

APPENDIX A
INCINERATOR
REGULATIONS

**European Union Directive
2000/76/EC on The Incineration
of Waste**

DIRECTIVE 2000/76/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 4 December 2000
on the incineration of waste

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the Opinion of the Economic and Social Committee ⁽²⁾,

Having regard to the Opinion of the Committee of the Regions ⁽³⁾,

Acting in accordance with the procedure laid down in Article 251 of the Treaty ⁽⁴⁾, and in the light of the joint text approved by the Conciliation Committee on 11 October 2000,

Whereas:

- (1) The fifth Environment Action Programme: Towards sustainability — A European Community programme of policy and action in relation to the environment and sustainable development, supplemented by Decision No 2179/98/EC on its review ⁽⁵⁾, sets as an objective that critical loads and levels of certain pollutants such as nitrogen oxides (NO_x), sulphur dioxide (SO₂), heavy metals and dioxins should not be exceeded, while in terms of air quality the objective is that all people should be effectively protected against recognised health risks from air pollution. That Programme further sets as an objective a 90 % reduction of dioxin emissions of identified sources by 2005 (1985 level) and at least 70 % reduction from all pathways of cadmium (Cd), mercury (Hg) and lead (Pb) emissions in 1995.
- (2) The Protocol on persistent organic pollutants signed by the Community within the framework of the United Nations Economic Commission for Europe (UN-ECE) Convention on long-range transboundary air pollution sets legally binding limit values for the emission of dioxins and furans of 0,1 ng/m; TE (Toxicity Equivalents) for installations burning more than 3 tonnes per hour of municipal solid waste, 0,5 ng/m; TE for installations burning more than 1 tonne per hour of medical

waste, and 0,2 ng/m; TE for installations burning more than 1 tonne per hour of hazardous waste.

- (3) The Protocol on Heavy Metals signed by the Community within the framework of the UN-ECE Convention on long-range transboundary air pollution sets legally binding limit values for the emission of particulate of 10 mg/m³ for hazardous and medical waste incineration and for the emission of mercury of 0,05 mg/m³ for hazardous waste incineration and 0,08 mg/m³ for municipal waste incineration.
- (4) The International Agency for Research on Cancer and the World Health Organisation indicate that some polycyclic aromatic hydrocarbons (PAHs) are carcinogenic. Therefore, Member States may set emission limit values for PAHs among other pollutants.
- (5) In accordance with the principles of subsidiarity and proportionality as set out in Article 5 of the Treaty, there is a need to take action at the level of the Community. The precautionary principle provides the basis for further measures. This Directive confines itself to minimum requirements for incineration and co-incineration plants.
- (6) Further, Article 174 provides that Community policy on the environment is to contribute to protecting human health.
- (7) Therefore, a high level of environmental protection and human health protection requires the setting and maintaining of stringent operational conditions, technical requirements and emission limit values for plants incinerating or co-incinerating waste within the Community. The limit values set should prevent or limit as far as practicable negative effects on the environment and the resulting risks to human health.
- (8) The Communication from the Commission on the review of the Community Strategy for waste management assigns prevention of waste the first priority, followed by reuse and recovery and finally by safe disposal of waste; in its Resolution of 24 February 1997 on a Community Strategy for waste management ⁽⁶⁾, the Council reiterated its conviction that waste prevention should be the first priority of any rational waste policy in relation to minimising waste production and the hazardous properties of waste.

⁽¹⁾ OJ C 13, 17.1.1998, p. 6 and

OJ C 372, 2.12.1998, p. 11.

⁽²⁾ OJ C 116, 28.4.1999, p. 40.

⁽³⁾ OJ C 198, 14.7.1999, p. 37.

⁽⁴⁾ Opinion of the European Parliament of 14 April 1999 (OJ C 219, 30.7.1999, p. 249), Council Common Position of 25 November 1999 (OJ C 25, 28.1.2000, p. 17) and Decision of the European Parliament of 15 March 2000 (not yet published in the Official Journal). Decision of the European Parliament of 16 November 2000 and Decision of the Council of 20 November 2000.

⁽⁵⁾ OJ C 138, 17.5.1993, p. 1 and

OJ L 275, 10.10.1998, p. 1.

⁽⁶⁾ OJ C 76, 11.3.1997, p. 1.

- (9) In its Resolution of 24 February 1997 the Council also underlines the importance of Community criteria concerning the use of waste, the need for appropriate emission standards to apply to incineration facilities, the need for monitoring measures to be envisaged for existing incineration plants, and the need for the Commission to consider amending Community legislation in relation to the incineration of waste with energy recovery in order to avoid large-scale movements of waste for incineration or co-incineration in the Community.
- (10) It is necessary to set strict rules for all plants incinerating or co-incinerating waste in order to avoid transboundary movements to plants operating at lower costs due to less stringent environmental standards.
- (11) The Communication from the Commission/energy for the future: renewable sources of energy/White paper for a Community strategy and action plan takes into consideration in particular the use of biomass for energy purposes.
- (12) Council Directive 96/61/EC⁽¹⁾ sets out an integrated approach to pollution prevention and control in which all the aspects of an installations environmental performance are considered in an integrated manner. Installations for the incineration of municipal waste with a capacity exceeding 3 tonnes per hour and installations for the disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day are included within the scope of the said Directive.
- (13) Compliance with the emission limit values laid down by this Directive should be regarded as a necessary but not sufficient condition for compliance with the requirements of Directive 96/61/EC. Such compliance may involve more stringent emissions limit values for the pollutants envisaged by this Directive, emission limit values for other substances and other media, and other appropriate conditions.
- (14) Industrial experience in the implementation of techniques for the reduction of polluting emissions from incineration plants has been acquired over a period of ten years.
- (15) Council Directives 89/369/EEC⁽²⁾ and 89/429/EEC⁽³⁾ on the prevention and reduction of air pollution from municipal waste incineration plants have contributed to the reduction and control of atmospheric emissions from incineration plants. More stringent rules should now be adopted and those Directives should accordingly be repealed.
- (16) The distinction between hazardous and non-hazardous waste is based principally on the properties of waste prior to incineration or co-incineration but not on differences in emissions. The same emission limit values should apply to the incineration or co-incineration of hazardous and non-hazardous waste but different techniques and conditions of incineration or co-incineration and different monitoring measures upon reception of waste should be retained.
- (17) Member States should take into account Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air⁽⁴⁾ when implementing this Directive.
- (18) The incineration of hazardous waste with a content of more than 1 % of halogenated organic substances, expressed as chlorine, has to comply with certain operational conditions in order to destroy as many organic pollutants such as dioxins as possible.
- (19) The incineration of waste which contains chlorine generates flue gas residues. Such residues should be managed in a way that minimises their amount and harmfulness.
- (20) There may be grounds to provide for specified exemptions to the emission limit values for some pollutants during a specified time limit and subject to specific conditions.
- (21) Criteria for certain sorted combustible fraction of non-hazardous waste not suitable for recycling, should be developed in order to allow the authorisation of the reduction of the frequency of periodical measurements.
- (22) A single text on the incineration of waste will improve legal clarity and enforceability. There should be a single directive for the incineration and co-incineration of hazardous and non-hazardous waste taking fully into account the substance and structure of Council Directive 94/67/EC of 16 December 1994 on the incineration of hazardous waste⁽⁵⁾. Therefore Directive 94/67/EC should also be repealed.
- (23) Article 4 of Council Directive 75/442/EEC of 15 July 1975 on waste⁽⁶⁾ requires Member States to take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without harming the environment. To this end, Articles 9 and 10 of that Directive provide that any plant or undertaking treating waste must obtain a permit from the competent authorities relating, *inter alia*, to the precautions to be taken.

⁽¹⁾ OJ L 257, 10.10.1996, p. 26.

⁽²⁾ OJ L 163, 14.6.1989, p. 32. Directive as last amended by the Accession Act of 1994.

⁽³⁾ OJ L 203, 15.7.1989, p. 50. Directive as last amended by the Accession Act of 1994.

⁽⁴⁾ OJ L 163, 29.6.1999, p. 41.

⁽⁵⁾ OJ L 365, 31.12.1994, p. 34.

⁽⁶⁾ OJ L 194, 25.7.1975, p. 39. Directive as last amended by Commission Decision 350/96/EC (OJ L 135, 6.6.1996, p. 32).

- (24) The requirements for recovering the heat generated by the incineration or co-incineration process and for minimising and recycling residues resulting from the operation of incineration or co-incineration plants will assist in meeting the objectives of Article 3 on the waste hierarchy of Directive 75/442/EEC.
- (25) Incineration and co-incineration plants treating only animal waste regulated by Directive 90/667/EEC⁽¹⁾ are excluded from the scope of this Directive. The Commission intends to propose a revision to the requirements of Directive 90/667 with a view to providing for high environmental standards for the incineration and co-incineration of animal waste.
- (26) The permit for an incineration or co-incineration plant shall also comply with any applicable requirements laid down in Directives 91/271/EEC⁽²⁾, 96/61/EC, 96/62/EC⁽³⁾, 76/464/EEC⁽⁴⁾, and 1999/31/EC⁽⁵⁾.
- (27) The co-incineration of waste in plants not primarily intended to incinerate waste should not be allowed to cause higher emissions of polluting substances in that part of the exhaust gas volume resulting from such co-incineration than those permitted for dedicated incineration plants and should therefore be subject to appropriate limitations.
- (28) High-standard measurement techniques are required to monitor emissions to ensure compliance with the emission limit values for the pollutants.
- (29) The introduction of emission limit values for the discharge of waste water from the cleaning of exhaust gases from incineration and co-incineration plants will limit a transfer of pollutants from the air into water.
- (30) Provisions should be laid down for cases where the emission limit values are exceeded as well as for technically unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices.
- (31) In order to ensure transparency of the permitting process throughout the Community the public should have access to information with a view to allowing it to be involved in decisions to be taken following applications for new permits and their subsequent updates. The

public should have access to reports on the functioning and monitoring of the plants burning more than three tonnes per hour in order to be informed of their potential effects on the environment and human health.

- (32) The Commission should present a report both to the European Parliament and the Council based on the experience of applying this Directive, the new scientific knowledge gained, the development of the state of technology, the progress achieved in emission control techniques, and on the experience made in waste management and operation of the plants and on the development of environmental requirements, with a view to proposing, as appropriate, to adapt the related provisions of this Directive.
- (33) The measures necessary for the implementation of this Directive are to be adopted in accordance with Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission⁽⁶⁾.
- (34) Member States should lay down rules on penalties applicable to infringements of the provisions of this Directive and ensure that they are implemented; those penalties should be effective, proportionate and dissuasive,

HAVE ADOPTED THIS DIRECTIVE:

Article 1

Objectives

The aim of this Directive is to prevent or to limit as far as practicable negative effects on the environment, in particular pollution by emissions into air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste.

This aim shall be met by means of stringent operational conditions and technical requirements, through setting emission limit values for waste incineration and co-incineration plants within the Community and also through meeting the requirements of Directive 75/442/EEC.

Article 2

Scope

1. This Directive covers incineration and co-incineration plants.

⁽⁶⁾ OJ L 184, 17.7.1999, p. 23.

⁽¹⁾ Council Directive 90/667/EEC of 27 November 1990, laying down the veterinary rules for the disposal and processing of animal waste, for its placing on the market and for the prevention of pathogens in feedstuffs of animal or fish origin and amending Directive 90/425/EEC (OJ L 363, 27.12.1990, p. 51). Directive as last amended by the Accession Act of 1994.

⁽²⁾ Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ L 135, 30.5.1991, p. 40). Directive as amended by Directive 98/15/EC (OJ L 67, 7.3.1998, p. 29).

⁽³⁾ Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management (OJ L 296, 21.11.1996, p. 55).

⁽⁴⁾ Council Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (OJ L 129, 18.5.1976, p. 23). Directive as last amended by the Accession Act of 1994.

⁽⁵⁾ Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OJ L 182, 16.7.1999, p. 1).

2. The following plants shall however be excluded from the scope of this Directive:

(a) Plants treating only the following wastes:

- (i) vegetable waste from agriculture and forestry,
- (ii) vegetable waste from the food processing industry, if the heat generated is recovered,
- (iii) fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered,
- (iv) wood waste with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood-preserved or coating, and which includes in particular such wood waste originating from construction and demolition waste,
- (v) cork waste,
- (vi) radioactive waste,
- (vii) animal carcasses as regulated by Directive 90/667/EEC without prejudice to its future amendments,
- (viii) waste resulting from the exploration for, and the exploitation of, oil and gas resources from off-shore installations and incinerated on board the installation;

(b) Experimental plants used for research, development and testing in order to improve the incineration process and which treat less than 50 tonnes of waste per year.

(i) the mass content of polychlorinated aromatic hydrocarbons, e.g. polychlorinated biphenyls (PCB) or pentachlorinated phenol (PCP) amounts to concentrations not higher than those set out in the relevant Community legislation;

(ii) these wastes are not rendered hazardous by virtue of containing other constituents listed in Annex II to Directive 91/689/EEC in quantities or in concentrations which are inconsistent with the achievement of the objectives set out in Article 4 of Directive 75/442/EEC; and

(iii) the net calorific value amounts to at least 30 MJ per kilogramme,

(b) any combustible liquid wastes which cannot cause, in the flue gas directly resulting from their combustion, emissions other than those from gasoil as defined in Article 1(1) of Directive 93/12/EEC⁽¹⁾ or a higher concentration of emissions than those resulting from the combustion of gasoil as so defined;

3. 'mixed municipal waste' means waste from households as well as commercial, industrial and institutional waste, which because of its nature and composition is similar to waste from households, but excluding fractions indicated in the Annex to Decision 94/3/EC⁽²⁾ under heading 20 01 that are collected separately at source and excluding the other wastes indicated under heading 20 02 of that Annex;

4. 'incineration plant' means any stationary or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without recovery of the combustion heat generated. This includes the incineration by oxidation of waste as well as other thermal treatment processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment are subsequently incinerated.

This definition covers the site and the entire incineration plant including all incineration lines, waste reception, storage, on site pretreatment facilities, waste-fuel and air-supply systems, boiler, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, stack, devices and systems for controlling incineration operations, recording and monitoring incineration conditions;

5. 'co-incineration plant' means any stationary or mobile plant whose main purpose is the generation of energy or production of material products and:

- which uses wastes as a regular or additional fuel; or
- in which waste is thermally treated for the purpose of disposal.

Article 3

Definitions

For the purposes of this Directive:

1. 'waste' means any solid or liquid waste as defined in Article 1(a) of Directive 75/442/EEC;
2. 'hazardous waste' means any solid or liquid waste as defined in Article 1(4) of Council Directive 91/689/EEC of 12 December 1991 on hazardous waste⁽¹⁾.

