



**A GUIDANCE NOTE ON
BEST PRACTICABLE MEANS**

FOR

LEAD WORKS

(MANUFACTURE AND USE OF LEAD COMPOUNDS)

BPM 17 (09)

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 processes in which lead compounds are manufactured or used, which comes within the specified process "Lead Works" described in Schedule 1 to the Ordinance as:

"Works of the following kinds in which—

- (a) by application of heat-
 - (i) lead is extracted or recovered from any material containing lead or its compounds; or
 - (ii) lead is refined; or
 - (iii) lead is applied as a surface coating to other metals by spraying; or
- (b) compounds of lead are manufactured, extracted, recovered or used in processes which give rise to particulates emission, excluding the manufacture of electric accumulators and the application of glazes or vitreous enamels; or
- (c) organic lead compounds are made."

They do not cover other processes which are also described as Lead 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 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 Emission of air pollutants shall be minimized to prevent:
 - (a) harm to the environment, adverse effects to human health, or creation of any nuisance situation;
 - (b) threatening the attainment or maintenance of the relevant air quality objectives;
 - (c) giving rise to an objectionable odour noticeable outside the premises where the process is carried out; and
 - (d) imposing undue constraint on the existing and future development or land use.
- 4.2 To satisfy the emission limits set out in Section 2 of this Note, prevention or reduction of emissions at source is the choice. Where the emission cannot be prevented or reduced at source to a sufficient extent to meet these requirements, air pollution control equipment shall be provided.
- 4.3 Clean energy sources and fuels which have proven benefits to reduce air pollution shall be used whenever possible in relevant specified process and associated operations. The use of electricity or gaseous fuel for process heating is recommended.
- 4.4 Properly designed operation process shall be installed and operated to contain and treat process emissions including, but not be limited to, particulates, fumes and odours. Relevant emissions shall be adequately collected by local exhaust, and vented to suitable abatement plant for treatment, meeting the specified emission limits set out in Section 2 of this Note, before being discharged to the atmosphere.

- 4.5 Furnace(s) and process heat generation plant(s) shall be of adequate design for efficient energy application and transfer as well as minimizing releases to air. Combustion plant(s) shall be of low pollution design and equipped with advanced process control technology to ensure good combustion and reduce air emissions. For controlling NO_x emission from combustion processes, the use of primary reduction techniques such as low-NO_x technology in process operation is in preference to secondary treatment techniques.

Design of chimney

- 4.6 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.
- 4.7 The design of chimney is to be determined by mathematical or physical dispersion modelling techniques acceptable to the Authority. The aims are to ensure the objectives listed in paragraph 4.1 are observed and followed through.
- 4.8 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 shall 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, it 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 chimney shall not be less than 15 m/s at full load condition. 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, and in any case, not less than 80°C.

(d) Mode of discharge

Releases to air from chimney shall be directed vertically upwards and not 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 shall, wherever possible, be insulated. The insulation materials shall be free of asbestos.

4.9 Other auxiliary operations

- (a) For auxiliary operations including drawing of solder wire, preparing or handling flux material such as rosin and any other process that may generate air pollutants, suitable control measures shall be provided to minimize the air pollutant emissions to air.
- (b) In particular, for any process which would generate particulate emissions, the particulates generated shall be collected and vented to an arrestment plant meeting the emission limit stipulated in Section 2 of this Note.

5. FUGITIVE EMISSION CONTROL

5.1 Boundary ambient standards

- (a) The 24-hour ambient levels of suspended particulates shall not exceed the relevant Hong Kong Air Quality Objectives.
- (b) Lead: $1.5\mu\text{g}/\text{m}^3$ (3-month average)
- (c) 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, products, wastes or by-products shall 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 requirements, the following control measures shall be implemented:

- (a) Dusty materials, or potentially dusty materials, for example, powder additives shall be stored and handled in such a manner as to minimize resultant fugitive dust emission.
- (b) All residues produced, including those produced by arrestment plant, shall be handled and stored in a manner which could minimize emissions to air.
- (c) Air pollutant emissions from melting or holding furnaces and other process equipment shall be adequately contained to prevent fugitive emissions. The emissions shall be vented to suitable arrestment plant, where necessary, meeting the emission limits stipulated in Section 2 of this Note.

