A GUIDANCE NOTE ON THE BEST PRACTICABLE MEANS

FOR

CERAMIC WORKS

BPM 4 (94)

Environmental Protection Department
Air Policy Group

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1. INTRODUCTION

1.1 This Note is one of a series issued by the Environmental Protection Department to provide guidance on air pollution management for processes specified under Part IV of the Air Pollution Control Ordinance (the Ordinance). It also serves as a guide for the assessment of an application for Specified Process licence under the Ordinance.

1.2 It should be understood that this Note sets out the basic requirements for the applicant to provide and maintain the best practicable means for the prevention of emission of air pollutants. The applicant should recognize that whether a licence is granted or refused, and on what conditions, will depend on all the circumstances of an individual application besides the requirements set out in this Note. The Authority may devise specific requirements for individual facility carrying out the specified process.

1.3 This Note covers the specified process and associated processes for the manufacture of ceramic products, described as "Ceramic Works" in Schedule 1 to the Ordinance. Ceramic Works are works in which the processing capacity exceeds 2 tonnes, or, if the mode of operation is continuous, 0.67 tonne per day, and in which any ceramic products including bricks, tiles, pipes, pottery goods, or refractories are manufactured in furnaces or kilns fired by any fuel.

2. EMISSION LIMITS

2.1 All emissions to air, other than steam or water vapour, shall be colourless, free from persistent mist or fume, and free from droplets.

2.2 Emissions from the specified process and associated processes as covered by this Note shall not:

(a) exceed the concentration limits set out in Annex I.

(b) appear to be as dark as or darker than Shade 1 on the Ringelmann Chart when compared in the appropriate manner with the Ringelmann Chart or an approved device.

3. FUEL RESTRICTION

3.1 All fuels to be used shall comply with the Air Pollution Control (Fuel Restriction) Regulations in force.

4. CONTROL OF EMISSIONS

4.1 Design of Chimney

Chimney includes structures and openings of any kind from or through which air pollutants, generated from combustion, drying and/or other manufacturing process of the plant, may be emitted.

4.2 The design of chimney is to be determined by mathematical or physical dispersion modelling techniques acceptable to the Authority. The aims are to ensure:

(a) the relevant Air Quality Objectives (AQOs) will not be threatened;

(b) the emission of non-AQO pollutants, in particular, heavy metals and carcinogenic organic compounds, will not cause any adverse effect to human health or environment; and

(c) no undue constraint will be incurred to the existing and future development or land use.

4.3 In any case, the design of chimney shall at least satisfy the following conditions:

(a) Chimney Height

(i) For combustion processes, the final chimney height shall be agreed with the Authority but as a general guideline, the chimney height, in a flat terrain situation, should as far as practicable be at least Building Height + 1.5 x Building Width or Building Height, whichever is the lesser. Suitable adjustment should be made to take into account local meteorological data, local topography and background air pollutant concentrations. In any case, the minimum chimney height shall be at least 8 metres above ground level or 3 metres above the roof top of the building to which it is attached, whichever is the greater.

(ii) For non-combustion processes, same guideline shall be observed as far as practicable and in any case, the chimney height shall be at least 3 metres above the roof top of the building to which it is attached.

(b) Efflux Velocity

The efflux velocity of chimney shall not be less than 15 m/s at full load condition.

(c) Exit Temperature

For combustion process, the flue gas exit temperature shall not be less than the acid dew point.

(d) Mode of Discharge

Releases to air from chimney shall be directed vertically upwards and not be restricted or deflected by the use of, for example, plates, caps or cowls.

In order to obtain maximum thermal buoyancy, hot emissions should take place from the minimum number of chimneys and multiplicity of discharge points should be avoided where practicable.

Chimney for release of hot emissions should, wherever possible, be insulated. The insulation materials shall be free of asbestos.

4.4 Clean energy sources and fuels with proven benefits to air pollution reduction shall be used whenever possible in the relevant specified process and associated operations. The use of electricity or gaseous fuel for process heating or production of goods is always recommended.

5. FUGITIVE EMISSION CONTROL

5.1 Boundary Ambient Standards

Total suspended particulates	260 $\mu g/m^3$ (24-hour average)
Respirable suspended particulates	180 $\mu g/m^3$ (24-hour average)
Odour	2 odour units

(Note: An odour unit is the measuring unit of odour level and is analogous to pollution concentration. In this context, the odour level is defined as the ratio of the volume which the sample would occupy when diluted with air to the odour threshold, to the volume of the sample. In other words, one odour unit is the concentration of the odorant which just induces an odour sensation.)