For the following hazardous wastes, the specific requirements for hazardous waste in this Directive shall not apply:

- (a) combustible liquid wastes including waste oils as defined in Article 1 of Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils⁽²⁾ provided that they meet the following criteria:

⁽¹⁾ OJ L 377, 31.12.1991, p. 20. Directive as amended by Directive 94/31/EC. (OJ L 168, 2.7.1994, p. 28).

⁽²⁾ OJ L 194, 25.7.1975, p. 23. Directive as last amended by the Accession Act of 1994.

⁽¹⁾ Council Directive 93/12/EEC of 23 March 1993 relating to the sulphur content of certain liquid fuels (OJ L 74, 27.3.1993, p. 81). Directive as last amended by Directive 1999/32/EC (OJ L 121, 11.5.1999, p. 13).

⁽²⁾ Commission Decision 94/3/EC of 20 December 1993 establishing a list of wastes pursuant to Article 1a of Council Directive 75/442/EEC on waste (OJ L 5, 7.1.1994, p. 15).

If co-incineration takes place in such a way that the main purpose of the plant is not the generation of energy or production of material products but rather the thermal treatment of waste, the plant shall be regarded as an incineration plant within the meaning of point 4.

This definition covers the site and the entire plant including all co-incineration lines, waste reception, storage, on site pretreatment facilities, waste-, fuel- and air-supply systems, boiler, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, stack devices and systems for controlling incineration operations, recording and monitoring incineration conditions;

6. 'existing co-incineration or co-incineration plant' means an incineration or co-incineration plant:

- (a) which is in operation and has a permit in accordance with existing Community legislation before 28 December 2002, or,
- (b) which is authorised or registered for incineration or co-incineration and has a permit issued before 28 December 2002 in accordance with existing Community legislation, provided that the plant is put into operation not later than 28 December 2003, or
- (c) which, in the view of the competent authority, is the subject of a full request for a permit, before 28 December 2002, provided that the plant is put into operation not later than 28 December 2004;

7. 'nominal capacity' means the sum of the incineration capacities of the furnaces of which an incineration plant is composed, as specified by the constructor and confirmed by the operator, with due account being taken, in particular, of the calorific value of the waste, expressed as the quantity of waste incinerated per hour;

8. 'emission' means the direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources in the plant into the air, water or soil;

9. 'emission limit values' means the mass, expressed in terms of certain specific parameters, concentration and/or level of an emission, which may not be exceeded during one or more periods of time;

10. 'dioxins and furans' means all polychlorinated dibenzo-p-dioxins and dibenzofurans listed in Annex I;

11. 'operator' means any natural or legal person who operates or controls the plant or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the plant has been delegated;

12. 'permit' means a written decision (or several such decisions) delivered by the competent authority granting authorisation to operate a plant, subject to certain conditions which guarantee that the plant complies with all the

requirements of this Directive. A permit may cover one or more plants or parts of a plant on the same site operated by the same operator;

13. 'residue' means any liquid or solid material (including bottom ash and slag, fly ash and boiler dust, solid reaction products from gas treatment, sewage sludge from the treatment of waste waters, spent catalysts and spent activated carbon) defined as waste in Article 1(a) of Directive 75/442/EEC, which is generated by the incineration or co-incineration process, the exhaust gas or waste water treatment or other processes within the incineration or co-incineration plant.

Article 4

Application and permit

1. Without prejudice to Article 11 of Directive 75/442/EEC or to Article 3 of Directive 91/689/EEC, no incineration or co-incineration plant shall operate without a permit to carry out these activities.

2. Without prejudice to Directive 96/61/EC, the application for a permit for an incineration or co-incineration plant to the competent authority shall include a description of the measures which are envisaged to guarantee that:

- (a) the plant is designed, equipped and will be operated in such a manner that the requirements of this Directive are taking into account the categories of waste to be incinerated;
- (b) the heat generated during the incineration and co-incineration process is recovered as far as practicable e.g. through combined heat and power, the generating of process steam or district heating;
- (c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;
- (d) the disposal of the residues which cannot be prevented, reduced or recycled will be carried out in conformity with national and Community legislation.

3. The permit shall be granted only if the application shows that the proposed measurement techniques for emissions into the air comply with Annex III and, as regards water, comply with Annex III paragraphs 1 and 2.

4. The permit granted by the competent authority for an incineration or co-incineration plant shall, in addition to complying with any applicable requirement laid down in Directives 91/271/EEC, 96/61/EC, 96/62/EC, 76/464/EEC and 1999/31/EC:

- (a) list explicitly the categories of waste which may be treated. The list shall use at least the categories of waste set up in the European Waste Catalogue (EWC), if possible, and contain information on the quantity of waste, where appropriate;

(b) include the total waste incinerating or co-incinerating capacity of the plant;

(c) specify the sampling and measurement procedures used to satisfy the obligations imposed for periodic measurements of each air and water pollutants.

5. The permit granted by the competent authority to an incineration or co-incineration plant using hazardous waste shall in addition to paragraph 4:

(a) list the quantities of the different categories of hazardous waste which may be treated;

(b) specify the minimum and maximum mass flows of those hazardous wastes, their lowest and maximum calorific values and their maximum contents of pollutants, e.g. PCB, PCP, chlorine, fluorine, sulphur, heavy metals.

6. Without prejudice to the provisions of the Treaty, Member States may list the categories of waste to be mentioned in the permit which can be co-incinerated in defined categories of co-incineration plants.

7. Without prejudice to Directive 96/61/EC, the competent authority shall periodically reconsider and, where necessary, update permit conditions.

8. Where the operator of an incineration or co-incineration plant for non-hazardous waste is envisaging a change of operation which would involve the incineration or co-incineration of hazardous waste, this shall be regarded as a substantial change within the meaning of Article 2(10)(b) of Directive 96/61/EC and Article 12(2) of that Directive shall apply.

9. If an incineration or co-incineration plant does not comply with the conditions of the permit, in particular with the emission limit values for air and water, the competent authority shall take action to enforce compliance.

Article 5

Delivery and reception of waste

1. The operator of the incineration or co-incineration plant shall take all necessary precautions concerning the delivery and reception of waste in order to prevent or to limit as far as practicable negative effects on the environment, in particular the pollution of air, soil, surface water and groundwater as well as odours and noise, and direct risks to human health. These

measures shall meet at least the requirements set out in paragraphs 3 and 4.

2. The operator shall determine the mass of each category of waste, if possible according to the EWC, prior to accepting the waste at the incineration or co-incineration plant.

3. Prior to accepting hazardous waste at the incineration or co-incineration plant, the operator shall have available information about the waste for the purpose of verifying, *inter alia*, compliance with the permit requirements specified in Article 4(5). This information shall cover:

(a) all the administrative information on the generating process contained in the documents mentioned in paragraph 4(a);

(b) the physical, and as far as practicable, chemical composition of the waste and all other information necessary to evaluate its suitability for the intended incineration process;

(c) the hazardous characteristics of the waste, the substances with which it cannot be mixed, and the precautions to be taken in handling the waste.

4. Prior to accepting hazardous waste at the incineration or co-incineration plant, at least the following reception procedures shall be carried out by the operator:

(a) the checking of those documents required by Directive 91/689/EEC and, where applicable, those required by Council Regulation (EEC) No 259/93 of 1 February 1993 on the supervision, and control of shipments of waste within, into and out of the European Community⁽¹⁾ and by dangerous-goods transport regulations;

(b) the taking of representative samples, unless inappropriate, e.g. for infectious clinical waste, as far as possible before unloading, to verify conformity with the information provided for in paragraph 3 by carrying out controls and to enable the competent authorities to identify the nature of the wastes treated. These samples shall be kept for at least one month after the incineration.

5. The competent authorities may grant exemptions from paragraphs 2, 3 and 4 for industrial plants and undertakings incinerating or co-incinerating only their own waste at the place of generation of the waste provided that the requirements of this Directive are met.

Article 6

Operating conditions

1. Incineration plants shall be operated in order to achieve a level of incineration such that the slag and bottom ashes Total Organic Carbon (TOC) content is less than 3 % or their loss on ignition is less than 5 % of the dry weight of the material. If necessary appropriate techniques of waste pretreatment shall be used.

⁽¹⁾ OJ L 30, 6.2.1993, p. 1. Regulation as last amended by Commission Regulation (EC) No 2408/98 (OJ L 298, 7.11.1998, p. 19).

Incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850 °C, as measured near the inner wall or at another representative point of the combustion chamber as authorised by the competent authority, for two seconds. If hazardous wastes with a content of more than 1 % of halogenated organic substances, expressed as chlorine, are incinerated, the temperature has to be raised to 1 100 °C for at least two seconds.

Each line of the incineration plant shall be equipped with at least one auxiliary burner. This burner must be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below 850 °C or 1 100 °C as the case may be. It shall also be used during plant start-up and shut-down operations in order to ensure that the temperature of 850 °C or 1 100 °C as the case may be is maintained at all times during these operations and as long as unburned waste is in the combustion chamber.

During start-up and shut-down or when the temperature of the combustion gas falls below 850 °C or 1 100 °C as the case may be, the auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gasoil as defined in Article 1(1) of Council Directive 75/716/EEC, liquefied gas or natural gas.

2. Co-incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the co-incineration of waste is raised in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850 °C for two seconds. If hazardous wastes with a content of more than 1 % of halogenated organic substances, expressed as chlorine, are co-incinerated, the temperature has to be raised to 1 100 °C.

3. Incineration and co-incineration plants shall have and operate an automatic system to prevent waste feed:

- (a) at start-up, until the temperature of 850 °C or 1 100 °C as the case may be or the temperature specified according to paragraph 4 has been reached;
- (b) whenever the temperature of 850 °C or 1 100 °C as the case may be or the temperature specified according to paragraph 4 is not maintained;
- (c) whenever the continuous measurements required by this Directive show that any emission limit value is exceeded due to disturbances or failures of the purification devices.

4. Conditions different from those laid down in paragraph 1 and, as regards the temperature, paragraph 3 and specified in the permit for certain categories of waste or for certain thermal processes may be authorised by the competent authority,

provided the requirements of this Directive are met. Member States may lay down rules governing these authorisations. The change of the operational conditions shall not cause more residues or residues with a higher content of organic pollutants compared to those residues which could be expected under the conditions laid down in paragraph 1.

Conditions different from those laid down in paragraph 2 and, as regards the temperature, paragraph 3 and specified in the permit for certain categories of waste or for certain thermal processes may be authorised by the competent authority, provided the requirements of this Directive are met. Member States may lay down rules governing these authorisations. Such authorisation shall be conditional upon at least the provisions for emission limit values set out in Annex V for total organic carbon and CO being complied with.

In the case of co-incineration of their own waste at the place of its production in existing bark boilers within the pulp and paper industry, such authorisation shall be conditional upon at least the provisions for emission limit values set out in Annex V for total organic carbon being complied with.

All operating conditions determined under this paragraph and the results of verifications made shall be communicated by the Member State to the Commission as part of the information provided in accordance with the reporting requirements.

5. Incineration and co-incineration plants shall be designed, equipped, built and operated in such a way as to prevent emissions into the air giving rise to significant ground-level air pollution; in particular, exhaust gases shall be discharged in a controlled fashion and in conformity with relevant Community air quality standards by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.

6. Any heat generated by the incineration or the co-incineration process shall be recovered as far as practicable.

7. Infectious clinical waste should be placed straight in the furnace, without first being mixed with other categories of waste and without direct handling.

8. The management of the incineration or the co-incineration plant shall be in the hands of a natural person who is competent to manage the plant.

Article 7

Air emission limit values

1. Incineration plants shall be designed, equipped, built and operated in such a way that the emission limit values set out in Annex V are not exceeded in the exhaust gas.

2. Co-incineration plants shall be designed, equipped, built and operated in such a way that the emission limit values determined according to or set out in Annex II are not exceeded in the exhaust gas.

If in a co-incineration plant more than 40 % of the resulting heat release comes from hazardous waste, the emission limit values set out in Annex V shall apply.

3. The results of the measurements made to verify compliance with the emission limit values shall be standardised with respect to the conditions laid down in Article 11.

4. In the case of co-incineration of untreated mixed municipal waste, the limit values will be determined according to Annex V, and Annex II will not apply.

5. Without prejudice to the provisions of the Treaty, Member States may set emission limit values for polycyclic aromatic hydrocarbons or other pollutants.

Article 8

Water discharges from the cleaning of exhaust gases

1. Waste water from the cleaning of exhaust gases discharged from an incineration or co-incineration plant shall be subject to a permit granted by the competent authorities.

2. Discharges to the aquatic environment of waste water resulting from the cleaning of exhaust gases shall be limited as far as practicable, at least in accordance with the emission limit values set in Annex IV.

3. Subject to a specific provision in the permit, the waste water from the cleaning of exhaust gases may be discharged to the aquatic environment after separate treatment on condition that:

- (a) the requirements of relevant Community, national and local provisions are complied with in the form of emission limit values; and
- (b) the mass concentrations of the polluting substances referred to in Annex IV do not exceed the emission limit values laid down therein.

4. The emission limit values shall apply at the point where waste waters from the cleaning of exhaust gases containing the polluting substances referred to in Annex IV are discharged from the incineration or co-incineration plant.

Where the waste water from the cleaning of exhaust gases is treated on site collectively with other on-site sources of waste water, the operator shall take the measurements referred to in Article 11:

- (a) on the waste water stream from the exhaust gas cleaning processes prior to its input into the collective waste water treatment plant;

- (b) on the other waste water stream or streams prior to its or their input into the collective waste water treatment plant;

- (c) at the point of final waste water discharge, after the treatment, from the incineration plant or co-incineration plant.

The operator shall take appropriate mass balance calculations in order to determine the emission levels in the final waste water discharge that can be attributed to the waste water arising from the cleaning of exhaust gases in order to check compliance with the emission limit values set out in Annex IV for the waste water stream from the exhaust gas cleaning process.

Under no circumstances shall dilution of waste water take place for the purpose of complying with the emission limit values set in Annex IV.

5. When waste waters from the cleaning of exhaust gases containing the polluting substances referred to in Annex IV are treated outside the incineration or co-incineration plant at a treatment plant intended only for the treatment of this sort of waste water, the emission limit values of Annex IV are to be applied at the point where the waste waters leave the treatment plant. If this off-site treatment plant is not only dedicated to treat waste water from incineration, the operator shall take the appropriate mass balance calculations, as provided for under paragraph 4(a), (b) and (c), in order to determine the emission levels in the final waste water discharge that can be attributed to the waste water arising from the cleaning of exhaust gases in order to check compliance with the emission limit values set out in Annex IV for the waste water stream from the exhaust gas cleaning process.