6. MATERIAL RESTRICTION

- 6.1 Materials charged to melting furnace shall be clean, uncontaminated by grease or non-metallic matters unless the furnace is either designed or fitted with equipment for controlling air emissions to the satisfaction of the Authority.

7. OPERATION AND MAINTENANCE

- 7.1 Best Practicable Means requirements include the proper operation and maintenance of equipment, its supervision when in use and the training and supervision of qualified staff. Specific operation and maintenance requirements may be specified for individual equipment.
- 7.2 All control and monitoring equipment shall be operational and functioning properly when the plant or other associated processes are in operation.

- 7.3 Operating staff shall be properly trained in their duties relating to control of the process and emissions to air. Particular emphasis shall be given to training for start-up, shut down and abnormal conditions.
- 7.4 In case of 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, the incident shall be reported to the Authority without delay. Moreover, all practicable means (including refraining from using the defective plant) shall be taken to minimize the abnormal emission.

8. MONITORING REQUIREMENTS

- 8.1 Necessary monitoring equipment and techniques, agreeable to the Authority, shall be provided and used to demonstrate that the process is properly operated and the emissions can be minimized to meet the air pollution control requirements. The scope, manner and frequency of the monitoring shall be sufficient for this purpose and will be determined by the Authority. In general, visual and olfactory assessment on the operation of process equipment, air pollution control system(s) and air emissions shall be made frequently and at least once a day.
- 8.2 Monitoring results shall be recorded in such manner specified by the Authority. The record shall be retained at the premises for a minimum of two years, or other period specified by the Authority, after the date of last entry and made available for examination as and when required by the Authority.
- 8.3 Indication of satisfactory performance of air pollution control equipment shall be provided. Continuous monitoring of essential operating parameter(s) that may significantly affect the emission of air pollutants, such as volumetric flow of extraction / air pollution control system(s) or essential operating parameter(s) of relevant abatement plant(s), shall be displayed.
- 8.4 Appropriate instrumentation shall be installed to monitor the performance of air pollution management system(s) including the emission extraction device and relevant abatement plant(s). It shall be fitted with audible and visual alarms with trigger levels for activation agreeable to the Authority. Emission events that lead to the alarms being activated shall be properly recorded in such manner and format agreed with the Authority. These instruments shall be checked regularly to ensure that they are functioning correctly in accordance with the manufacturer's instructions.

9. COMMISSIONING

- 9.1 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 LEAD WORKS –
MANUFACTURE AND USE OF LEAD COMPOUNDS**

I.1 The concentration limits stipulated in the tables below shall be applicable to all emissions from the subject specified process and associated processes covered by this Note during normal operations. The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure and dry gas, without correction for oxygen content. The introduction of dilution air to achieve the emission limits is not permitted. All the concentration limits specified below are daily average values.

(a) Metal melting process

Air Pollutant	Concentration Limit (mg/m³)
Particulates	10
Copper, lead, zinc, nickel, and their compounds (as metal)	Total 2
Antimony, tin, tellurium and their compounds (as metal)	Total 2
Cadmium, arsenic, mercury, thallium, selenium, and their compounds (as metal)	Total 0.5
Chloride (expressed as hydrogen chloride)	5

(Note: Adjustment to the above suites of metals may be necessary to cater for the specifications and materials feed of individual processes.)

(b) Other auxiliary operations

Air Pollutant	Concentration Limit (mg/m³)
Particulates	10

I.2 Notwithstanding I.1, due to the toxicity of lead and other heavy metals that may be emitted together in the subject specified process and associated processes, the owner of the specified process shall conduct an assessment by atmospheric dispersion modelling or other methodology acceptable to the Authority to determine the maximum emission and concentration allowable for ensuring that:

- (a) the relevant air quality objective and other health-related limits, including those prescribed in the Technical Memorandum for Specifying Air Quality Objectives for Hong Kong are not threatened;
- (b) the air quality at the receptors in the vicinity will not be significantly deteriorated.