



**A GUIDANCE NOTE ON THE
BEST PRACTICABLE MEANS**

FOR

COPPER WORKS

**(MELTING OF COPPER
AND/OR COPPER ALLOY)**

BPM 6 (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 below operations under “Copper Works” as described in Schedule 1 to the Ordinance in which the processing capacity exceeds 0.5 tonne (expressed as copper) or, if the mode of operation is continuous, 0.45 tonne (expressed as copper) per hour and in which:
- (a) by the application of heat-
 - (i) molten copper is refined; or
 - (ii) copper or copper alloy swarf is degreased; or
 - (iii) copper alloys are recovered from scrap fabricated metal, swarf or residues; or
 - (b) copper and/or copper alloy is melted and cast

They do not cover other processes which are also defined as Copper Works under the Ordinance.

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, including vents and process exhausts, from or through which air pollutants generated from combustion, melting and/or other manufacturing process 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 process, the final chimney height shall be agreed with the Authority and in any case, it shall be at least 3 metres above the roof top of the building to which it is attached or 8 metres above ground level, whichever is the greater. In addition, suitable adjustment should be made to take into account of local meteorology, local topography and background emissions.
- (ii) For non-combustion process, the 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

In any case, the efflux velocity shall not be less than 15 m/s at full load operation. Where a wet method of arrestment is used, the linear velocity within the chimney shall not exceed 9 m/s, to avoid entrainment of droplets from chimney surface into the gas stream.

(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.

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

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

4.4 For auxiliary operations including casting, finishing, milling, annealing, surface treatment and any other processes that may generate air pollutants, suitable control measures shall be provided to minimize the air pollutant emissions to air. In particular, for any process which would generate particulate emission, the particulates generated shall be collected and vented to an arrestment plant meeting the emission limits stipulated in Section 2 of this Note.

4.5 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 $\mu\text{g}/\text{m}^3$ (24-hour average)
Respirable suspended particulates	180 $\mu\text{g}/\text{m}^3$ (24-hour average)
Odour	2 odour units

(Note: An odour unit is the measuring unit of odour level and analogous to pollutant 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, wastes or by-products should be carried out 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 requirements, the following control measures shall be implemented:

- (a) Dusty or potentially dusty materials, for example, coke or sand, shall be stored and handled in such a manner as to minimize resultant fugitive dust emissions.
- (b) All residues produced, including those produced by arrestment plant, shall be handled and stored in such a manner as to minimize emissions to air.
- (c) Air pollutant emissions from melting and holding furnace shall be adequately contained and collected to prevent fugitive emissions. The emissions shall be vented to suitable arrestment plant to meet the emission limits stipulated in Section 2 of this Note.

6. MATERIAL RESTRICTION

- 6.1 Metallic charge shall be clean, uncontaminated by grease or non-metallic matters, unless the design of the furnace together with the control equipment fitted are capable of controlling the emissions caused by charging the contaminated materials to the satisfaction of the Authority.

7. OPERATION AND MAINTENANCE

- 7.1 Requirements include not only the provisions of the appliances, but also the proper operation and maintenance of equipment, its supervision and the training and supervision of properly qualified staff. Specific operation and maintenance requirements may be specified for individual equipment.
- 7.2 Malfunction and breakdown of the process equipment or air pollution control equipment that would cause exceedance of the emission limits or breach of other air pollution control requirements should be reported to the Authority within 3 working days.

8. MONITORING REQUIREMENTS

8.1 Parameters and sampling frequency will be determined by the Authority.

9. COMMISSIONING

9.1 Commissioning trials (to be witnessed by the Authority whenever appropriate) shall be conducted to demonstrate performance 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.

ANNEX I CONCENTRATION LIMIT FOR EMISSION FROM COPPER WORKS- MELTING OF COPPER AND/OR COPPER ALLOY

I.1 The concentration limits stipulated below shall be applicable to all emissions from the subject specified process and associated processes covered by this Note during normal operations including load change. For smoke emission, the emission limits shall also be applicable to the start-up and shutdown periods. The introduction of dilution air to achieve the emission limits is not permitted.

(a) Metal melting process

The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, and without correction for CO₂ and water content (except emission limit on smoke).

Air Pollutant	Concentration Limit
Particulates	50 mg/m ³
Copper and its compounds (as copper)	20 mg/m ³
Lead and its compounds (as lead)	2 mg/m ³
Nickel and its compounds (as nickel)	10 mg/m ³
Tin and its compounds (as tin)	10 mg/m ³
Fluoride (as hydrogen fluoride)	5 mg/m ³

(b) Other auxiliary operations

The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, and without correction of water content.

Air Pollutant	Concentration Limit
Particulates	50 mg/m ³