Under no circumstances shall dilution of waste water take place for the purpose of complying with the emission limit values set in Annex IV.

6. The permit shall:

- (a) establish emission limit values for the polluting substances referred to in Annex IV, in accordance with paragraph 2 and in order to meet the requirements referred to in paragraph 3(a);
- (b) set operational control parameters for waste water at least for pH, temperature and flow.

7. Incineration and co-incineration plant sites, including associated storage areas for wastes, shall be designed and in such a way as to prevent the unauthorised and accidental release of any polluting substances into soil, surface water and groundwater in accordance with the provisions provided for in relevant Community legislation. Moreover, storage capacity shall be provided for contaminated rainwater run-off from the incineration or co-incineration plant site or for contaminated water arising from spillage or fire-fighting operations.

The storage capacity shall be adequate to ensure that such waters can be tested and treated before discharge where necessary.

8. Without prejudice to the provisions of the Treaty, Member States may set emission limit values for polycyclic aromatic hydrocarbons or other pollutants.

Article 9

Residues

Residues resulting from the operation of the incineration or co-incineration plant shall be minimised in their amount and harmfulness. Residues shall be recycled, where appropriate, directly in the plant or outside in accordance with relevant Community legislation.

Transport and intermediate storage of dry residues in the form of dust, such as boiler dust and dry residues from the treatment of combustion gases, shall take place in such a way as to prevent dispersal in the environment e.g. in closed containers.

Prior to determining the routes for the disposal or recycling of the residues from incineration and co-incineration plants, appropriate tests shall be carried out to establish the physical and chemical characteristics and the polluting potential of the different incineration residues. The analysis shall concern the total soluble fraction and heavy metals soluble fraction.

Article 10

Control and monitoring

1. Measurement equipment shall be installed and techniques used in order to monitor the parameters, conditions and mass concentrations relevant to the incineration or co-incineration process.

2. The measurement requirements shall be laid down in the permit or in the conditions attached to the permit issued by the competent authority.

3. The appropriate installation and the functioning of the automated monitoring equipment for emissions into air and water shall be subject to control and to an annual surveillance test. Calibration has to be done by means of parallel measurements with the reference methods at least every three years.

4. The location of the sampling or measurement points shall be laid down by the competent authority.

5. Periodic measurements of the emissions into the air and water shall be carried out in accordance with Annex III, points 1 and 2.

Article 11

Measurement requirements

1. Member States shall, either by specification in the conditions of the permit or by general binding rules, ensure that paragraphs 2 to 12 and 17, as regards air, and paragraphs 9 and 14 to 17, as regards water, are complied with.

2. The following measurements of air pollutants shall be carried out in accordance with Annex III at the incineration and co-incineration plant:

(a) continuous measurements of the following substances: NO_x , provided that emission limit values are set, CO, total dust, TOC, HCl, HF, SO_2 ;

(b) continuous measurements of the following process operation parameters: temperature near the inner wall or at another representative point of the combustion chamber as authorised by the competent authority, concentration of oxygen, pressure, temperature and water vapour content of the exhaust gas;

(c) at least two measurements per year of heavy metals, dioxins and furans; one measurement at least every three months shall however be carried out for the first 12 months of operation. Member States may fix measurement periods where they have set emission limit values for polycyclic aromatic hydrocarbons or other pollutants.

3. The residence time as well as the minimum temperature and the oxygen content of the exhaust gases shall be subject to appropriate verification, at least once when the incineration or co-incineration plant is brought into service and under the most unfavourable operating conditions anticipated.

4. The continuous measurement of HF may be omitted if treatment stages for HCl are used which ensure that the emission limit value for HCl is not being exceeded. In this case the emissions of HF shall be subject to periodic measurements as laid down in paragraph 2(c).

5. The continuous measurement of the water vapour content shall not be required if the sampled exhaust gas is dried before the emissions are analysed.

6. Periodic measurements as laid down in paragraph 2(c) of HCl, HF and SO_2 instead of continuous measuring may be authorised in the permit by the competent authority in incineration or co-incineration plants, if the operator can prove that the emissions of those pollutants can under no circumstances be higher than the prescribed emission limit values.

7. The reduction of the frequency of the periodic measurements for heavy metals from twice a year to once every two years and for dioxins and furans from twice a year to once every year may be authorised in the permit by the competent authority provided that the emissions resulting from co-incineration or incineration are below 50 % of the emission limit values determined according to Annex II or Annex V respectively and provided that criteria for the requirements to be met, developed in accordance with the procedure laid down in Article 17, are available. These criteria shall at least be based on the provisions of the second subparagraph, points (a) and (d).

Until 1 January 2005 the reduction of the frequency may be authorised even if no such criteria are available provided that:

- (a) the waste to be co-incinerated or incinerated consists only of certain sorted combustible fractions of non-hazardous waste not suitable for recycling and presenting certain characteristics, and which is further specified on the basis of the assessment referred to in subparagraph (d);
- (b) national quality criteria, which have been reported to the Commission, are available for these wastes;
- (c) co-incineration and incineration of these wastes is in line with the relevant waste management plans referred to in Article 7 of Directive 75/442/EEC;
- (d) the operator can prove to the competent authority that the emissions are under all circumstances significantly below the emission limit values set out in Annex II or Annex V for heavy metals, dioxins and furans; this assessment shall be based on information on the quality of the waste concerned and measurements of the emissions of the said pollutants;
- (e) the quality criteria and the new period for the periodic measurements are specified in the permit; and
- (f) all decisions on the frequency of measurements referred to in this paragraph, supplemented with information on the amount and quality of the waste concerned, shall be communicated on a yearly basis to the Commission.

8. The results of the measurements made to verify compliance with the emission limit values shall be standardised at the following conditions and for oxygen according to the formula as referred to in Annex VI:

- (a) Temperature 273 K, pressure 101,3 kPa, 11 % oxygen, dry gas, in exhaust gas of incineration plants;
- (b) Temperature 273 K, pressure 101,3 kPa, 3 % oxygen, dry gas, in exhaust gas of incineration of waste oil as defined in Directive 75/439/EEC;
- (c) when the wastes are incinerated or co-incinerated in an oxygen-enriched atmosphere, the results of the measurements can be standardised at an oxygen content laid down by the competent authority reflecting the special circumstances of the individual case;
- (d) in the case of co-incineration, the results of the measurements shall be standardised at a total oxygen content as calculated in Annex II.

When the emissions of pollutants are reduced by exhaust gas treatment in an incineration or co-incineration plant treating hazardous waste, the standardisation with respect to the oxygen contents provided for in the first subparagraph shall be done only if the oxygen content measured over the same period as for the pollutant concerned exceeds the relevant standard oxygen content.

9. All measurement results shall be recorded, processed and presented in an appropriate fashion in order to enable the competent authorities to verify compliance with the permitted operating conditions and emission limit values laid down in this Directive in accordance with procedures to be decided upon by those authorities.

10. The emission limit values for air shall be regarded as being complied with if:

- (a) — none of the daily average values exceeds any of the emission limit values set out in Annex V(a) or Annex II;
— 97 % of the daily average value over the year does not exceed the emission limit value set out in Annex V(e) first indent;
- (b) either none of the half-hourly average values exceeds any of the emission limit values set out in Annex V(b), column A or, where relevant, 97 % of the half-hourly average values over the year do not exceed any of the emission limit values set out in Annex V(b), column B;
- (c) none of the average values over the sample period set out for heavy metals and dioxins and furans exceeds the emission limit values set out in Annex V(c) and (d) or Annex II;
- (d) the provisions of Annex V(e), second indent or Annex II, are met.

11. The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (excluding the start-up and shut-off periods if no waste is being incinerated) from the measured values after having subtracted the value of the confidence interval specified in point 3 of Annex III. The daily average values shall be determined from those validated average values.

To obtain a valid daily average value no more than five half-hourly average values in any day shall be discarded due to malfunction or maintenance of the continuous measurement system. No more than ten daily average values per year shall be discarded due to malfunction or maintenance of the continuous measurement system.

12. The average values over the sample period and the average values in the case of periodical measurements of HF, HCl and SO₂ shall be determined in accordance with the requirements of Article 10(2) and (4) and Annex III.

13. The Commission, acting in accordance with the procedure laid down in Article 17, shall decide, as soon as appropriate measurement techniques are available within the Community, the date from which continuous measurements of the air emission limit values for heavy metals, dioxins and furans shall be carried out in accordance with Annex III.

14. The following measurements shall be carried out at the point of waste water discharge:

- (a) continuous measurements of the parameters referred to in Article 8(6)(b);
- (b) spot sample daily measurements of total suspended solids; Member States may alternatively provide for measurements of a flow proportional representative sample over a period of 24 hours;
- (c) at least monthly measurements of a flow proportional representative sample of the discharge over a period of 24 hours of the polluting substances referred to in Article 8(3) with respect to items 2 to 10 in Annex IV;

(d) at least every six months measurements of dioxins and furans; however one measurement at least every three months shall be carried out for the first 12 months of operation. Member States may fix measurement periods where they have set emission limit values for polycyclic aromatic hydrocarbons or other pollutants.

15. The monitoring of the mass of pollutants in the treated waste water shall be done in conformity with Community legislation and laid down in the permit as well as the frequency of the measurements.

16. The emission limit values for water shall be regarded as being complied with if:

- (a) for total suspended solids (polluting substance number 1), 95 % and 100 % of the measured values do not exceed the respective emission limit values as set out in Annex IV;
- (b) for heavy metals (polluting substances number 2 to 10) no more than one measurement per year exceeds the emission limit values set out in Annex IV; or, if the Member State provides for more than 20 samples per year, no more than 5 % of these samples exceed the emission limit values set out in Annex IV;
- (c) for dioxins and furans (polluting substance 11), the twice-yearly measurements do not exceed the emission limit value set out in Annex IV.

17. Should the measurements taken show that the emission limit values for air or water laid down in this Directive have been exceeded, the competent authorities shall be informed without delay.

Article 12

Access to information and public participation

1. Without prejudice to Council Directive 90/313/EEC⁽¹⁾ and Directive 96/61/EC, applications for new permits for incineration and co-incineration plants shall be made available at one or more locations accessible to the public, such as local authority offices, for an appropriate period to enable it to comment on them before the competent authority reaches a decision. That decision, including at least a copy of the permit, and any subsequent updates, shall also be made available to the public.

2. For incineration or co-incineration plants with a nominal capacity of two tonnes or more per hour and notwithstanding Article 15(2) of Directive 96/61/EC, an annual report to be provided by the operator to the competent authority on the functioning and monitoring of the plant shall be made available to the public. This report shall, as a minimum requirement, give an account of the running of the process and the emissions into air and water compared with the emission standards in this Directive. A list of incineration or co-incineration plants with a nominal capacity of less than two tonnes per

hour shall be drawn up by the competent authority and shall be made available to the public.

Article 13

Abnormal operating conditions

1. The competent authority shall lay down in the permit the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the concentrations in the discharges into the air and the purified waste water of the regulated substances may exceed the prescribed emission limit values.

2. In the case of a breakdown, the operator shall reduce or close down operations as soon as practicable until normal operations can be restored.

3. Without prejudice to Article 6(3)(c), the incineration plant or co-incineration plant or incineration line shall under no circumstances continue to incinerate waste for a period of more than four hours uninterrupted where emission limit values are exceeded; moreover, the cumulative duration of operation in such conditions over one year shall be less than 60 hours. The 60-hour duration applies to those lines of the entire plant which are linked to one single flue gas cleaning device.

4. The total dust content of the emissions into the air of an incineration plant shall under no circumstances exceed 150 mg/m³ expressed as a half-hourly average; moreover the air emission limit values for CO and TOC shall not be exceeded. All other conditions referred to in Article 6 shall be complied with.

Article 14

Review clause

Without prejudice to Directive 96/61/EC, the Commission shall submit a report to the European Parliament and the Council before 31 December 2008 based on experience of the application of this Directive, in particular for new plants, and on the progress achieved in emission control techniques and experience in waste management. Furthermore, the report shall be based on the development of the state of technology, of experience in the operation of the plants, of environmental requirements. This report will include a specific section on the application of Annex II.1.1. and in particular on the economic and technical feasibility for existing cement kilns as referred to in the footnote to Annex II.1.1. of respecting the NO_x emission limit value for new cement kilns set out in that Annex. The report shall, as appropriate, be accompanied by proposals for revision of the related provisions of this Directive. However, the Commission shall, if appropriate, propose an amendment for Annex II.3 before the said report, if major waste streams are directed to types of co-incineration plants other than those dealt with in Annex II.1 and II.2.

⁽¹⁾ Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment (OJ L 158, 23.6.1990, p. 56). Directive as last amended by the Accession Act of 1994.

Article 15**Reporting**

The reports on the implementation of this Directive shall be established in accordance with the procedure laid down in Article 5 of Council Directive 91/692/EEC. The first report shall cover at least the first full three-year period after 28 December 2002 and comply with the periods referred to in Article 17 of Directive 94/67/EC and in Article 16(3) of Directive 96/61/EC. To this effect, the Commission shall elaborate the appropriate questionnaire in due time.

Article 16**Future adaptation of the directive**

The Commission shall, in accordance with the procedure laid down in Article 17(2), amend Articles 10, 11 and 13 and Annexes I and III in order to adapt them to technical progress or new findings concerning the health benefits of emission reductions.

Article 17**Regulatory committee**

1. The Commission shall be assisted by a regulatory committee.
 2. Where reference is made to this paragraph, Articles 5 and 7 of Decision 1999/468/EC shall apply, having regard to the provisions of Article 8 thereof.
- The period laid down in Article 5(6) of Decision 1999/468/EC shall be set at three months.
3. The committee shall adopt its own rules of procedure.

Article 18**Repeal**

The following shall be repealed as from 28 December 2005:

- (a) Article 8(1) and the Annex to Directive 75/439/EEC;
- (b) Directive 89/369/EEC;
- (c) Directive 89/429/EEC;
- (d) Directive 94/67/EC.

Article 19**Penalties**

The Member States shall determine penalties applicable to breaches of the national provisions adopted pursuant to this Directive. The penalties thus provided for shall be effective, proportionate and dissuasive. The Member States shall notify those provisions to the Commission by 28 December 2002 at the latest and shall notify it without delay of any subsequent amendment affecting them.

Article 20**Transitional provisions**

1. Without prejudice to the specific transitional provisions provided for in the Annexes to this Directive, the provisions of this Directive shall apply to existing plants as from 28 December 2005.
2. For new plants, i.e. plants not falling under the definition of 'existing incineration or co-incineration plant' in Article 3(6) or paragraph 3 of this Article, this Directive, instead of the Directives mentioned in Article 18, shall apply as from 28 December 2002.
3. Stationary or mobile plants whose purpose is the generation of energy or production of material products and which are in operation and have a permit in accordance with existing Community legislation where required and which start co-incinerating waste not later than 28 December 2004 are to be regarded as existing co-incineration plants.

