



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

**FOR**

**METAL RECOVERY WORKS**

**BPM 10 (96)**

Environmental Protection Department  
Air Policy Group

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## **1. INTRODUCTION**

- 1.1 This note is issued by the Environmental Protection Department as one of a series to provide guidance for the control of specified processes in Part IV of the Air Pollution Control Ordinance (the Ordinance). It is a guide in the assessment of an application for a licence under the Ordinance.
- 1.2 It should be understood that this note sets out the minimum requirement for the applicant to provide and maintain the best practicable means for the prevention of the 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, including this note.
- 1.3 This Note covers the specified process and associated processes for metal recovery, described as "Metal Recovery Works" in Schedule 1 to the Ordinance. Metal Recovery Works are works in which scrap metals are treated in any type of furnace for recovery of metal with a processing capacity exceeding 50 kg per hour, where this is the primary object of the works.

## **2. EMISSION LIMITS**

- 2.1 All emissions to air, other than steam or water vapour, should 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 As a general guideline, emission of air pollutants should be minimised and controlled 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 on; 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 preferred. Where the emission cannot be prevented or reduced at sources to meet these requirements, suitable air pollution control equipment shall be provided in order to meet these requirements.
- 4.3 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.
- *Metal Recovery Process*
- 4.4 Emissions from the equipment for the recovery of metals from scrap materials shall be adequately contained and vented to suitable control equipment where necessary to meet the requirements of Section 2 of this Note.
- 4.5 Enclosed furnaces, casings, ductwork, ancillary equipment and furnace doors shall be made and maintained as gas-tight as is practicable. Emissions from charging operations shall be prevented by careful selection of scrap and its introduction to the furnace. Where emissions cannot be prevented, local exhaust ventilation shall be provided to vent the emissions to suitable control equipment where necessary to meet the requirements of Section 2 of this Note.
- 4.6 Where the metal recovery works includes incineration of any materials in an incinerator, the minimum temperature of the secondary combustion chamber or zone of the incinerator should not be less than 1,000<sup>0</sup>C. In addition, the residence time and the oxygen content of the flue gases in the secondary combustion chamber or zone should not be less than 2 seconds and 6% by volume respectively. It is to ensure complete combustion of waste gases and destruction of dioxins and furans in order to meet the requirements of Section 2 of this Note.
- *Design of Chimney*
- 4.7 Chimney includes vents, structures and openings of any kind from or through which air pollutants may be emitted. The applicant will need to demonstrate that the proposed chimney will provide sufficient dispersion of air pollutants in determining the adequacy of its height.
- 4.8 A chimney shall be at least 3 metres above the roof of any building to which it attaches, and the roof of any adjacent buildings.

- 4.9 Releases to air from chimney shall be directed vertically upwards and not restricted or deflected by the use of, for example, plates or caps.
- 4.10 Chimney shall normally be designed for an efflux velocity of not less than 15 m/s at full load condition.
- 4.11 For a combustion process, the flue gas exit temperature shall not be less than the acid dew point.

## **5. FUGITIVE EMISSION CONTROL**

- *Materials Handling*

- 5.1 As a general guideline, handling and storage of fuel, raw materials, products, wastes or by-products shall be carried out in such a manner to prevent the release of:
- (a) visible dust emissions;
  - (b) emissions of organic vapours; and/or
  - (c) other noxious or offensive emissions.

## **6 OPERATION AND MAINTENANCE**

- 6.1 Best practicable means 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 qualified staff.
- 6.2 In general, equipment should be repaired as soon as practicable. Specific operation and maintenance requirements may be specified for individual equipment.
- 6.3 Failure of any process or air pollution control equipment that may result in abnormal emission of air pollutants shall be reported to the Authority as soon as possible.

## **7. MONITORING REQUIREMENTS**

- 7.1 Parameters and sampling frequency will be determined by the Authority. The aim shall be to demonstrate:
- (a) the process is properly controlled; and
  - (b) compliance with the terms and conditions imposed to the licence.
- 7.2 As a general requirement, indication of the satisfactory of air pollution control equipment should be provided.

7.3 For the incineration process mentioned in paragraph 4.6 above, suitable continuous monitoring and recording devices shall be provided to monitor and record continuously the temperature and the concentrations of carbon monoxide and oxygen of the exhaust gases at the outlet of the secondary combustion chamber or zone of the incinerator.

