by the requirement not to entail excessive cost. (The definition and meaning of BATNEEC is contained in the Industrial Pollution Control Part A and B processes "A Practical Guide".)

The guidance contained in this Note is based on the current state of knowledge and understanding of these processes, their potential impact on the environment, and the available control techniques at the time of publication. The guidance note will be updated regularly, (as a minimum the Note will be reviewed at not more than four yearly intervals from the date of publication), to reflect changes in knowledge and understanding. It will not always be possible to revise the Notes quickly enough to keep in absolute step with rapid changes. It is therefore recommended that operators and their advisors check with the Inspectorate as to whether there have been any changes before relying on this Note for the purpose of making an application or taking other significant action under the Order.

2. PROCESS DEFINITION

2.1 This Note applies to glass manufacturing processes for soda-lime-silica glass, or other glass, but not lead glass with a design capacity of 5,000 tonnes or more per year as described in Schedule 1 - Section 3.5, Part B of the Industrial Pollution Control Order (Prescribed Processes and Substances) Regulations (Northern Ireland) 1998. A separate Note GNB 3/5 has been produced to cover lead glass and frit processes.

2.2 In the context of this Note "process" comprises the whole process including the treating, handling and storage of any materials used in the process as well as products and wastes produced by the process.

3. GENERAL REQUIREMENTS

3.1 New processes must comply with the standards contained in this Note immediately.

3.2 It should be the aim to bring existing processes up to current standards whenever the opportunity arises. Account should be taken of the plant's technical characteristics; its rate of utilisation and the length of its remaining life; the nature and amount of polluting emissions from it and the desirability of not entailing excessive costs for the plant concerned.

3.3 As part of first application for authorisation of existing processes, those means of the process that require upgrading to achieve the standards of this Note should be identified and the possible techniques which are to be employed indicated. Under normal circumstances, a detailed programme for upgrading, including timetable, should be submitted with the application.

3.4 Existing processes should be upgraded with the aim of attaining the standards quoted in this Note by no later than 31 December 2001.

4. RELEASES INTO AIR

4.1 Reference Conditions

All pollutant concentrations from contained releases should be expressed at reference conditions of temperature 273K (0°C) and pressure 101.3 kPa (1 atmosphere) without correction for water vapour content. The concentration of pollutants in furnace emissions should be normalised to 8% oxygen content dry.

Where oxygen is monitored continuously in-situ, a conversion to dry basis should be submitted, using a factor agreed with the Inspectorate based on the calculated water content of the waste gases.

Where the combustion air is enriched with oxygen, correction to 8% oxygen may not be appropriate.

In the case of some smaller furnaces, correction to 8% oxygen will not be appropriate. Examples include muffle melters and melters with open-door batch filling. In these circumstances, the concentration of pollutants in the exhaust gas may be reported without correction for oxygen content.

4.2 **Emission Targets**

4.2.1 All releases, other than steam or water vapour, should be colourless, free from persistent mist or fume and free from droplets. All contained releases should be free from visible particulate matter.

4.2.2 The aim should be that all releases are free of offensive odours outside the process site boundary, as perceived by the Inspectorate.

4.2.3 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 Standards BS 2742:1969.

4.2.4 The introduction of dilution air to achieve the emission standards in this Note should not be permitted. Exhaust flow rates should be consistent with efficient capture of emissions and good operating practice.

4.2.5 For all processes the following emission standards should apply:-

	Where the mass emission exceeds (kg/hr)	**The concentration should not exceed (mg/m^3)**
Oxides of Sulphur (expressed as SO_2)		
- gas fired	5	750
- oil fired	5	1750
Oxides of Nitrogen (expressed as NO_2)	5	2700[1]
Fluoride (expressed as HF)	0.05	5[2]
Chloride (expressed as HC1)	0.3	50[3]
Bromide (expressed as HBr)	0.3	50[4]
Total Particulate	0.5	100

Notes

1. For the manufacture of glasses using nitrates in the raw materials, the concentration should not exceed 5400 mg/m^3.
2. For the manufacture of fluoride-opal glass, the concentration should not exceed 20 mg/m^3.
3. For the manufacture of glass using chlorides in the raw materials, the concentration should not exceed 100 mg/m^3.
4. This concentration should only be applied where bromides are used as raw materials.

4.2.6 In situations where emission standards expressed in terms of concentrations of pollutants in the exhaust gases are not appropriate, emissions may be expressed in terms of mass per unit of production. These circumstances are likely to arise where process changes are designed to reduce the waste gas volume, (for example, the enrichment of combustion air with oxygen and electrical melting). The necessary conversion factor will vary according to the type of glass and furnace and should be determined for each process individually to give a mass emission which is no less stringent than the relevant concentration outlined in par. 4.2.5.

4.2.7 The concentration of particulate in the emissions to the air from the handling of solid materials used in or produced by the process should not exceed 100 mg/m^3 without correction for oxygen content. This standard has been set taking account of the reference test method in par. 7.2.11 which is used to verify compliance.