Article 21**Implementation**

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than 28 December 2002. They shall forthwith inform the Commission thereof.

When Member States adopt those measures, they shall contain a reference to this Directive or be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by the Member States.

2. Member States shall communicate to the Commission the text of the provisions of domestic law which they adopt in the field governed by this Directive.

Article 22**Entry into force**

This Directive shall enter into force on the day of its publication in the *Official Journal of the European Communities*.

Article 23**Addressees**

This Directive is addressed to the Member States.

Done at Brussels, 4 December 2000.

For the European Parliament

The President

N. FONTAINE

For the Council

The President

F. VÉDRINE

ANNEX I

Equivalence factors for dibenzo-p-dioxins and dibenzofurans

For the determination of the total concentration (TE) of dioxins and furans, the mass concentrations of the following dibenzo-p-dioxins and dibenzofurans shall be multiplied by the following equivalence factors before summing:

		Toxic equivalence factor
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

ANNEX II

DETERMINATION OF AIR EMISSION LIMIT VALUES FOR THE CO-INCINERATION OF WASTE

The following formula (mixing rule) is to be applied whenever a specific total emission limit value 'C' has not been set out in a table in this Annex.

The limit value for each relevant pollutant and carbon monoxide in the exhaust gas resulting from the co-incineration of waste shall be calculated as follows:

$$\frac{V_{\text{waste}} \times C_{\text{waste}} + V_{\text{proc}} \times C_{\text{proc}}}{V_{\text{waste}} + V_{\text{proc}}} = C$$

V_{waste} : exhaust gas volume resulting from the incineration of waste only determined from the waste with the lowest calorific value specified in the permit and standardised at the conditions given by this Directive.

If the resulting heat release from the incineration of hazardous waste amounts to less than 10 % of the total heat released in the plant, V_{waste} must be calculated from a (notional) quantity of waste that, being incinerated, would equal 10 % heat release, the total heat release being fixed.

C_{waste} : emission limit values set for incineration plants in Annex V for the relevant pollutants and carbon monoxide.

V_{proc} : exhaust gas volume resulting from the plant process including the combustion of the authorised fuels normally used in the plant (wastes excluded) determined on the basis of oxygen contents at which the emissions must be standardised as laid down in Community or national regulations. In the absence of regulations for this kind of plant, the real oxygen content in the exhaust gas without being thinned by addition of air unnecessary for the process must be used. The standardisation at the other conditions is given in this Directive.

C_{proc} : emission limit values as laid down in the tables of this annex for certain industrial sectors or in case of the absence of such a table or such values, emission limit values of the relevant pollutants and carbon monoxide in the flue gas of plants which comply with the national laws, regulations and administrative provisions for such plants while burning the normally authorised fuels (wastes excluded). In the absence of these measures the emission limit values laid down in the permit are used. In the absence of such permit values the real mass concentrations are used.

C: total emission limit values and oxygen content as laid down in the tables of this annex for certain industrial sectors and certain pollutants or in case of the absence of such a table or such values total emission limit values for CO and the relevant pollutants replacing the emission limit values as laid down in specific Annexes of this Directive. The total oxygen content to replace the oxygen content for the standardisation is calculated on the basis of the content above respecting the partial volumes.

Member States may lay down rules governing the exemptions provided for in this Annex.

II.1. Special provisions for cement kilns co-incinerating waste

Daily average values (for continuous measurements) Sample periods and other measurement requirements as in Article 7. All values in mg/m³ (Dioxins and furans ng/m³). Half-hourly average values shall only be needed in view of calculating the daily average values.

The results of the measurements made to verify compliance with the emission limit values shall be standardised at the following conditions: Temperature 273 K, pressure 101,3 kPa, 10 % oxygen, dry gas.

II.1.1. C — total emission limit values

Pollutant	C
Total dust	30
HCl	10
HF	1
NO _x for existing plants	800
NO _x for new plants	500 (1)

Pollutant	C
Cd + Tl	0,05
Hg	0,05
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V	0,5
Dioxins and furans	0,1

(¹) For the implementation of the NO_x emission limit values, cement kilns which are in operation and have a permit in accordance with existing Community legislation and which start co-incinerating waste after the date mentioned in Article 20(3) are not to be regarded as new plants.

Until 1 January 2008, exemptions for NO_x may be authorised by the competent authorities for existing wet process cement kilns or cement kilns which burn less than three tonnes of waste per hour, provided that the permit foresees a total emission limit value for NO_x of not more than 1200 mg/m³.

Until 1 January 2008, exemptions for dust may be authorised by the competent authority for cement kilns which burn less than three tonnes of waste per hour, provided that the permit foresees a total emission limit value of not more than 50 mg/m³.

II.1.2. C — total emission limit values for SO₂ and TOC

Pollutant	C
SO ₂	50
TOC	10

Exemptions may be authorised by the competent authority in cases where TOC and SO₂ do not result from the incineration of waste.

II.1.3. Emission limit value for CO

Emission limit values for CO can be set by the competent authority.

II.2. Special provisions for combustion plants co-incinerating waste

II.2.1. Daily average values

Without prejudice to Directive 88/609/EEC and in the case where, for large combustion plants, more stringent emission limit values are set according to future Community legislation, the latter shall replace, for the plants and pollutants concerned, the emission limit values as laid down in the following tables (C_{proc}). In that case, the following tables shall be adapted to these more stringent emission limit values in accordance with the procedure laid down in Article 17 without delay.

Half-hourly average values shall only be needed in view of calculating the daily average values.

C_{proc}:

C_{proc} for solid fuels expressed in mg/Nm³ (O₂ content 6 %):

Pollutants	< 50 MWth	50-100 MWth	100 to 300 MWth	> 300 MWth
SO ₂				
general case		850	850 to 200 (linear decrease from 100 to 300 MWth)	200
indigenous fuels		or rate of desulphurisation ≥ 90 %	or rate of desulphurisation ≥ 92 %	or rate of desulphurisation ≥ 95 %
NO _x		400	300	200
Dust	50	50	30	30

Until 1 January 2007 and without prejudice to relevant Community legislation, the emission limit value for NO_x does not apply to plants only co-incinerating hazardous waste.

Until 1 January 2008, exemptions for NO_x and SO_2 may be authorised by the competent authorities for existing co-incineration plants between 100 and 300 MWth using fluidised bed technology and burning solid fuels provided that the permit foresees a C_{proc} value of not more than 350 mg/Nm³ for NO_x and not more than 850 to 400 mg/Nm³ (linear decrease from 100 to 300 MWth) for SO_2 .

C_{proc} for biomass expressed in mg/Nm³ (O_2 content 6 %):

'Biomass' means: products consisting of any whole or part of a vegetable matter from agriculture or forestry, which can be used for the purpose of recovering its energy content as well as wastes listed in Article 2(2)(a)(i) to (v).

Pollutants	< 50 MWth	50 to 100 MWth	100 to 300 MWth	> 300 MWth
SO_2		200	200	200
NO_x		350	300	300
Dust	50	50	30	30

Until 1 January 2008, exemptions for NO_x may be authorised by the competent authorities for existing co-incineration plants between 100 and 300 MWth using fluidised bed technology and burning biomass provided that the permit foresees a C_{proc} value of not more than 350 mg/Nm³.

C_{proc} for liquid fuels expressed in mg/Nm³ (O_2 content 3 %):

Pollutants	< 50 MWth	50 to 100 MWth	100 to 300 MWth	> 300 MWth
SO_2		850	850 to 200 (linear decrease from 100 to 300 MWth)	200
NO_x		400	300	200
Dust	50	50	30	30

II.2.2. C — total emission limit values

C expressed in mg/Nm³ (O_2 content 6 %). All average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours:

Pollutant	C
Cd + Tl	0,05
Hg	0,05
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V	0,5

C expressed in ng/Nm³ (O_2 content 6 %). All average values measured over the sample period of a minimum of 6 hours and a maximum of 8 hours:

Pollutant	C
Dioxins and furans	0,1

II.3. Special provisions for industrial sectors not covered under II.1 or II.2 co-incinerating waste

II.3.1. C — total emission limit values:

C expressed in ng/Nm³. All average values measured over the sample period of a minimum of 6 hours and a maximum of 8 hours:

Pollutant	C
Dioxins and furans	0,1

C expressed in mg/Nm³. All average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours:

Pollutant	C
Cd + Tl	0,05
Hg	0,05

ANNEX III

Measurement techniques

1. Measurements for the determination of concentrations of air and water polluting substances have to be carried out representatively.
2. Sampling and analysis of all pollutants including dioxins and furans as well as reference measurement methods to calibrate automated measurement systems shall be carried out as given by CEN-standards. If CEN standards are not available, ISO standards, national or international standards which will ensure the provision of data of an equivalent scientific quality shall apply.
3. At the daily emission limit value level, the values of the 95 % confidence intervals of a single measured result shall not exceed the following percentages of the emission limit values:

Carbon monoxide:	10 %
Sulphur dioxide:	20 %
Nitrogen dioxide:	20 %
Total dust:	30 %
Total organic carbon:	30 %
Hydrogen chloride:	40 %
Hydrogen fluoride:	40 %.

ANNEX IV

Emission limit values for discharges of waste water from the cleaning of exhaust gases

Polluting substances	Emission limit values expressed in mass concentrations for unfiltered samples	
	95 % 30 mg/l	100 % 45 mg/l
1. Total suspended solids as defined by Directive 91/271/EEC		
2. Mercury and its compounds, expressed as mercury (Hg)	0,03 mg/l	
3. Cadmium and its compounds, expressed as cadmium (Cd)	0,05 mg/l	
4. Thallium and its compounds, expressed as thallium (Tl)	0,05 mg/l	
5. Arsenic and its compounds, expressed as arsenic (As)	0,15 mg/l	
6. Lead and its compounds, expressed as lead (Pb)	0,2 mg/l	
7. Chromium and its compounds, expressed as chromium (Cr)	0,5 mg/l	
8. Copper and its compounds, expressed as copper (Cu)	0,5 mg/l	
9. Nickel and its compounds, expressed as nickel (Ni)	0,5 mg/l	
10. Zinc and its compounds, expressed as zinc (Zn)	1,5 mg/l	
11. Dioxins and furans, defined as the sum of the individual dioxins and furans evaluated in accordance with Annex I	0,3 mg/l	

Until 1 January 2008, exemptions for total suspended solids may be authorised by the competent authority for existing incineration plants provided the permit foresees that 80 % of the measured values do not exceed 30 mg/l and none of them exceed 45 mg/l.

ANNEX V

AIR EMISSION LIMIT VALUES

(a) Daily average values

Total dust	10 mg/m ³
Gaseous and vaporous organic substances, expressed as total organic carbon	10 mg/m ³
Hydrogen chloride (HCl)	10 mg/m ³
Hydrogen fluoride (HF)	1 mg/m ³
Sulphur dioxide (SO ₂)	50 mg/m ³
Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂), expressed as nitrogen dioxide for existing incineration plants with a nominal capacity exceeding 6 tonnes per hour or new incineration plants	200 mg/m ³ (*)
Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂), expressed as nitrogen dioxide for existing incineration plants with a nominal capacity of 6 tonnes per hour or less	400 mg/m ³ (*)

(*) Until 1 January 2007 and without prejudice to relevant (Community) legislation the emission limit value for NO_x does not apply to plants only incinerating hazardous waste.

Exemptions for NO_x may be authorised by the competent authority for existing incineration plants:

- with a nominal capacity of 6 tonnes per hour, provided that the permit foresees the daily average values do not exceed 500 mg/m³ and this until 1 January 2008,
- with a nominal capacity of >6 tonnes per hour but equal or less than 16 tonnes per hour, provided the permit foresees the daily average values do not exceed 400 mg/m³ and this until 1 January 2010,
- with a nominal capacity of >16 tonnes per hour but <25 tonnes per hour and which do not produce water discharges, provided that the permit foresees the daily average values do not exceed 400 mg/m³ and this until 1 January 2008.

Until 1 January 2008, exemptions for dust may be authorised by the competent authority for existing incinerating plants, provided that the permit foresees the daily average values do not exceed 20 mg/m³.

(b) Half-hourly average values

	(100 %) A	(97 %) B
Total dust	30 mg/m ³	10 mg/m ³
Gaseous and vaporous organic substances, expressed as total organic carbon	20 mg/m ³	10 mg/m ³
Hydrogen chloride (HCl)	60 mg/m ³	10 mg/m ³
Hydrogen fluoride (HF)	4 mg/m ³	2 mg/m ³
Sulphur dioxide (SO ₂)	200 mg/m ³	50 mg/m ³
Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂), expressed as nitrogen dioxide for existing incineration plants with a nominal capacity exceeding 6 tonnes per hour or new incineration plants	400 mg/m ³ (*)	200 mg/m ³ (*)

(*) Until 1 January 2007 and without prejudice to relevant Community legislation the emission limit value for NO_x does not apply to plants only incinerating hazardous waste.

Until 1 January 2010, exemptions for NO_x may be authorised by the competent authority for existing incineration plants with a nominal capacity between 6 and 16 tonnes per hour, provided the half-hourly average value does not exceed 600 mg/m^3 for column A or 400 mg/m^3 for column B.

(c) All average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours

Cadmium and its compounds, expressed as cadmium (Cd)		
Thallium and its compounds, expressed as thallium (Tl)	total 0,05 mg/m^3	total 0,1 mg/m^3 (*)
Mercury and its compounds, expressed as mercury (Hg)	0,05 mg/m^3	0,1 mg/m^3 (*)
Antimony and its compounds, expressed as antimony (Sb)	total 0,5 mg/m^3	total 1 mg/m^3 (*)
Arsenic and its compounds, expressed as arsenic (As)		
Lead and its compounds, expressed as lead (Pb)		
Chromium and its compounds, expressed as chromium (Cr)		
Cobalt and its compounds, expressed as cobalt (Co)		
Copper and its compounds, expressed as copper (Cu)		
Manganese and its compounds, expressed as manganese (Mn)		
Nickel and its compounds, expressed as nickel (Ni)		
Vanadium and its compounds, expressed as vanadium (V)		

(*) Until 1 January 2007 average values for existing plants for which the permit to operate has been granted before 31 December 1996, and which incinerate hazardous waste only.

These average values cover also gaseous and the vapour forms of the relevant heavy metal emissions as well as their compounds.

(d) Average values shall be measured over a sample period of a minimum of 6 hours and a maximum of 8 hours. The emission limit value refers to the total concentration of dioxins and furans calculated using the concept of toxic equivalence in accordance with Annex I.

