

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)**

**LOW LEVEL RADIOACTIVE WASTE
INCINERATION PROCESSES
UNDER 1 TONNE AN HOUR**

B PROCESS GUIDANCE NOTE - GNB 5/1 VERSION 1

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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 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 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 low level radioactive waste incinerators on premises where there is plant incinerating such waste at a rate of under one tonne per hour, as described in Schedule 1 - Section 5.1, Part B of the Industrial Pollution Control (Prescribed Processes and Substances) Regulations (Northern Ireland) 1998.
- 2.2 A Certificate of Authorisation for accumulation and disposal of radioactive waste issued under Sections 13(1), (3) and 14(1) of the Radioactive Substances Act 1993 should be in force before any waste is incinerated.

- 2.3 Radioactive waste is defined as waste which consists wholly or partly of -
- (a) a substance or article which, if it were not waste, would be radioactive material;
 - or
 - (b) a substance or article which has been contaminated in the course of the production, keeping or use of radioactive material, or by contact with or proximity to other waste falling within paragraph (a) of this paragraph.

- 2.4 It should be pointed out that separate notes are published for the following incineration processes:-

clinical waste;
municipal waste; and
sewage sludge.

If radioactive waste is being incinerated in conjunction with material falling within the category of any of the above waste streams then the provisions of the relevant note will also apply.

- 2.5 In the context of this note “process” comprises the whole process including the treatment, handling and storage of any materials used in the process as well as products and wastes produced by the process.

3.0 **GENERAL REQUIREMENTS**

- 3.1 New processes should comply with the standards contained in this Note immediately.
- 3.2 It should be the aim to bring processes up to current standards whenever the opportunity arises. Account should be taken of the plant’s technical characteristics; it’s 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 areas 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 It is recommended that designers and specifiers of new or replacement plant should be aware of the provisions contained in relevant EC Directives for example 94/67/EC 'Incineration of Hazardous Waste' and also the directive covering the incineration of non-hazardous waste (currently at a draft stage).

4. **RELEASES INTO AIR**

4.1 **Reference Conditions**

4.1.1 All pollutant concentrations from contained releases should be expressed at standard reference conditions of temperature 273K (0°C), pressure 101.3 kPa (1 atmosphere) and 11% oxygen content dry.

4.1.2 The above units and reference conditions may not be suitable for continuous monitoring methods and may, by agreement with the Inspectorate, be converted, for day to day control purposes, into values more suitable for the available instrumentation.

4.2 **Emission Targets**

4.2.1 The following emission standards should apply to contained releases:-

<u>Pollutant</u>	<u>Concentration (mg/m³)</u>
Carbon Monoxide	<p style="text-align: center;">100</p> <p>(all measurements determined as half hourly average values). and</p> <p style="text-align: center;">150</p> <p>(95% of all measurements determined as 10 minute average values taken in any 24-hour period).</p>
Organic compounds, expressed as total carbon (excluding particulate matter)	20
Total Particulate (for plant with a design capacity of more than 50 kg/hr)	30
Total Particulate (for plant with a design capacity of 50 kg/hr or less)	200
Heavy Metals (total of cadmium, mercury, arsenic, lead, chromium, nickel, copper and manganese and their compounds)	5
Hydrogen Chloride (excluding particulate) (for plant with a design capacity of 50 kg/hr or less)	250
Sulphur Dioxide	300
Dioxins and Furans (for plant with a design capacity of more than 50 kg/hr)	1 ng/m ³

- 4.2.2 All releases, other than steam or condensed water vapour should be free from persistent mist or fume and free from droplets.
- 4.2.3 The aim should be that all releases should be free from odour outside the process site boundary, as perceived by the Inspectorate.
- 4.2.4 Emissions from combustion processes should in normal operation be free from visible smoke and in any case should not exceed the equivalent of Ringlemann Shade 1, as described in BS 2742:1969.

5. **RELEASE ROUTES**

The principal release routes are as detailed below:-

<u>Pollutants</u>	<u>Source</u>
Particulate	Stack gases
Hydrogen chloride	Stack gases
Carbon Monoxide	Stack gases
Sulphur Dioxide	Stack gases
Organic Compounds	Stack gases, material handling and storage
Metals	Stack gases
Dioxins and Furans	Stack gases

6. TECHNIQUES FOR RELEASE MINIMISATION

6.1 Introduction

The techniques selected need to cover 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 Where consistent with the size, design and operation, loading should be by an automatic system.

6.2.2 All incinerators should be fitted with a burner in the primary combustion zone to ensure controlled incineration. All incinerators should also be fitted with a secondary combustion zone. The gas exit temperature from the secondary combustion zone should be continuously monitored and recorded. Audible and visual alarms should be triggered when the temperature at the point of exit from the secondary combustion zone falls below the minimum specified in par. 6.2.3.