5. RELEASE ROUTES

The principal release routes to air are as follows:-

Pollutant	**Source**
Oxides of Sulphur	Furnace emissions
Oxides of Nitrogen	Furnace emissions
Fluorides	Materials handling, furnace emissions
Chlorides	Materials handling, furnace emissions
Bromides	Materials handling, furnace emissions
Total Particulate	Materials handling, furnace emissions

6. TECHNIQUES FOR RELEASE MINIMISATION

6.1 Introduction

The techniques selected need to include releases from raw materials reception/storage, internal transportation, and from processing.

The process should be designed and operated in such a way that the substances released have the minimum impact on the environment. As a general principal the Inspectorate should be looking for evidence of the prevention, minimisation and rendering harmless of all releases of prescribed substances, and the rendering harmless of all other releases in the application, and requiring this in the authorisation.

Releases from the process may require a combination of several abatement techniques and the careful control of the process route taken in order to deal with the releases. The applicant should review all the options that are available and demonstrate that the combination of primary process and selected abatement equipment represents BATNEEC.

6.2 Techniques

6.2.1 Materials Handling

6.2.1.1 The aim should be to eliminate visible dust emissions from materials handling operations.

6.2.1.2 Fume and dust emitted from processing stages such as the use of release agents, coating/surface modification, break up dust, should be collected efficiently and ducted to suitable arrestment plant where necessary in order to meet the required standards. Operating procedures should be agreed with the Inspectorate.

6.2.1.3 The receipt, handling and storage of liquid fuel should be carried out so as to prevent nuisance from the emission of offensive vapours or gases to the air.

6.2.1.4 Bulk storage tanks should be fitted with a high level alarm or volume indicator to warn of, and thereby prevent, overfilling.

6.2.1.5 Above-ground bulk chemical and fuel storage tanks should be completely contained by bunding which is impervious and resistant to the fuels and chemicals in storage and capable of holding 110% of the capacity of the largest storage tank.

6.2.1.6 Stocks of dusty materials should be stored in purpose-built silos or undercover so as to prevent wind whipping, and loading to and from stock piles should be carried out so as to minimise emissions to the air.

6.2.1.7 Storage silos for dusty materials should be vented to air through suitable arrestment equipment, for example fabric filters, as agreed with the Inspectorate.

6.2.1.8 The transportation and handling of dusty materials should be carried out by methods which minimise emissions to the air, such as use of less dust-prone forms (slurries, pellets etc.), pipeline conveyance, and minimising drop heights. External above-ground conveyors for dusty materials should be fitted with protection against wind whipping: for example, side boards or enclosure. Transfer points should be totally enclosed and ducted to suitable arrestment equipment.

6.2.2 **General Operations**

6.2.2.1 Effective control of emissions requires the maintenance and proper use of equipment, as well as prudent supervision of process operations. Effective preventive maintenance should be employed on all plant and the equipment concerned with the control of emissions to the air. Essential spares and consumables should be held on site or available at short notice.

6.2.2.2 Any malfunction or breakdown leading to abnormal emissions should be dealt with promptly and process operations adjusted until normal operations can be restored. The Inspectorate should be informed without delay. All such malfunctions should be recorded in a log book, retained by the operator for a minimum of 4 years and available for examination by the Inspectorate.

6.2.2.3 Staff at all levels should receive the necessary formal training and instruction in their duties relating to control of the process and emissions to air. Particular emphasis should be given to training for start-up, shut down and abnormal conditions.

6.2.2.4 A high standard of housekeeping should be maintained.

6.2.3 **Dispersion from Chimneys and Vents**

6.2.3.1 The applicant will need to satisfy the Inspector than an appropriate assessment of vent and chimney heights has been made. This should provide adequate dispersion of odorous or prescribed substances, and other substances that might cause harm which cannot be prevented and may be released. Some guidance is given in Technical Guidance Note D1 (ISBN 0-11-752794-7).

6.2.3.2 It may be necessary for dispersion modelling to be carried out which takes into account local meteorological data, local structures and topography, as well as other local releases (for example sites with any large volume emission, significant non-combustion sources or multiple release points and sites where there are sensitive receptors nearby).

6.2.3.3 Applicants should provide clear information on the parameters used and the assumptions made in their assessment, especially when using dispersion models. The assessment of background concentrations of pollutants will be particularly relevant. Statutory air quality standards and other recognised criteria should be taken into account.

6.2.3.4 Process upsets or equipment failure giving rise to abnormally high release levels over short periods should be assessed. Even if a very low probability of occurrence can be demonstrated by the applicant, a value for the chimney or vent height should nevertheless be set to avoid any serious damage to health in such circumstances.

6.2.3.5 The Operator should have procedures in place to reduce load or shut-down plant in the event of inadequate dispersion conditions.