Dioxins and furans	0,1 ng/m^3
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(e) The following emission limit values of carbon monoxide (CO) concentrations shall not be exceeded in the combustion gases (excluding the start-up and shut-down phase):

- 50 milligrams/ m^3 of combustion gas determined as daily average value;
- 150 milligrams/ m^3 of combustion gas of at least 95 % of all measurements determined as 10-minute average values or 100 mg/m^3 of combustion gas of all measurements determined as half-hourly average values taken in any 24-hour period.

Exemptions may be authorised by the competent authority for incineration plants using fluidised bed technology, provided that the permit foresees an emission limit value for carbon monoxide (CO) of not more than 100 mg/m^3 as an hourly average value.

(f) Member States may lay down rules governing the exemptions provided for in this Annex.

ANNEX VI

Formula to calculate the emission concentration at the standard percentage oxygen concentration

$$E_s = \frac{21 - O_s}{21 - O_M} \times E_M$$

E_s = calculated emission concentration at the standard percentage oxygen concentration

E_M = measured emission concentration

O_s = standard oxygen concentration

O_M = measured oxygen concentration

Taiwan Waste Incinerator Air Pollutant Emissions Standards

Waste Incinerator Air Pollutant Emissions Standards

Original 14 articles promulgated by Environmental Protection Administration order on November 30, 1992; revisions to Article 3 promulgated on August 6, 1997; revisions to Articles 1, 11, and 13 promulgated on April 7, 1999
Revisions to Article 8, Tables 1 and 2, Article 10, the deletion of Article 9, and the addition of Article 12-1 promulgated on December 25, 2006.

Article 1

These Standards are determined pursuant to Article 20, Paragraph 2 of the Air Pollution Control Act.

Article 2

Terms and Symbols used in these Standards are defined as follows

- I. "mg" means 1 milligram, equal to 0.001 grams.
- II. "Nm³" means a cubic meter at a temperature of 273 K and a pressure of 1 atmosphere.
- III. "ppm" means parts per million.
- IV. "C" means pollutant concentration corrected to Standard Oxygen Basis, measured in ng-TEQ/Nm³ ppm or mg/Nm³.
- V. "Q" means emission quantity corrected to Basic Oxygen Standard, measured in Nm³/min.
- VI. "C_s" means the measured pollutant concentration based on test method, not corrected to Standard Oxygen Basis, measured in ng-TEQ/Nm³ ppm or mg/Nm³.
- VII. "O_s" means the actual measured oxygen concentration in emissions.
- VIII. "E" means the actual oxygen concentration of oxygen-enriched gases imported into incinerator.
- IX. "Variable one-hour average" means the average of continuously fluctuating values during a single hour.

Article 3

For matters not provided in these Standards, the regulations of other relevant standards shall apply; however, Waste Incinerator Dioxin Control and Emission Standards shall be determined separately.

Article 4

These Standards shall apply to stack emissions from general waste and industrial waste incinerators.

Article 5

Should there be particular other emission regulations for air pollutants from industrial waste incinerators such as in the Methods and Facilities Standards for the Storage, Clearance and Disposal of Industrial Waste, the more stringent regulations shall apply.

Article 6

In these Standards, the definitions of "general waste" and "industrial waste" are based on relevant regulations of the Waste Disposal Act. Pollutants produced by industrial units may be controlled in accordance with the General Waste Incinerator Emission Standards if the competent authority has authorized their disposal in a general waste incinerator.

Article 7

“Handling capacity”, as referred to in these Standards, means the maximum weight of waste fed into the said incinerator per hour (regardless of whether wet or dry).

Article 8

For values determined by these Standards view Table 1 and Table 2

Article 9

(deleted)

Article 10

The concentrations of all types of pollutants in stack emissions shall be calculated based on non-diluted dry emission volumes at a temperature of 273K and a pressure of 1 atmosphere. A 11% oxygen concentration shall serve as the reference standard. The correction formula is as follows:

$$C = \frac{21-11}{21-O_s} \cdot C_s$$

When the oxygen concentration of air introduced into an oxygen-enriched combustion system exceeds 21%, an oxygen concentration of 11% shall serve as the reference standard for emissions gases. The correction formula is as follows:

$$C = \frac{E-11}{E-O_s} \cdot C_s$$

If the values in the foregoing two paragraphs $(21-O_s)$ or $(E-O_s)$ are less than 1, they shall be calculated as 1.

Article 11

In these Standards, “existing incinerator” means:

- I. Construction was completed before December 2, 1992; and documentary proof thereof can be provided.
- II. Construction has been under way, project tender procedures were completed, or if no tenders were invited, project contracts were issued and signed before December 2, 1992. Moreover, such documentary proof was already submitted to the competent authority before March 1, 1993 in applying for verification and approval.

Incinerators not meeting the conditions of two foregoing paragraphs shall be considered newly installed incinerators.

Article 12

The local competent authority may, based on the particular needs of the local area, separately determine more stringent emission standards and submit such to the central competent authority for approval and official announcement.

Article 12-1

A stationary pollution source that uses regular or industrial waste as fuel or auxiliary fuel shall use such fuel in accordance with the usage quantities permitted by the local competent authority and the regulations in Article 8, Table 2 shall apply.

Article 13

Deleted

Article 14

These Standards shall take effect on the date of enforcement except for articles whose enforcement date has been set separately.

Table 1 Waste Incinerator Air Pollutant Emissions Standards

[illegible]

Table 2 Waste Incinerator Heavy Metal Air Pollutant Emissions Standards

Date of Promulgation	Handling capacity of 400 kg/hr and below		Handling capacity of 400 kg/hr and above	
Type	Waste incinerators established on or after January 1, 2007		Waste incinerators established prior to January 1, 2007	
Standard/Item	Handling capacity does not reach 4 tons/hr	Handling capacity is greater than 4 tons/hr	Handling capacity does not reach 4 tons/hr	Handling capacity is greater than 4 tons/hr
Lead and its compounds mg/Nm ³	0.5	0.2	0.5	0.2
Cadmium and its compounds mg/Nm ³	0.04	0.02	0.04	0.02
Mercury and its compounds mg/Nm ³	0.05	0.05	0.1	0.05
Notes	1. The standard values for lead, cadmium, mercury and their compounds include solid-gases. 2. Except where other regulations apply, the emission standard value for each pollutant means the average taken during sampling as regulated in the testing method. 3. Except where other regulations apply, when employing continuous automatic testing to test for each pollutant the hourly average shall be the standard value. 4. When there is more than one set of incinerator equipment on the factory premises, the combined Handling capacity for all incinerator equipment shall be the legal standard. 5. Waste incinerators established prior to January 1, 2007, means incinerators whose construction was completed or under way, whose project tender procedures were completed, or if no tenders were invited, whose project contracts were given out and signed before January 1, 2007. All other incinerators shall be categorized as waste incinerators established on or after January 1, 2007.			

Table 3 Sampling and Test Methods

Item	Test Methods
Opacity	1. Visual determination of smoke 2. Opacity measuring facilities
Particulate pollutants	1. Test methods, officially announced by the EPA, for particulate pollutant concentrations in duct emissions 2. According to Method 5 of EPA of the United States 3. According to JIS Z8808 of Japan 4. Analysis of gas components by Hempel or Orsat method: based on CNS K9018 or according to JIS K2301 5. Through opacity test facilities or other authorized continuous testing facilities that establishes conversion relationship
Sulfur oxides	1. "Testing method for total sulfur oxides in emissions" officially announced by the EPA 2. CNS K9008 3. According to JIS K0103 4. According to Method 6 or Method 8 of EPA of the United States 5. Automatic continuous testing instruments according to JIS B7981
Nitrogen oxides	1. "Testing method for total nitrogen oxides in emissions" officially announced by the EPA 2. According to JIS K0104 3. Automatic continuous testing instruments according to JIS B7982
Hydrogen chloride	1. CNS K9063 2. According to JIS K0107
Carbon monoxide	1. According to JIS K0098 (GC method and infrared method) 2. According to Method 10 of the EPA of United States
Lead and its components	1. According to JIS Z8808 method (atomic absorption spectrophotometry) 2. According to Method 12 of the EPA of the United States
Cadmium and its components	1. According to JIS Z8808 method (atomic absorption spectrophotometry) 2. According to Method 12 of the EPA of the United States
Mercury and its components	1. According to Method 101A of the EPA of the United States 2. According to JIS K0222 of Japan
Notes	If there exists any contradiction between test methods for different types of air pollutants, the newest or revised method as officially announced by the central competent authority shall supersede.

Waste Incinerator Dioxin Control and Emission Standards

Original 11 articles promulgated by Environmental Protection Administration order on August 6, 1997; Articles 1, 5 and 10 revised and promulgated by Environmental Protection Administration order on April 14, 1999 ; Articles 5 and 10 revised and promulgated by Environmental Protection Administration order on October 6, 1999; Article 1 revised and promulgated by Environmental Protection Administration order on October 16, 2002; Article 8 revised and promulgated by Environmental Protection Administration order on August 20, 2003.

Article 1

These Standards are determined pursuant to Article 20, Paragraph 2, Article 22, Paragraphs 2 and 3, and Article 23, Paragraph 2 of the Air Pollution Control Act.

Article 2

Terms and symbols used in these Standards are defined as follows:

- I. "ng" means nanogram, equivalent to 10^{-9} grams.
- II. "Nm³" means a cubic meter at a temperature of 273 K and a pressure of 1 atmosphere.
- III. "ppm" means parts per million.
- IV. "C" means pollutant concentration corrected to Standard Oxygen Basis, measured in ng-TEQ/Nm³.
- V. "Q" means emission quantity corrected to Basic Oxygen Standard, measured in Nm³/min.
- VI. "C_s" means measured pollutant concentration based on test method, not corrected to Standard Oxygen Basis, measured in ng-TEQ/Nm³.
- VII. "O_s" means the actual measured oxygen concentration in emissions.
- VIII. "E" means the actual oxygen concentration of oxygen-enriched gases imported into incinerator.
- IX. "I-TEF" means the International Toxicity Equivalency Factor used internationally to calculate the toxicity weighting of dioxin concentrations.
- X. "TEQ" (Toxicity Equivalency Quantity of 2,3,7,8-tetrachlorinated dibenzo-*p*-dioxin) means the method for calculating the toxicity weighting of dioxin concentrations.
- XI. "Continuous incineration facility" means a facility that is continuously operating 24 hours per day.
- XII. "Gas retention time" means the time gas is retained in the second combustion chamber (complete combustion).
- XIII. "Variable one-hour average" means the average of continuously fluctuating values during a single hour.

Article 3

For matters not provided in these Standards, the regulations of other relevant standards shall apply.

Article 4

These Standards shall apply to stack emissions from general waste incinerators (herein referred to as incinerators) in continuous operation and with a handling capacity of 10 tons/hour or more, or incinerators

designed for a total handling capacity of 300 tons/day or more. The controlled pollutant items are dioxins (dioxins and furans).

In the foregoing paragraph "handling capacity" means the maximum weight of waste fed into a single incinerator per hour (regardless of whether wet or dry). Total handling capacity means the sum of the handling capacities of all incinerators in a plant.

Article 5

The dioxin emission standard value in these Standards is 0.1ng-TEQ/Nm^3 .

The concentrations of the standard values of the foregoing paragraph are expressed as Toxicity Equivalent (TEQ). The measured concentrations of all listed dioxin pollutants Table multiplied by their International Toxicity Equivalency Factor (I-TEF) shall be added up as a total. Sampling and testing shall be performed five or more times and take the arithmetic mean value of the three middle values after the data have been sorted from the largest to the smallest. Each sampling shall be done at intervals of more than one hour.

Article 6

The concentrations of dioxin pollutants in stack emissions shall be calculated based on non-diluted dry emission volumes at a temperature of 273K and a pressure of 1 atmosphere. Moreover, a 10% emission oxygen concentration shall serve as the reference standard. The correction formula is as follows:

$$C = \frac{21-11}{21-O_s} \cdot C_s$$

When the oxygen concentration of air introduced into an oxygen-enriched combustion system exceeds 21%, an oxygen concentration of 11% shall serve as the reference standard for its emissions. The correction formula is as follows:

$$C = \frac{E-11}{E-O_s} \cdot C_s$$

If the values in the foregoing two paragraphs $(21-O_s)$ or $(E-O_s)$ are less than 1 they shall be calculated as 1.

Article 7

Incinerator operation shall meet the following conditions:

- I. The combustion temperature downstream of the secondary air injection port shall not be lower than an hourly average value of 850 degrees Celsius.
- II. Gas retention time in existing incinerators shall reach more than 1 second; in newly established incinerators it shall be more than 2 seconds.
- III. Carbon monoxide (CO) at the stack outlet shall not be lower than an hourly average value of 100 ppm. Emission oxygen concentration shall take 10% as reference standard.
- IV. Emission oxygen concentration shall be 6% or higher.
- V. The exhaust gas temperature at the dust collection equipment intake shall be lower than 280 degrees Celsius for existing incinerators, and lower than 200 degrees Celsius for newly established incinerators.

Incinerators that do not use the operational conditions of the foregoing paragraph, but still achieve a similar treatment result may submit relevant documentary proof to the local competent authority to apply to operate under different conditions.

Article 8

Incinerators shall be equipped with a control panel that displays real-time operating conditions listed in the foregoing article excluding Paragraph 1, Subparagraph 2 as well as the read outs from monitoring equipment for the opacity of particulate pollutants, carbon monoxide concentration, emission oxygen concentration.

The monitoring results of the foregoing paragraph shall be recorded and reported to the local competent authority before the 15th day of each month.

Incinerators shall conduct once a year regular tests of dioxin pollutants in stack emissions. Seven days before the initial regular test, a test plan shall be submitted to the local competent authority. If in subsequent regular tests the operational conditions of the incinerator are changed, an additional test plan shall be submitted. The test results shall be submitted to the local competent authority in a test report within 60 days after the test. The time interval between two consecutive regular tests shall be more than six months.

From January 1, 2004, incinerators shall conduct twice yearly regular tests of dioxine pollutants in stack emissions. Each test shall be executed during the January-June period and during the July-December period. However, the two regular tests shall be spaced three to nine months apart and shall not be carried out within the month following annual maintenance.

Incinerators of the foregoing paragraph shall submit a test plan to the local competent authority seven days before the initial regular test. Moreover, before each regular test, incinerators shall publicly announce the test date and test content at the incinerator plant or on the information website of the competent authority, or at an appropriate local location, while also notifying environmental groups and local resident representatives to participate in the supervision.

The results of regular incinerator tests of the foregoing paragraph shall be submitted to the local competent authority in a test report within 60 days after the test. After review by the local competent authority, the test results shall be made public on the information website of the local competent authority for reference by all sectors.

