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)

LEAD GLASS AND FRIT PROCESSES INCLUDING PROCESSES FOR THE POLISHING OF GLASS USING HF

B PROCESS GUIDANCE NOTE - GNB 3/5 VERSION 1

DATE OF ISSUE: MARCH 1998

CONTENTS

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 control and subject to regulation 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 substances 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 will be updated regularly, (as a minimum the Note will be reviewed at not mote 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 lead glass, glass frit, enamel frit processes or where the process includes the polishing or etching of glass using hydrofluoric acid 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 3/4 has been produced for manufacture of glass.

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 these Notes 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 concentrations of pollutants in furnace emissions should be corrected to 8% oxygen content measured dry for continuous lead glass furnaces and to 13% oxygen content measured dry for pot furnaces.

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

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

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 emissions should be free from visible particulate matter.

4.2.2 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.

4.2.3 The aim should be that releases are free from offensive odour outside the process site boundary, as perceived by the Inspectorate.

4.2.4 For all furnaces where the mass emission of lead exceeds 25 g/hour, the emission standard for lead is 5 mg/m^3 averaged over the production cycle. The production cycle should be taken to be the time between filling and emptying the furnace.

4.2.5 Where fumes or dust from batch mixing and charging operations involving red lead oxide are collected by secondary extraction, the extraction should be ducted to arrestment plant. The concentration in emissions to air from such arrestment plant should not exceed 2 mg/m^3 of lead. In cases of special difficulty, a standard of 5 mg/m^3 of lead may be appropriate. Cases of special difficulty could arise, for example, where the proportion of lead in the extracted particulate matter is high, or a

large proportion of the lead particles are small, in relation to arrestment plant efficiency and minimum particle size retention.

4.2.6 For all lead glass and frit manufacturing processes, the following emission levels should apply:-

	Where the mass emission from any furnace exceeds (kg/hr)	**The concentration should not exceed (mg/m^3)**
Oxides of Sulphur (expressed as SO_2) - gas fired - oil fired	 5 5	 750 1,750
Fluoride (expressed as HF)	0.05	5
Total Particulate	0.5	100

4.2.7 For batch lead glass furnaces, the emission of nitrogen oxides should not exceed 1,200 mg/m^3, except in the case of the manufacture of special glasses using nitrate in the batch where the emission should not exceed 2,400 mg/m^3. For continuous melting, where the emissions of nitrogen oxides exceed 5 kg/hr, the emission should not exceed 2,700 mg/m^3.

For lead glass furnaces, emissions of chloride, (expressed as HCl), should not exceed 30 mg/m^3.

4.2.8 For all frit manufacturing processes the following emission concentrations should apply:-

	Where the mass emission from any furnace exceeds (g/hr)	**The concentration should not exceed (mg/m^3)**
Cadmium	1	0.2 mg/m^3
Total Arsenic, Nickel, Selenium, Antimony, Chromium and Copper	5 g/hr	1 mg/m^3
Total Manganese, Vanadium and Tin	25 g/hr	5 mg/m^3

4.2.9 In situations where emission standards expressed in terms of concentrations of pollutants in the exhaust gases are not appropriate, emission standards 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 and include, 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 standard which is no less stringent than the relevant concentration values outlined in par. 4.2.4 to 4.2.8.

4.2.10 The concentration of particulate matter in the emissions from the handling of solid materials used in or produced by the process should not exceed 100 mg/m^3.

4.2.11 The following standards should apply to contained releases to air from glass polishing and etching processes using hydrofluoric acid:-

Pollutant	**Concentration (mg/m^3)**
Hydrogen Fluoride	2.5
Total Acidity (SO_3 equivalent)	50
Total Particulate	50
Ammonia	18

5. RELEASE ROUTES

The principal release routes to air are as follows:-

Pollutant	**Source**
Metals	Materials handling, furnace emission
Hydrofluoric acid	Polishing and etching
Sulphur Oxides	Furnace emission
Oxides of Nitrogen	Furnace emission
Total Particulate	Materials handling, furnace emission

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 principle 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 Dusty lead-bearing materials should be delivered to the process in a manner which prevents their escaping into the external environment. Use of enclosed containers or sealed bags, with the contents already oil dampened or wetted, (normally up to 1% moisture), or the use of granular material are the preferred methods. Alternatively, for large quantities, delivery in an oil dampened or wetted condition, (normally up to 1% moisture), in suitable bulk tankers, is acceptable. Where the material is to be sampled upon receipt, sampling should take place within an enclosed area, and preferably under cover.

6.2.1.2 The transport of dusty lead-bearing materials within the process should be carried out by methods which do not give rise to dust emissions. Preferred methods include pipeline, enclosed containers, or covered conveyors, or adequately covered vehicles.

6.2.1.3 External above-ground conveyors for other dusty materials should be fitted with protection against wind whipping for example sideboards or totally enclosed. Transfer points should be totally enclosed and ducted to suitable arrestment equipment such as fabric filters, as agreed with the Inspectorate to meet the emission standards specified in par.s 4.2.5 and 4.2.10.