5.2 Engineering Design/Technical Requirements

To be agreed with the Authority. As a general guideline, the loading, unloading, handling and storage of fuel, raw materials, product, wastes or by-products should be carried out in a manner acceptable to the Authority so as to prevent the release of:

(a) visible dust emissions; and/or

(b) emissions of organic vapours; and/or

(c) other noxious or offensive emissions.

5.3 Without prejudice to the generality of the above general requirements, the following control measures shall be implemented:

(a) Stockpiles of raw materials shall be enclosed on top and 3 sides leaving only one side for both loading and unloading. The aim should be to store all such fine materials in purpose-built silos or under cover. Storage silos for dusty materials shall be vented to air through suitable equipment in order to meet the emission limit stipulated in Section 2 of this Note. During loading of fine materials from stockpiles by loader trucks, spraying in the form of water mist shall be carried out so as to prevent dust emissions to air.

(b) The weight feeder shall be under cover and with flexible curtain to prevent wind-whipping during the raw materials loading process. External above ground conveyors for dusty materials shall be enclosed on top and two sides and fitted with bottom plate to protect against wind whipping. Transfer points shall be enclosed, and if necessary ducted to a suitable dust arrestment equipment as approved by the Authority.

(c) The loading of fine material into the hopper of mills shall be fitted with an overhead extraction hood for the extraction of fine fugitive particulates in order to meet the emission limit stipulated in Section 2 of this Note. The free fall of materials should also be minimized.

(d) All milling, grinding, screening or drying plant shall be fitted with an approved device for the control of emissions in order to meet the emission limit stipulated in Section 2 of this Note.

(e) Vehicle exhaust, wherever possible, should be directed upwards. As far as practicable, all access and route roads within the premises should be paved and adequately wetted.

(f) Spillage and waste material shall be cleared off frequently. A high standard of housekeeping shall be maintained.

6. OPERATION AND MAINTENANCE

6.1 Requirements include not only the provision of the appliances, but the proper operation and maintenance of equipment, its supervision when in use, and the training and supervision of properly qualified staff. Specific operation and maintenance requirements may be specified for individual equipment.

6.2 Malfunctioning and breakdown of the process or air pollution control equipment which would cause exceedance of the emission limits or breaches of other air pollution control requirements should be reported to the Authority within 3 working days.

7. MONITORING REQUIREMENTS

7.1 Parameters and sampling frequency will be determined by the Authority. In any case, the emission of particulates, heavy metals, nitrogen oxides, sulphur oxides, chlorides and fluorides from the chimneys serving the kiln and/or the spray dryer and/or equipment as specified by the Authority, shall be tested at least annually. In addition, the following parameters should be monitored continuously as a minimum requirement:

(a) In-stack monitoring

Particulate matter (opacity) measured by an opacity meter installed at the chimney serving the spray dryer.

(b) Process monitoring

Production rate and other essential operating parameter(s) which may significantly affect the emission of air pollutants.

(c) Ambient monitoring

At site boundary and/or any other locations acceptable to the Authority	Total suspended particulates and/or respirable suspended particulates (at least one 24-hour sample per 6 calendar days)

8. COMMISSIONING

8.1 Commissioning trials (to be witnessed by the Authority whenever appropriate) shall be conducted to demonstrate performance and capability of the air pollution control measures and a report of commissioning trial shall be submitted to the Authority within 1 month after completion of the trial.

ANNEX I CONCENTRATION LIMIT FOR EMISSION FROM CERAMIC WORKS

I.1 Air pollutant emissions from the subject specified process and associated processes covered by this Note shall not exceed the concentration limits specified in the table below.

Air Pollutant	Concentration Limit
Particulates	50 mg/m^3
Heavy Metals and their Compounds[1] (expressed as total metals)	5 mg/m^3
Halogen Compounds	
Fluorine and its compounds (expressed as hydrogen fluoride)	10 mg/m^3
Chlorine and its compounds (expressed as hydrogen chloride)	50 mg/m^3
Nitrogen Oxides (expressed as NO_2)	200 mg/m^3

I.2 For combustion gases, the concentration of air pollutant is expressed at dry, 0^oC temperature, 101.325 kPa pressure and 18% oxygen content conditions.

I.3 For non-combustion gases, the concentration of air pollutant is expressed at 0^oC temperature, 101.325 kPa pressure conditions but no correction for water vapour or oxygen content is required. The introduction of dilution air to achieve the emission concentration limits shall not be permitted.

[1] Arsenic, Antimony, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Vanadium and their compounds