A single incinerator plant that has multiple incinerators of identical model, scale, operating conditions and pollution control equipment may select one incinerator above a certain quantity, in accordance with the content and regulations of the operating permit or after gaining approval from the local competent authority, and conduct the test. However, the incinerator in two consecutive tests may not be the same.

The local competent authority may designate the certain quantity (X) of the foregoing paragraph according to following calculation method:

$$X = \ln N, \text{ by rounding decimals to the nearest whole number.}$$

ln: Natural logarithm

N : Stationary pollution sources of identical model, scale, operating conditions and pollution control equipment, $N \geq 2$.

Article 9

The sampling and test methods in these Standards are pursuant to methods officially announced by the central competent authority.

Article 10

Incinerators already constructed or that are in the process of being constructed, for which project tender procedures have been completed, or if no tenders were invited, for which project contracts were issued and signed before August 8, 1999, and for which dioxin emission standards were not listed in the

project tender criteria and have documentary proof for this, shall comply with dioxin emission standard values from August 8, 2001.

Article 11

These Standards shall take effect on the date of announcement except for articles for which effective dates have been set separately.

Table International Toxicity Equivalency Factor

Dioxin pollutants	International Toxicity Equivalency Factor
2,3,7,8-TeCDD	1.0
1,2,3,7,8-PeCDD	0.5
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.001
2,3,7,8-TeCDF	0.1
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.001
Other PCDDs and PCDFs	0

Notes:

TeCDD: tetrachlorinated dibenzo-*p*-dioxin
 PeCDD: pentachlorinated dibenzo-*p*-dioxin
 HxCDD: hexachlorinated dibenzo-*p*-dioxin
 HpCDD: heptachlorinated dibenzo-*p*-dioxin
 OCDD: octachlorinated dibenzo-*p*-dioxin
 PCDDs: polychlorinated dibenzodioxins
 TeCDF: tetrachlorinated dibenzofuran
 PeCDF: pentachlorinated dibenzofuran
 HxCDF: hexachlorinated dibenzofuran
 HpCDF: heptachlorinated dibenzofuran
 OCDF: octachlorinated dibenzofuran
 PCDFs: polychlorinated dibenzofurans

Singapore Environmental Pollution Control Air Impurities Regulation

ENVIRONMENTAL POLLUTION CONTROL ACT

(CHAPTER 94A, SECTION 77 (1))

ENVIRONMENTAL POLLUTION CONTROL (AIR IMPURITIES) REGULATIONS

[1st January 2001]

Citation

1. These Regulations may be cited as the Environmental Pollution Control (Air Impurities) Regulations.

Dark smoke

2. —(1) For the purposes of section 11 of the Act, dark smoke includes smoke of any colour which appears to the Director or any authorised officer —
 - (a) to be darker than shade No. 1 on the Ringelmann Chart;
 - (b) when observed or recorded with such instrument or device as the Director may approve, to be darker than shade No. 1 on the Ringelmann Chart; or
 - (c) to be of such opacity as to cause obscuration to a degree equivalent to smoke darker than shade No. 1 on the Ringelmann Chart.
- (2) Section 11 of the Act shall not apply to the emission of dark smoke from any chimney where —
 - (a) the emission of dark smoke is for a duration of less than 5 minutes in any period of one hour in a day; and
 - (b) the total number of emissions of dark smoke from that chimney does not exceed 3 times a day.

Methods of smoke indication

3. —(1) Every occupier of any industrial or trade premises in or on which any industrial plant or fuel burning equipment is situated shall, if required by the Director to do so, provide or install such instrument, equipment or device in or on the premises in accordance with paragraphs (2) and (3).
- (2) The instrument, equipment or device referred to in paragraph (1) must be of such type and installed in such manner as will enable any person in charge of the industrial plant or fuel burning equipment to readily ascertain at all times and without leaving the boiler room, furnace room or control room, whether smoke is being discharged from any chimney on the industrial or trade premises.
- (3) The instrument, equipment or device may include one or more of the following:
 - (a) a smoke density indicator, recorder and alarm which will provide adequate indication in the boiler room, furnace room or control room of the density of smoke being discharged from the chimney;
 - (b) a closed circuit television installation with the receiver located in the boiler room, furnace room or control room; or
 - (c) any other instrument, equipment or device approved by the Director.

Standards of concentration of air impurities

4. —(1) For the purposes of section 12 of the Act, the standards of concentration of air impurities that must be complied with in the conduct of any trade, industry or process or the operation of any fuel burning equipment or industrial plant shall be those specified in the Schedule.
- (2) The concentration of any substance specified in the first column of the Schedule shall be determined in accordance with such method as may be specified by or is acceptable to the Director.

Testing procedures and requirements

5. —(1) For the purposes of section 12 of the Act, the Director may specify in any particular case, the point at which the concentration of air impurities shall be measured.
- (2) The point at which the concentration of air impurities shall be measured may be situated at —
- (a) the fixed point of emission of any air impurities;
 - (b) the final point of emission of any air impurities; or
 - (c) any other point in or along any flue, duct or chimney located at a place in the premises other than the final point of emission of air impurities.
- (3) Every owner or occupier of any industrial or trade premises shall --
- (a) carry out such tests with respect to the emission of air impurities from and the consumption of fuel in or on the premises as may be required by the Director;
 - (b) keep a register of all such tests, specifying the date, nature and results of each test; and
 - (c) ensure that such register is available for inspection by the Director or any authorised officer at all reasonable times.
- (4) Subject to paragraph (5), the results of all tests conducted on boilers, furnaces and incinerators with respect to the emission of air impurities shall be expressed on the basis of flue gas containing 12% by volume of carbon dioxide.
- (5) The results of all tests conducted on waste incinerators with respect to the emission of dioxins and furans shall be expressed on the basis of flue gas containing 11% by volume of oxygen.
- (6) Every owner or occupier of any industrial or trade premises shall, for the purposes of enabling the Director or any authorised officer to exercise his powers under the Act —
- (a) provide the Director or the authorised officer with access to such premises, any part thereof and any control equipment, fuel burning equipment, industrial plant or chimney on such premises, at all reasonable times and as often as the Director or the authorised officer considers necessary; and
 - (b) provide the Director or the authorised officer with such assistance and facilities as may reasonably be required by the Director or the authorised officer.
- (7) The assistance and facilities referred to in paragraph (6) (b) shall include, in respect of each chimney serving the premises, the provision of one or more inspection opening or openings and such means of safe and adequate access for the purposes of enabling an authorised officer to inspect and obtain representative samples of any discharge from the chimney.
- (8) In this regulation —
- 'boiler' means any device in which water or other liquid is heated by any combustible material;
- 'furnace' means any chamber, other than a boiler in which combustion takes place;
- 'incinerator' means any structure or part of a structure used in any trade, industry or process to dispose of material by burning or heating with any form of energy;
- 'waste incinerator' means an incinerator which is used for the purposes of disposing of municipal, industrial or hospital waste.

Exemption

6. —(1) Regulation 4 shall not apply to such industrial or trade premises and for such period between 1st January 2001 to 31st December 2003 as the Director may determine.
- (2) The Director may —
- (a) require any industrial or trade premises referred to in paragraph (1) to comply with such other emission standards as he may specify; and
 - (b) if he considers it necessary, extend the period of exemption referred to in paragraph (1), subject to such conditions as he may impose.

Penalties

7. —(1) Any person who contravenes regulation 3 or 5 (3) or (6) shall be guilty of an offence and shall be liable —
- (a) on the first conviction, to a fine not exceeding \$10,000 and, in the case of a continuing offence, to a further fine not exceeding \$300 for every day or part thereof during which the offence continues after conviction; and

- (b) on the second or subsequent conviction to a fine not exceeding \$20,000 and, in the case of a continuing offence, to a further fine not exceeding \$500 for every day or part thereof during which the offence continues after conviction.
- (2) Any offence under these Regulations may be compounded by the Director in accordance with section 72 (1) of the Act.

THE SCHEDULE

Regulation 4

STANDARDS OF CONCENTRATION OF AIR IMPURITIES

1. The concentration of any substance specified in the first column emitted from any operation in any trade, industry, process, fuel burning equipment or industrial plant specified in the second column shall not at any point before admixture with air, smoke or other gases, exceed the limits specified in the third column.

<i>Substance</i>	<i>Trade, industry, process, fuel burning equipment or industrial plant</i>	<i>Emission limits</i>
(a) Ammonia and ammonium compounds	Any trade, industry or process	76 mg/Nm ³ expressed as ammonia
(b) Antimony and its compounds	Any trade, industry or process	5 mg/Nm ³ expressed as antimony
(c) Arsenic and its compounds	Any trade, industry or process	1 mg/Nm ³ expressed as arsenic
(d) Benzene	Any trade, industry or process	5 mg/Nm ³
(e) Cadmium and its compounds	Any trade, industry or process	3 mg/Nm ³ expressed as cadmium
(f) Carbon monoxide	Any trade, industry, process or fuel burning equipment	625 mg/Nm ³
(g) Chlorine	Any trade, industry or process	32 mg/Nm ³
(h) Copper and its compounds	Any trade, industry or process	5 mg/Nm ³ expressed as copper
(i) Dioxins and furans	Any waste incinerator	(i) 1.0 ng TEQ/Nm ³ for waste incinerators commissioned before 1st January 2001 (ii) 0.1 ng TEQ/Nm ³ for waste incinerators commissioned on or after 1st January 2001
(j) Ethylene oxide	Any trade, industry or process	5 mg/Nm ³
(k) Fluorine, hydrofluoric acid or inorganic fluorine compounds	Any trade, industry or process	50 mg/Nm ³ expressed as hydrofluoric acid

(l) Formaldehyde	Any trade, industry or process	20 mg/Nm ³
(m) Hydrogen chloride	Any trade, industry or process	200 mg/Nm ³
(n) Hydrogen sulphide	Any trade, industry or process	7.6 mg/Nm ³
(o) Lead and its compounds	Any trade, industry or process	5 mg/Nm ³ expressed as lead
(p) Mercury and its compounds	Any trade, industry or process	3 mg/Nm ³ expressed as mercury
(q) Oxides of nitrogen	Any trade, industry, process or fuel burning equipment	700 mg/Nm ³ expressed as nitrogen dioxide
(r) Particulate substances including smoke, soot, dust, ash, fly-ash, cinders, cement, lime, alumina, grit and other solid particles of any kind	Any trade, industry, process, fuel burning equipment or industrial plant (except for any cold blast foundry cupolas)	(i) 100 mg/Nm ³ ; or (ii) where there is more than one flue, duct or chimney in any scheduled premises, the total mass of the particulate emissions from all of such flue, duct or chimney divided by the total volume of such emissions shall not exceed 100 mg/Nm ³ and the particulate emissions from each of such flue, duct or chimney shall not exceed 200 mg/Nm ³ at any point in time.
(s) Styrene monomer	Any trade, industry or process	100 mg/Nm ³
(t) Sulphur dioxide (non-combustion sources)	Any trade, industry or process	500 mg/Nm ³
(u) Sulphur trioxide and other acid gases	The manufacture of sulphuric acid	500 mg/Nm ³ expressed as sulphur trioxide. Effluent gases shall be free

		from persistent mist.
(v) Sulphur trioxide or sulphuric acid mist	Any trade, industry or process, other than any combustion process and any plant involving the manufacture of sulphuric acid	100 mg/Nm ³ expressed as sulphur trioxide
(w) Vinyl chloride monomer	Any trade, industry or process	20 mg/Nm ³

2. In this Schedule —

'dioxins and furans' means polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), being tricyclic and aromatic compounds formed by 2 benzene rings which are connected by 2 oxygen atoms in PCDD and by one oxygen atom in PCDF and the hydrogen atoms of which may be replaced by up to 8 chlorine atoms;

'mg' means milligram;

'ng' means nanogram;

'Nm³' means normal cubic metre, being that amount of gas which when dry, occupies a cubic metre at a temperature of 0 degree Centigrade and at an absolute pressure of 760 millimetres of mercury;

'TEF' means Toxic Equivalency Factor;

'TEQ' means Toxic Equivalent, being the sum total of the concentrations of each of the dioxin and furan compounds specified in the first column of the table below multiplied by their corresponding TEF specified in the second column thereof:

<i>Dioxin/Furan</i>	<i>TEF</i>
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
Octachlorodibenzo-p-dioxin	0.0001
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran	0.0001

**The Waste Incineration
(England and Wales)
Regulations 2002**

[Home](#)
[About Us](#)
[Browse Legislation](#)
[New Legislation](#)
[Changes to Legislation](#)
[Search Legislation](#)

	Year:	Number:	Type: All Legislation	Search
----------------------	----------------------------	------------------------------	--	---------------------------------------

[Advanced Search](#)

The Waste Incineration (England and Wales) Regulations 2002

2002 No. 2980 Whole Act

[Table of Contents](#)[Content](#)[Previous](#)[Next](#)[Plain View](#)[Print Options](#)**Latest Version**[Latest available \(Revised\)](#)[Original \(As made\)](#)

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Statutory Instruments

2002 No. 2980**Opening Options**

ENVIRONMENTAL PROTECTION, ENGLAND AND WALES

The Waste Incineration (England and Wales) Regulations 2002

Made

3rd December 2002

Laid before Parliament

4th December 2002

Coming into force

28th December 2002

The Secretary of State, in exercise of the powers conferred on her by section 2 of the Pollution Prevention and Control Act 1999(1), having in accordance with section 2(4) of that Act consulted the Environment Agency, such bodies or persons appearing to her to be representative of the interests of local government, industry, agriculture and small businesses respectively as she considers appropriate, and such other bodies and persons as she considers appropriate, hereby makes the following Regulations:

Citation, commencement and extent

1.—(1) These Regulations may be cited as the Waste Incineration (England and Wales) Regulations 2002.

(2) These Regulations shall come into force on 28th December 2002.

(3) These Regulations extend to England and Wales.

Interpretation

2.—(1) In these Regulations—

"the 1990 Act" means the Environmental Protection Act 1990(2);

"the 2000 Regulations" means the Pollution Prevention and Control (England and Wales) Regulations 2000(3);

"authorisation" means an authorisation granted under section 6 of the 1990 Act;

"existing waste incineration installation" means a waste incineration installation which—

(a)

in the case of an installation which is a co-incineration plant, is put into operation before 28th December 2004 subject to a relevant approval; or

(b)

in any other case—

(i)

is put into operation before 28th December 2003 subject to a relevant approval granted before 28th December 2002; or

(ii)

is put into operation before 28th December 2004 subject to a relevant approval granted on the basis of a duly made application submitted before 28th December 2002;

and where an installation becomes authorised as a waste incineration installation for the first time as a result of a modification or variation pursuant to section 10, 11 or 37 of the 1990 Act or regulation 17 of the 2000 Regulations, references in this definition to a relevant approval shall be construed as references to that modification or variation and not to the original relevant approval, and references to the grant of an approval shall be construed as references to the service of the notice effecting the modification or variation; and

"relevant approval" means any of the following—

(a)

a permit;

(b)

an authorisation;

(c)

a waste management licence granted under section 36 of the 1990 Act; or

(d)

an exemption registered under regulation 18 of the Waste Management Licensing Regulations 1994(4), and the entry of particulars in the register under regulation 18 of those Regulations shall be treated as the grant of a relevant approval for the purposes of the definition of "existing waste incineration installation".