Conveyor discharge points should be arranged to minimise at all times the free fall into store or receiving hopper. Care should be taken to ensure that the material is not dispersed around the site on the bodies of vehicles or on their wheels. Wherever appropriate, the materials should be suitably oil dampened or wetted.

6.2.1.4 Stocks of dusty materials should be stored in purpose-built silos, enclosed store rooms or under cover so as to prevent wind whipping, and loading to and from stockpiles should be carried out so as to minimise emissions to the air.

Storage silos for dusty materials should be vented to air through suitable arrestment equipment, such as fabric filters, as agreed with the Inspectorate to meet the emission standards specified in par.s 4.2.5 and 4.2.10.

6.2.1.5 All floors and surfaces of storerooms, mixing rooms, charging points, and waste-holding areas should be kept clean at all times.

6.2.1.6 All sources of lead emissions, such as mixing, charging points, and glass breaking and cutting, should where necessary, be hooded, adequately extracted to suitable arrestment equipment and vented to an adequately designed discharge point, as agreed with the Inspectorate to meet the emission standards specified in par.s 4.2.5 and 4.2.10.

6.2.1.7 The handling and transfer of collected fine dusts from dry arrestment plant and from the storage of waste lead compounds should be carried out by methods which do not give rise to dust emission.

Suitable practices include:-

(i) recycling within the process; and

(ii) discharging from the arrestment equipment directly into bags or drums in an enclosed filling booth extracted to a dust collector for subsequent disposal.

Waste materials and packaging should be deposited in closed containers.

6.2.1.8 The receipt, handling and storage of liquid fuels should be carried out so as to minimise the emission of gases or offensive odour to the air.

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

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

6.2.1.11 Where drum storage of liquids is unavoidable, drums should be stored in a dedicated, well-ventilated area. Partly-used or nominally empty drums should be kept tightly closed. Drums should not be pressurised to effect delivery from them unless they are designed to be emptied in this way.

6.2.2 The potential for fugitive emissions should be considered in the design of the equipment, in the plant layout and in operating practices with the objective of eliminating the release of untreated emissions.

6.2.3 Mixing operations should be well contained and where necessary should be extracted to suitable arrestment plant to meet the requirements of par.s 4.2.5 and 4.2.10.

6.2.4 Furnace charging should be carried out using techniques which minimise emissions, (for example by enclosed systems or use of extraction and collection).

6.2.5 All baths, process vessels and open feedstock tanks should be provided with local extraction and ducted to arrestment equipment where necessary to meet the requirements of par.s 4.2.1, 4.2.3 and 4.2.11.

6.2.6 **General Operations**

6.2.6.1 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 or be available at short notice.

6.2.6.2 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.

6.2.6.3 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.

6.2.6.4 A high standard of housekeeping should be maintained.

6.2.7 **Dispersion from Chimneys and Vents**

6.2.7.1 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 odourous 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).

6.2.7.2 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).

6.2.7.3 Applicants should provide clear information on the parameters used and the assumptions made in their assessments, 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.

6.2.7.4 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.

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

6.2.7.6 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.

6.2.7.7 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.

6.2.7.8 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 dispersion of the residual pollutants except for a cone to meet the efflux velocity requirements of par. 6.2.7.6. 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, and the scale of operation.

7.2.2 Particulate emissions should be continuously monitored and continuously recorded to indicate performance of plant. The instruments should be fitted with audible and visual alarms which should activate at a reference level agreed with the Inspectorate. Emission events which lead to the alarms being activated should be recorded. These monitors should be checked to ensure that they are functioning correctly in accordance with the manufacturers instructions. Continuous emission charts and records should be retained by the operator for a minimum of 4 years and available for examination by the Inspectorate

7.2.3 Particulate emissions should be measured at least annually. The reference test method of particular emission 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.

7.2.4 The interval between testing for lead emissions from continuous and intermittent furnaces should normally be not more than 6 months. The interval between testing for lead and other heavy metals emissions from furnaces for the manufacture of frit should not normally be more than one year for each emission point. The emission points to be tested should be identified and agreed with the Inspectorate.

7.2.5 Emissions of hydrogen fluoride and ammonia (if used) should be measured at least once every 6 months, using a test method agreed with the Inspectorate. All tests should be carried out when the process is operating normally. In addition to this, indicative testing for hydrogen fluoride and ammonia (if used) should be carried out at least once a week (for example a glass gas detection tube).

The frequency of testing should be increased when 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.

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

7.2.7 In some circumstances emissions may be readily calculable, (for example in the case of sulphur oxides their concentration 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 lest on an annual basis.

7.2.8 Visual and olfactory 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, (with the exception of indicative testing using gas detection tubes), should be forwarded to the Inspectorate within 8 weeks of the completion of the sampling.

7.2.11 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.

7.2.12 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.

7.2.13 All furnaces should be equipped with a temperature recorder and an audible high temperature alarm.

7.2.3 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.