As one of the means for achieving good combustion, all new incinerators should be designed so that there is adequate air in the secondary combustion zone to ensure good turbulence.

- 6.2.3 The temperature of all gases in the secondary combustion zone, after the last injection of combustion air, should be maintained at not less than 1123K (850°C) including during start-up and at the end of an incineration cycle for as long as gases that respond to thermal oxidation could be present in that zone. The minimum residence time for gases in this zone should not be less than 2 seconds as calculated in accordance with British Standards BS 3316, Part 2: 1987. The concentration of oxygen at the outlet of this zone should not be less than 6% by volume, subject to par. 6.2.4.
- 6.2.4 In the case of processes *not* covered by EC Directives 89/369/EEC and 89/4298/EEC, the concentration of oxygen at the outlet of the secondary combustion zone should be not less than 6% by volume if measured on a wet basis or an average of 6% by volume with a minimum of 3% by volume if measured dry.
- 6.2.5 All processes which come within the scope of EC Directive 89/369/EEC should be equipped with auxiliary burners. These burners should be switched on automatically when the temperature of the combustion gases falls below 850°C. They should also be used during the plant start up and shut down operations in order to ensure that this temperature is maintained at all times during these operations and as long as there is waste in the combustion chamber.
- 6.2.6 The charging system should be interlocked with the temperature monitors in order to prevent the addition of fresh materials if the temperature in the secondary combustion zone falls below 1123K (850°C).
- 6.2.7 Care should be taken in handling ash and dust. Provision should be made for preventing the emission of dust during removal of ash and non-combustible residues from the incinerator. Ash should be moved and stored in a covered container or adequately conditioned with water.

6.2.8 **General Operations**

6.2.8.1 Effective control of emissions requires the maintenance and proper use of equipment, and the proper 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 available at short notice.

6.2.8.2 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 four years and available for examination by the Inspectorate.

6.2.8.3 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.

6.2.8.4 A high standard of housekeeping should be maintained.

6.2.9 **Dispersion**

6.2.9.1 The applicants will need to satisfy the Inspectorate that an appropriate assessment of vent and chimney heights has been made to provide adequate dispersion of 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).

- 6.2.9.2 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).
- 6.2.9.3 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.
- 6.2.9.4 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 high should nevertheless be set to avoid any serious damage to health in such circumstances.
- 6.2.9.5 The Operator should have procedures in place to reduce load or shut-down plant in the event of inadequate dispersion conditions.
- 6.2.9.6 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.
- 6.2.9.7 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.

- 6.2.9.8 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. 6.2.9.6. 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 The concentration of oxygen and carbon monoxide should be continuously monitored and recorded at the outlet from the secondary combustion zone. Data should be acquired at periodic intervals not exceeding 10 seconds. Oxygen should also be monitored concurrently with any non-continuous monitoring exercise at the same sampling location as the pollutant of concern, to facilitate correction of results to the standard reference conditions specified in par. 4.1.

7.2.2 Continuous monitoring instruments for oxygen and carbon monoxide should be checked for correct functioning and calibrated in accordance with the manufacturer's instructions.

- 7.2.3 Particulate emissions should be continuously monitored and recorded to indicate performance of abatement plant. Audible and visual alarms should be fitted that activate at a reference level agreed with the Inspectorate. Emission events which lead to the alarms being activated should be electronically recorded. These monitors should be checked to ensure that they are functioning correctly in accordance with the manufacturer's instructions.
- 7.2.4 Tests should be carried out at least annually for heavy metals, sulphur dioxide, hydrogen chloride, organic compounds and particulate emissions. Plant with a design capacity of more than 50 kg/hr should be tested at least annually for emissions of dioxins and furans.
- 7.2.5 The frequency of testing should be increased, when commissioning new or substantially changed processes or where there is a justifiable complaint situation.
- 7.2.6 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 and noted in a log book, retained by the operator for a minimum of 4 years and available for examination by the Inspectorate.
- 7.2.7 The results of all monitoring and inspections should be recorded in the log book. Adverse results including cases where any continuous monitor alarm is activated 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.
- 7.2.8 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.

- 7.2.9 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.
- 7.2.10 The suggested reference test method for particulate emissions in chimneys and ducts is the United States Environmental Protection Agency (US EPA) 40 CFR Part 60 Appendix A Method 5a or b. Alternative methods of testing may be acceptable with the Inspectorate provided that it can be shown that comparable results are obtained.
- 7.2.11 The measurement of the concentration of all other pollutants should be with test methods agreed with the Inspectorate.
- 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 **Environmental Monitoring**

The impact of the process on the environment will be affected by the size of the releases and the site's 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.