(2) In these Regulations, words and expressions which are defined in the 2000 Regulations shall have the same meaning as in those Regulations.

Applications in relation to waste incineration installations

3.—(1) Where an existing waste incineration installation is on 31st December 2004 subject to a permit, the operator shall within the period 1st January to 31st March 2005 make an application under regulation 17 of the 2000 Regulations for a variation of the conditions of that permit.

(2) Where an existing waste incineration installation (not being one falling within Section 5.1 of Part 1 of Schedule 1 of the 2000 Regulations) is on 31st December 2004 subject to an authorisation, the operator shall within the period 1st January to 31st March 2005 either—

(a) apply under section 11 of the 1990 Act for a variation of the conditions of the authorisation; or

(b) make an application for a permit under regulation 10 of the 2000 Regulations.

(3) An application under paragraph (1) or (2) shall contain the information specified in paragraph 1B of Part 1 of Schedule 4 of the 2000 Regulations.

(4) Where a waste incineration installation would have fallen within paragraph (a), (b)(i) or (b)(ii) of the definition of existing waste incineration installation in regulation 2 had it been put into operation before the date specified in the applicable paragraph, it shall not thereafter be put into operation unless—

(a) in the case of an installation which is already subject to a permit, the permit is varied pursuant to an application under regulation 17 of the 2000 Regulations; or

(b) in any other case, a permit is granted in relation to the installation.

(5) Where an operator fails to comply with any of the requirements of this regulation the regulator shall serve a notice on the operator specifying the relevant requirement, requiring him to comply with that requirement and specifying the period within which it must be complied with.

(6) A notice served under paragraph (5) shall be treated as an enforcement notice served under regulation 24(1) of the 2000 Regulations.

Transitional provisions

4. Part 1 of Schedule 3 to the 2000 Regulations shall apply in relation to any installation or mobile plant which by virtue of these Regulations becomes a Part A installation or Part A mobile plant (but which would otherwise not have been an installation or mobile plant or would have been a Part B installation or Part B mobile plant) as if—

(a) in paragraph 1 the prescribed date for a new Part A installation or new Part A mobile plant were 28th December 2002;

(b) in paragraph 4—

(i) sub-paragraph (1) were omitted; and

(ii) in sub-paragraph (2) for "1st January 2001" there were substituted "28th December 2002"; and

(c) in paragraph 6—

(i) for the definition of "existing" there were substituted—

- "existing" means, in relation to a Part A installation or a Part A mobile plant—

(a)

an installation or mobile plant which is put into operation before 28th December 2002;

(b)

an installation or mobile plant which is put into operation on or after that date if—

(i)

its operation was authorised by the relevant authorisation before that date; or

(ii)

an application for such authorisation was duly made before that date";

(ii) in the definition of "new" for "31st October 1999" there were substituted "28th December 2002"; and

(iii) in the definition of "relevant authorisation" for "31st October 1999" (in both places where it occurs) there were substituted "28th December 2002".

Amendments to the 2000 Regulations

5.—(1) The 2000 Regulations have effect subject to the following amendments.

(2) In regulation 2 (interpretation: general)—

(a) in paragraph (1), after the definition of "variation notice" insert—

- "waste incineration installation" means that part of an installation or mobile plant in which any of the following activities is carried out—

(a)

the incineration of waste falling within Section 5.1A(1)(a), (b) or (c) or A(2) of Part 1 of Schedule 1; or

(b)

any activity falling within any Section of that Part of that Schedule which is carried out in a co-incineration plant as defined in Section 5.1 of that Part of that Schedule"; and

(b) after paragraph (2A) insert—

"(2B) For the purposes of these Regulations a change in the operation of a waste incineration installation which involves incineration or co-incineration for the first time of hazardous waste shall be treated as a substantial change in operation, and for the purposes of this paragraph "co-incineration" and "hazardous waste" shall have the meanings given in Section 5.1 of Part 1 of Schedule 1."

(3) In regulation 19 (application to surrender a permit for a Part A installation or Part A mobile plant)—

(a) in paragraph (1), delete "This regulation" and substitute "Subject to paragraph (1A) this regulation"; and

(b) after paragraph (1) insert—

"(1A) This regulation does not apply in relation to that part of any installation or mobile plant where an activity falling within Part A(2) of Section 5.1 of Part 1 of Schedule 1 is carried out."

(4) In regulation 20 (notification of surrender of a permit for a Part B installation or Part B mobile plant) after paragraph (1) insert—

"(1A) This regulation also applies in relation to that part of any installation or mobile plant where an activity falling within Part A(2) of Section 5.1 of Part 1 of Schedule 1 is carried out."

(5) In Part 1 of Schedule 1 (Activities, Installations and Mobile Plant)—

(a) delete Section 5.1 and substitute—

"Section 5.1—Incineration and Co-incineration of Waste Part A(1)

(a) The incineration of hazardous waste in an incineration plant.

(b) Unless carried out as part of any other Part A(1) activity, the incineration of hazardous waste in a co-incineration plant.

(c) The incineration of non-hazardous waste in an incineration plant with a capacity of 1 tonne or more per hour.

(d) Unless carried out as part of any other activity in this Part, the incineration of hazardous waste in a plant which is not an incineration plant or a co-incineration plant.

(e) Unless carried out as part of any other activity in this Part, the incineration of non-hazardous waste in a plant which is not an incineration plant or a co-incineration plant but which has a capacity of 1 tonne or more per hour.

Part A(2)

(a) The incineration of non-hazardous waste in an incineration plant with a capacity of less than 1 tonne per hour.

(b) Unless carried out as part of any other Part A activity, the incineration of non-hazardous waste in a co-incineration plant.

Part B

(a) The incineration of non-hazardous waste in a plant which is not an incineration plant or a co-incineration plant but which has a capacity of 50 kilogrammes or more per hour but less than 1 tonne per hour.

(b) The cremation of human remains.

Interpretation of Section 5.1

In this Section—

"co-incineration" means the use of wastes as a regular or additional fuel in a co-incineration plant or the thermal treatment of waste for the purpose of disposal in a co-incineration plant;

"co-incineration plant" means any stationary or mobile plant whose main purpose is the generation of energy or production of material products and:

— which uses wastes as a regular or additional fuel; or

— in which waste is thermally treated for the purpose of disposal.

If co-incineration takes place in such a way that the main purpose of the plant is not the generation of energy or production of material products but rather the thermal treatment of waste, the plant shall be regarded as an incineration plant.

This definition covers the site and the entire plant including all co-incineration lines, waste reception, storage, on site pre-treatment facilities, waste-, fuel- and air-supply systems, boiler, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, stack devices and systems for controlling incineration operations, recording and monitoring incineration conditions; but does not cover co-incineration in an excluded plant;

- "excluded plant" means—

(a)

a plant treating only the following wastes—

(i)

vegetable waste from agriculture and forestry;

(ii)

vegetable waste from the food processing industry, if the heat generated is recovered;

(iii)

fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered;

(iv)

wood waste with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood-preservatives or coating, and which includes in particular such wood waste originating from construction and demolition waste;

(v)

cork waste;

(vi)

radioactive waste;

(vii)

animal carcasses as regulated by Council Directive 90/667/EEC laying down the veterinary rules for the disposal and processing of animal waste, for its placing on the market and for the prevention of pathogens in feedstuffs of animal or fish origin and amending Directive 90/425/EEC(5); or

(viii)

waste resulting from the exploration for, and the exploitation of, oil and gas resources from off-shore installations and incinerated on board the installation; and

(b)

an experimental plant used for research, development and testing in order to improve the incineration process and which treats less than 50 tonnes of waste per year;

- "hazardous waste" means any solid or liquid waste as defined in Article 1(4) of Council Directive 91/689/EEC on hazardous waste(6) except for—

(a)

combustible liquid wastes including waste oils as defined in Article 1 of Council Directive 75/439/EEC on the disposal of waste oils(7) provided that they meet the following criteria—

(i)

the mass content of polychlorinated aromatic hydrocarbons, for example polychlorinated biphenyls or pentachlorinated phenol, amounts to concentrations not higher than those set out in the relevant Community legislation(8);

(ii)

these wastes are not rendered hazardous by virtue of containing other constituents listed in Annex II to Council Directive 91/689/EEC on hazardous waste in quantities or in concentrations which are inconsistent with the achievement of the objectives set out in Article 4 of Council Directive 75/442/EEC on waste(9); and

(iii)

the net calorific value amounts to at least 30 MJ per kilogramme;

(b)

any combustible liquid wastes which cannot cause, in the flue gas directly resulting from their combustion, emissions other than those from gasoil as defined in Article 1(1) of Council Directive 93/12/EEC relating to the sulphur content of certain liquid fuels(10) or a higher concentration of emissions than those resulting from the combustion of gasoil as so defined;

- "incineration plant" means any stationary or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without recovery of the combustion heat generated. This includes the incineration by oxidation of waste as well as other thermal treatment processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment are subsequently incinerated.

This definition covers the site and the entire incineration plant including all incineration lines, waste reception, storage, on site pre-treatment facilities, waste-fuel and air-supply systems, boiler, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, stack, devices and systems for controlling incineration operations recording and monitoring incineration conditions; but does not cover incineration in an excluded plant;

"non-hazardous waste" means waste which is not hazardous waste;

"waste" means any solid or liquid waste as defined in Article 1(a) of Council Directive 75/442/EEC on waste"; and

(b) in Part A(1)(c) of Section 6.8 after "rendering" insert "or by incineration falling within Section 5.1 of this Part of this Schedule".

(6) In Part 3 of Schedule 1 (interpretation of "Part A installation" etc.)—

(a) in paragraph 17(2)(a) after "this Schedule" insert "or the incineration of waste in a waste incineration installation"; and

(b) delete paragraph 18.

(7) In Part 1 of Schedule 3 (prescribed date and transitional arrangements)—

(a) in the table which follows paragraph 2(2) delete that part of the table which relates to activities falling within Section 5.1 and substitute—

"Section 5.1

Part A(1) Paragraphs (a), (b), (c)

1st January to 31st March 2005

Part A(1) Paragraphs (d), (e)

1st June to 31st August 2005

Part A(2)

1st January to 31st March 2005"

(b) in the definition of "existing" in paragraph 6, in sub-paragraph (a) after "operation" insert "pursuant to a relevant authorisation granted".

(8) In Part 1 of Schedule 4 (applications for permits)—

(a) in sub-paragraph (1)(d) after "Part A mobile plant" insert "(but excluding any part of such an application which relates to an activity falling

within Part A(2) of Section 5.1 of Part 1 of Schedule 1”;

(b) after paragraph 1A insert—

“1B—(1) Subject to sub-paragraph (2), an application for a permit to operate a waste incineration installation shall in addition contain a description of the measures which are envisaged to guarantee in respect of that installation that—

(a) the plant is designed, equipped and will be operated in such a manner that the requirements of European Parliament and Council Directive 2000/76/EC on the incineration of waste (11) are met, taking into account the categories of waste to be incinerated;

(b) the heat generated during the incineration and co-incineration process is recovered as far as practicable, for example through combined heat and power, the generating of process steam or district heating;

(c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;

(d) the disposal of the residues which cannot be prevented, reduced or recycled will be carried out in conformity with national and Community legislation; (12) and

(e) the proposed measurement techniques for emissions into the air comply with Annex III of European Parliament and Council Directive 2000/76/EC on the incineration of waste and, as regards water, comply with paragraphs 1 and 2 of that Annex.

(2) Sub-paragraph (1) shall not apply in relation to an application which is duly made before 28 December 2002, or in the case of any installation which is a co-incineration plant as defined in Section 5.1 of Part 1 of Schedule 1, before 28 August 2004.”

(9) In Part 1 of Schedule 7 (variation of conditions), after paragraph 1(f) insert—

“(g) in the case of an application for the variation of the conditions of a permit in respect of a waste incineration installation the information specified in paragraph 1B of Schedule 4, or where such information has previously been included in an application made under these Regulations, a statement of any changes as respects the matters dealt with in paragraph 1B of Schedule 4 which would result if the proposed change in the operation of the installation or mobile plant requiring the variation were made”.

(10) In Schedule 9 (registers) at the end of paragraph 1 insert—

“(aa) a list which identifies all waste incineration installations which have a capacity of less than two tonnes per hour and which are the subject of a permit or an authorisation granted under section 6 of the Environmental Protection Act 1990 (13) containing conditions which give effect to the provisions of European Parliament and Council Directive 2000/76/EC on the incineration of waste”.

Amendments to the Waste Management Licensing Regulations 1994

6.—(1) The Waste Management Licensing Regulations 1994 (14) have effect subject to the following amendments.

(2) In regulation 16 (exclusion from waste management licensing), at the end of sub-paragraph (ba) of paragraph (1) insert “or a Part A(2) installation which is a waste incineration installation within the meaning of the 2000 Regulations”.

(3) In Schedule 3 (exempt activities)—

(a) delete paragraphs 3(d) and (e); and

(b) in paragraph 29 delete “or an exempt incineration plant for the purposes of Section 5.1 of Part 1 of Schedule 1 to the 2000 Regulations”.

Michael Meacher,

Minister of State,

Department for Environment, Food and Rural Affairs

3rd December 2002

Explanatory Note

(This note is not part of the Regulations)

These Regulations are made under section 2 of the Pollution Prevention and Control Act 1999 (1999 c. 24). They partly implement in England and Wales the provisions of European Parliament and Council Directive 2000/76/EC on the incineration of waste (the Directive). The Secretary of State’s proposed Directions to transpose the remaining provisions of the Directive were set out in the Consultation Paper on implementation of Council Directive 2000/76/EC on the incineration of waste (15).