6.2.3.6 Chimneys or process vents should be designed to provide efflux velocities that meet the requirements for stack aerodynamic downwash as described in Technical Guidance Note D1. Care should be taken to avoid generating positive pressure zones within the chimney unless the chimney wall is impervious or lined. Where a wet method of arrestment is used, the linear velocity within the arrestment equipment should not exceed 9 m/sec, to avoid entrainment of droplets.

6.2.3.7 Chimney flues, process vents and all ductwork should be leakproof. Chimney flues and ductwork leading to the chimney should be adequately insulated to minimise the cooling of waste gases and prevent liquid condensation on internal surfaces. Chimney flues and ductwork should be regularly cleaned to prevent accumulation of material.

6.2.3.8 Chimney or process vents should not be fitted with any restriction at the final opening, (for example, a plate, cap or cowl) where it is necessary to achieve a dispersion of the residual pollutants, except for a cone to meet the efflux velocity requirements of par. 6.2.3.6. The discharge should be vertically upwards.

7. COMPLIANCE MONITORING PROGRAMME

7.1 General

Conditions in the authorisation should require the results of all monitoring to be recorded. It should further distinguish between:

- compliance records;
- measurement or records for which regular formal returns to the Inspectorate are not normally required; and
- operational records made by the operator during the normal course of operating the process.

7.2 Monitoring Requirements

7.2.1 As part of proper supervision the operator should monitor emissions and make tests and inspections of the process. The need for and scope of testing and the frequency in time of sampling, will depend on local circumstances and operational practice, as well as the scale of operation.

7.2.2 Emissions should be continuously monitored where practicable for oxides of nitrogen and particulate matter where the mass emission exceeds the levels in par. 4.2.5. Particulate matter should be continuously monitored by optical density measurement or particulate impingement techniques. Oxides of nitrogen should be continuously monitored by infra red or chemiluminescence technique. All

monitoring readings should normally be immediately displayed to operating staff, within the characteristics of the instruments, but for recording purposes should be computed as averages on time periods agreed with the Inspectorate. Emission monitor readings should be observed regularly. The instruments should be checked daily and calibrated at least annually.

7.2.3 Where continuous monitoring is undertaken:

(a) no more than 5% of all 15-minute mean emission concentrations should exceed the specified emission concentration limits, and

(b) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits.

Compliance with this requirement should be demonstrated on a daily basis. Continuous emission charts and records should be retained for a minimum of 4 years and available for examination by the Inspectorate.

7.2.4 In some circumstances emissions may be readily calculable, (for example in the case of oxides of sulphur oxides their concentrations may be established by analysis of the fuel and raw materials). This matter should be discussed with the Inspectorate to determine the frequency and specification for such analysis. In any event quantitative tests should be carried out at least on an annual basis.

7.2.5 For nitrogen oxides, as an alternative to monitoring both nitric oxide and nitrogen dioxide, the total NOx emission may be determined by monitoring for nitric oxide alone and adding an increment, agreed with the Inspectorate, to represent the proportion of nitrogen dioxide, for glass furnace processes. Nitrogen dioxide usually makes up around 5% of the total emission of nitrogen oxides.

7.2.6 Depending on the nature of the emissions, the measurement of the other pollutants may be required.

7.2.7 The frequency of testing should be increased as part of commissioning new or substantially changed processes, where there is a justifiable complaint situation, or where emission levels are near to or approach the emission standards.

7.2.8 Visual assessments of emissions should be made frequently, and at least once a day. Remedial action should be taken immediately in the case of abnormal emissions.

7.2.9 The results of all monitoring and inspections should be recorded in the log book. Adverse results should be investigated immediately and in all cases should be recorded in the log book. The operator should ensure that the cause has been identified and corrective action taken, and this action recorded in the log book.

7.2.10 The results of all non-continuous emission testing should be forwarded to the Inspectorate within 8 weeks of the completion of the sampling. The Inspectorate should be advised at least 7 days in advance of any periodic monitoring exercise to determine compliance with emission standards as well as the provisional time and date of monitoring, pollutants to be tested and the methods to be used.

7.2.11 The reference test method for particulate emissions is BS 3405: 1983. An alternative method of testing is acceptable by agreement with the Inspectorate, provided that it can be shown that results comparable with this method are obtained.

7.2.12 The onus is on the operator, that the appropriate equipment, laboratory facilities, expertise and quality control procedures are provided to ensure accurate results.

7.2.13 The sampling positions for all monitoring instruments should be agreed with the Inspectorate. Care is needed in the design and location of sampling systems to obtain representative samples.

7.2.14 All furnaces should be equipped with a temperature recorded and an audible high temperature alarm.

7.3 Environmental Monitoring

The impact of the process on the environment will be affected by the size of the releases and the sites location. The need for environmental monitoring should be addressed in the application, where necessary, to demonstrate that the releases have been adequately rendered harmless by the application of BATNEEC.