A GUIDANCE NOTE ON THE BEST PRACTICABLE MEANS

FOR

CERAMIC WORKS

BPM 4

Environmental Protection Department
Air Management Group

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1. INTRODUCTION

This note lists the minimum requirements for meeting the best practicable means for Ceramic Works. It should be noted that in granting a licence under the Ordinance, the Authority, i.e. the Director of Environmental Protection, will also consider all other relevant aspects and may impose more stringent and/or additional control requirements by taking into account individual process characteristics, local topography and air quality and any other factors.

The requirements in this note are applicable to any 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. DESIGN OF CHIMNEY

Chimneys include 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.

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

(i) the relevant Air Quality Objective (AQO) will not be threatened;

(ii) 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

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

In any case, the design of chimneys shall at least satisfy the following conditions : –

(a) Chimney Height

For combustion processes, the final chimney height should 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.

For non-combustion processes, same guideline should 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 the chimneys shall not be less than 15 m/s at full load condition.

(c) Exit Temperature

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

(d) Mode of Discharge

Releases to air from chimneys shall be directed vertically upwards and not 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.

3. EMISSION LIMITS

All emissions to air, other than steam or water vapour, should be colourless and free from persistent mist.

Particulate Matters	50 mg/m^3
Heavy Metals and their compounds (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
Smoke	Less than Ringelmann Shade 1

(For combustion gases, the concentration of pollutants are expressed at dry, $0^{o}C$ temperature, 101.325 kPa pressure and 18% oxygen content conditions. For non-combustion gases, the concentration of pollutants are also at $0^{o}C$ 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.)

4. FUGITIVE EMISSION CONTROL

(a) 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.)

(b) 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:-

(i) visible dust emissions; and/or

(ii) emissions of organic vapours; and/or

(iii) other noxious or offensive emissions.

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

(I) Stockpiles of raw materials should 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 should be vented to air through suitable equipment in order to meet the limit values mentioned in Section 3 above. During loading of fine materials from stockpiles by loader trucks, spraying in the form of water mist should be carried out so as to prevent dust emissions to air.

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

(III) The loading of fine material into the hopper of mills should be fitted with an overhead extraction hood for the extraction of fine fugitive particulates in order to meet the limit values mentioned in Section 3 above. The free fall of materials should also be minimized.

(IV) All milling, grinding, screening or drying plant should be fitted with an approved control devices for the control of emissions in order to meet the limit values mentioned in Section 3 above.

(V) 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.

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

5. MATERIAL/FUEL RESTRICTION

Gaseous fuel is the recommended fuel to be used but the Authority may also accept the use of liquid fuel on special circumstances with the following specifications :-

Sulphur content	Not greater than 0.5 % (by weight)
Viscosity	Not greater than 6 centistokes (at $40^{o}C$)

6. MONITORING REQUIREMENTS

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)

7. COMMISSIONING

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

8. OPERATION AND MAINTENANCE

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.

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.