## **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 METAL RECOVERY WORKS

I.1 The concentration limits specified below apply to emissions from a furnace and other equipment (except incinerator) for the recovery of metals from scrap materials. The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, and without correction for water vapour or oxygen content. Introduction of dilution air to achieve the concentration limits is not allowed.

- (a) The emissions shall comply with the following concentration limits with respect to particulates and heavy metals:

Air Pollutant	Concentration Limit
Particulates	50 mg/m <sup>3</sup>
Lead and its compounds (as lead)	2 mg/m <sup>3</sup>
Beryllium and its compounds (as beryllium)	0.002 mg/m <sup>3</sup>
Total cadmium and mercury and their compounds (as metals)	0.2 mg/m <sup>3</sup>
Total nickel and arsenic and their compounds (as metals)	1 mg/m <sup>3</sup>
Total heavy metals (as metals)	5 mg/m <sup>3</sup>

- (b) Where halogens and their compounds are emitted, the emissions shall also comply with the following concentration limits:

Air Pollutant	Concentration Limit
Hydrogen chloride	50 mg/m <sup>3</sup>
Chlorine	30 mg/m <sup>3</sup>
Fluorine and its compounds (as hydrogen fluoride)	10 mg/m <sup>3</sup>

I.2 Where the metal recovery works includes incineration of any materials in an incinerator, the emission from the incineration process shall comply with the following concentration limits. The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, dry and 11% O<sub>2</sub> content conditions.

<b>Air Pollutant</b>	<b>Concentration Limit</b>
Particulates	50 mg/m <sup>3</sup>
Sulphur dioxide	250 mg/m <sup>3</sup>
Nitrogen oxides (as nitrogen dioxide)	400 mg/m <sup>3</sup>
Carbon monoxide	100 mg/m <sup>3</sup>
Chlorine and its compounds (as hydrogen chloride)	50 mg/m <sup>3</sup>
Fluorine and its compounds (as hydrogen fluoride)	4 mg/m <sup>3</sup>
Hydrogen bromide	5 mg/m <sup>3</sup>
Hydrogen sulphide	5 mg/m <sup>3</sup>
Phosphorus and its compounds (as phosphorus)	5 mg/m <sup>3</sup>
Lead and its compounds (as lead)	2 mg/m <sup>3</sup>
Beryllium and its compounds (as beryllium)	0.002 mg/m <sup>3</sup>
Total cadmium and mercury and their compounds (as metals)	0.2 mg/m <sup>3</sup>
Total nickel and arsenic and their compounds (as metals)	1 mg/m <sup>3</sup>
Total heavy metals (as metals)	5 mg/m <sup>3</sup>
Polychlorinated dibenzodioxins and Polychlorinated dibenzofurans <i>(see Annex II for the calculation of equivalent concentration)</i>	0.1 ng/m <sup>3</sup>
Organic compounds (as total carbon, excluding particulates)	20 mg/m <sup>3</sup>

## ANNEX II CALCULATION OF EQUIVALENT CONCENTRATION FOR DIOXINS

II.1 For the determination of the total concentration of dioxins and furans, the mass concentrations of the following dibenzodioxins and dibenzofurans shall be multiplied by the following equivalence factors before summing:

		<u>Toxic Equivalence Factor</u>
2,3,7,8 -	Tetrachlorodibenzodioxin (TCDD)	1
1,2,3,7,8 -	Pentachlorodibenzodioxin (PeCDD)	0.5
1,2,3,4,7,8 -	Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,6,7,8 -	Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,7,8,9 -	Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,4,6,7,8 -	Heptachlorodibenzodioxin (HpCDD)	0.01
	Octachlorodibenzodioxin (OCDD)	0.001
2,3,7,8 -	Tetrachlorodibenzofuran (TCDF)	0.1
2,3,4,7,8 -	Pentachlorodibenzofuran (PeCDF)	0.5
1,2,3,7,8 -	Pentachlorodibenzofuran (PeCDF)	0.05
1,2,3,4,7,8 -	Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,6,7,8 -	Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,7,8,9 -	Hexachlorodibenzofuran (HxCDF)	0.1
2,3,4,6,7,8 -	Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,4,6,7,8 -	Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8,9 -	Heptachlorodibenzofuran (HpCDF)	0.01
	Octachlorodibenzofuran (OCDF)	0.001