Regulation 3 requires applications to be made by the operators of certain existing waste incineration installations (as defined in regulation 2) within the period 1st January to 31st March 2005. The applications must be made under either the Pollution Prevention and Control Regulations 2000 (S.I. 2000/1973) (the PPC Regulations) or the Environmental Protection Act 1990 (1990 c. 43) and must contain the information specified in regulation 5(8)(b). Regulation 3(4) prohibits certain waste incineration installations from being put into operation until the relevant application has been determined. Regulation 3(5) requires regulators under the PPC Regulations to serve a notice on any operator who fails to comply with any requirement of regulation 3. The notice must require the operator to comply with the relevant requirement within a specified period and is to be treated as an enforcement notice under regulation 24 of the PPC Regulations.

Regulation 4 contains transitional provisions for waste incineration installations which require a permit under the PPC Regulations as a result of these Regulations.

Regulation 5 makes a number of amendments to the PPC Regulations. These include: an extension to the definition of "substantial change" in regulation 2; a revision of Section 5.1 of Part 1 of Schedule 1 (which describes the waste incineration installations which are subject to the PPC Regulations); amendments to the transitional timetable in Schedule 3 and the requirements in Schedules 4 and 7 which apply to waste incineration installations; and an addition to the list of information in Schedule 9 which is required to be kept on the public register maintained under the Regulations.

Regulation 6 makes consequential amendments to the Waste Management Licensing Regulations 1994 (S.I. 1994/1056).

These Regulations extend to England and Wales.

A regulatory impact assessment and transposition note have been prepared and copies can be obtained from AEQ Division, Department for Environment, Food and Rural Affairs, Zone 4/H11, Ashdown House, 123 Victoria Street, London SW1E 6DE.

(1)

1999 c. 24. Directive 2000/76/EC was designated for the purposes of paragraph 20 of Schedule 1 to the Pollution Prevention and Control Act 1999 by the Pollution Prevention and Control (Designation of Council Directives on Large Combustion Plants, Incineration of Waste and National Emission Ceilings) Order 2002, SI 2002/2528. The Secretary of State can exercise these powers only in relation to England and Wales—see section 53 of the Scotland Act 1998 (c. 46) and section 5(3) of the Pollution Prevention and Control Act 1999.

(2)

1990 c. 43.

(3)

S.I. 2000/1973; relevant amending instruments are S.I. 2001/503, 2002/275, 2002/1559 and 2002/2688.

(4)

S.I. 1994/1056; relevant amending instruments are S.I. 1995/288, 1996/634, 1996/972, 1998/606 and 2000/1973.

(5)

OJ No. L363, 27.12.90, p.51.

(6)

OJ No. L377, 31.12.91, p.20 amended by Council Directive 94/31/EC (OJ No. L168, 2.7.94, p.28).

(7)

OJ No. L194, 25.7.75, p.23.

(8)

See, in particular, Council Directive 96/59/EC (OJ No. L243, 24.9.96, p.31).

(9)

OJ No. L194, 25.7.75, p.39 amended by Council Directives 91/156/EEC (OJ No. L78, 26.3.91, p.32) and 91/692/EEC (OJ No. L377, 31.12.91, p.48) and Commission Decision 96/350/EC (OJ No. L135, 6.6.96, p.32).

(10)

OJ No. L74, 27.3.93, p.81 amended by Council Directive 99/32/EC (OJ No. L121, 11.5.99, p.13).

(11)

OJ No. L332, 28.12.2000, p.91.

(12)

See, for example, Council Directive 75/442/EEC on waste (OJ No. L194, 25.7.75, p.39), as amended by Council Directives 91/156/EEC (OJ No. L78, 26.3.91, p.32) and 91/692/EEC (OJ No. L377, 31.12.91, p.48) and Commission Decision 96/350/EC (OJ No. L135, 6.6.96, p.32). Part II of the Environmental Protection Act 1990 (c. 43) and the Waste Management Licensing Regulations 1994 (S.I. 1994/1056) to which there are amendments.

(13)

1990 c. 43.

(14)

S.I. 1994/1056; relevant amending instruments are S.I. 1995/288, 1996/634, 1996/972, 1998/606 and 2000/1973.

(15)

Copies of the Consultation Paper are available from Defra Publications, Admail 6000, London SW1A 2XX, and may be found on the internet at www.defraweb/environment/consult/wasteincin/index.htm.

[Back to top](#)

APPENDIX B

MEMORANDUM OF
CHIMNEY HEIGHT

ent.
Environment
Risk Development
Department
Fish Office

CHIMNEY HEIGHTS

Third edition of the
1956 Clean Air Act Memorandum

to the
to the
Fish Office

Introduction

Scope of Memorandum

1. This publication provides for the use of Local Authorities, Industry and others who may need to determine the height appropriate for certain new chimneys, a relatively simple method of calculating the approximate height desirable in normal circumstances.
2. Heights determined by these methods should be regarded as a guide rather than as a mathematically precise decision on chimney height. The conclusions may need to be modified in the light of particular local circumstances such as valleys, hills and other topographical features.
3. The advice which follows is applicable only to chimneys of fuel burning plant with gross heat input (ie heat release rates in the combustion chamber) of between 0.15 MW (150 kW) and 150 MW,* including stationary diesel generators. It does not deal with direct fired heating systems which discharge into the space being heated, gas turbines, or incinerators (which require separate treatment depending on the pollutants emitted).
4. The main changes from the second edition are the inclusion of a method dealing with very low sulphur fuel; the extension of the method for taking into account the height of nearby buildings and the extension of the range of the size of furnace included.

Basis of Method

5. The method seeks to determine the minimum height for a chimney that will ensure adequate dispersal of sulphur dioxide and other pollutants produced in normal combustion. Calculations for fuels with very low sulphur (VLS) content (ie less than 0.04%)* are therefore different from those for normal sulphur containing fuels. For VLS fuels the initial calculation of chimney height depends on the maximum rated continuous heat input of the furnaces; for other fuels the initial calculation depends on the rate of emission of sulphur dioxide at the maximum heat input, taking into account the type of area within which the chimney is situated. In both cases further calculations may need to be performed to take account of adjacent buildings or chimneys to determine the final required height.
6. In each case in assessing the maximum heat input account should be taken of standby plant only where in use this would significantly increase the total heat input or the rate of emission of sulphur dioxide (eg where oil fuel is used in place of an interruptible gas supply).

Efflux Velocity

7. The calculations assume that an adequate efflux velocity for the flue gas will be achieved to prevent the plume of gas flowing down the outside of the chimney. For boilers up to 2.2 MW input the target velocity should be not less than 6 m/s at full load although it is recognised that many existing designs of small installations cannot achieve this. For boilers and similar plant equipped with induced draught fans, the velocity should be not less than 7.5 m/s at full load for boilers rated up to 9 MW, above 135 MW it should be 15 m/s, and between 9 MW and 135 MW *pro rata*.

* Furnaces at the lower end of this range will be outside the statutory requirement for local authority chimney height approval.

* These fuels comprise natural gas, premium kerosene (BS 2869 Class C1), butane, propane, and coke oven gas where satisfactorily desulphurised.

Combining of Emissions

8. Where there are several adjacent fuel burning plants in the same works, the waste gases should normally be discharged from a common chimney, preferably multi-flued. The emission from a common chimney has a greater plume rise than the discharges from separated chimneys and the concentration of gaseous effluent reaching the ground is smaller. If this arrangement is not practicable, the chimneys might be collected together in a cluster adequately stiffened. Where several furnaces are served by one chimney or cluster, the maximum sulphur dioxide emission rates (or for VLS fuels the furnace heat input rates) should be added in order to determine the chimney height. (See paragraph 6 for standby plant)

Method of calculating chimney heights

Stages of Calculation

9. Figure 1 sets out in diagrammatic form the procedure to be followed. The first stage is the calculation of the 'uncorrected chimney height' (U). There are separate methods of calculation for VLS fuels (para 11-13) and for other fuels (para 14-20). Where more than one fuel may be used, calculations should be carried out for each and the greatest resulting height adopted. In any rare cases where fuel is in the range 0.04-0.2% S a similar procedure of performing both calculations should be followed.

10. The second stage is the calculation of the 'final chimney height' (C). This is the uncorrected chimney height increased as necessary to allow for the effects on dispersion of the building to which the chimney is attached and of neighbouring buildings (para 21-24). Where the calculations at this stage result in the chimney height being less than certain overall minimum requirements a further increase must be made to meet these requirements (para 25). In certain conditions exceptions are made for fan diluted systems (para 26-28).

Calculation of Uncorrected Chimney Height (U) for VLS Fuels

11. Where VLS fuels are used the uncorrected chimney height is determined from the gross heat input which should be obtained from the formula:

$$Q = \frac{WB}{3600} \quad (1)$$

where Q is the heat input in MW

W is the maximum rate of combustion of fuel in kg/h for mass or m³/h for volume and

B is the respective gross calorific value in MJ/kg or MJ/m³

(see Appendix II for conversion factors).

12. The uncorrected chimney height (U) can then be derived from the gross heat input (Q) using the appropriate equation below:

For heat inputs from 30 MW to 150 MW

$$U = 1.36 Q^{0.6} (1 - 4.7 \times 10^{-5} Q^{1.69}) \quad (2)$$

For heat inputs less than 30 MW, the equation may be simplified by omitting the part in brackets.

$$U = 1.36 Q^{0.6} \quad (3)$$

13. Alternatively chart I can be used to read off U for values of Q.

Calculation of Uncorrected Chimney Height (U) for other fuels

14. For other fuels the uncorrected chimney height (U) is determined according to the rate of emission of sulphur dioxide and the character of the area.

15. The rate of emission of sulphur dioxide shall be calculated for the purpose of this Memorandum as follows:

Oil firing

$$R = 0.020 WS \quad (4)$$

Coal firing

$$R = 0.018 WS \quad (5)$$

where

R is the rate of emission of sulphur dioxide in kg/h

W is the maximum rate at which fuel is burnt in kg/h

S is the content of sulphur in the fuel in per cent.

16. The percentage of sulphur contained in the fuel should be obtained from the supplier. If the sulphur content of the fuel cannot be ascertained or is likely to vary,

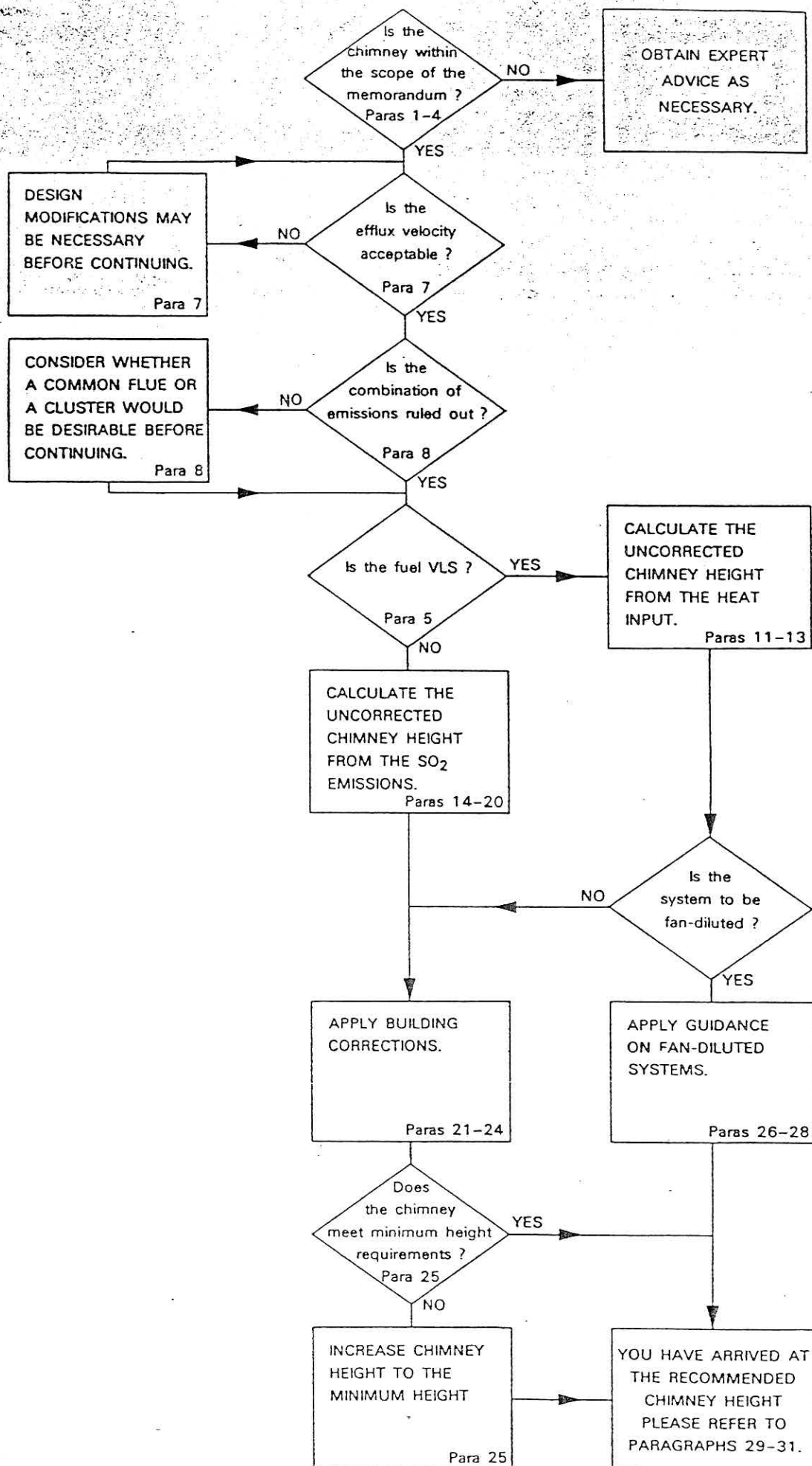


FIG 1. Procedure for using the memorandum.

values of 1.6% for solid fuel and 3.0% for residual fuel oil should be assumed; these figures represent the present upper quartile of the sulphur content of solid fuels and a similar assessment of residual fuel oil.

17. Decide which of the following categories best describes the area surrounding the chimney in question:

- A an undeveloped area where development is unlikely;
- B a partially developed area with scattered houses;
- C a built-up residential area;
- D an urban area of mixed industrial and residential development;
- E a large city or an urban area, of mixed heavy industrial and dense residential development.

The uncorrected chimney height (U) should then be calculated either by the procedure depending on equations given in paragraph 18 or from alignment charts according to the method described in paragraph 20.

Determination of U for other fuels from equations

18. Calculate an adjusted sulphur dioxide emission rate (R_A) by multiplying the sulphur dioxide emission rate (R) by the appropriate factor from Table I according to the category of the surrounding area:

Table I

Type of district	Factor
A	0.55
B	0.78
C	1.00
D	1.30
E	1.60

19. Calculate the uncorrected chimney height (U) from the adjusted sulphur dioxide emission rate (R_A) using one of the following equations:

$$\text{If } R_A \text{ is less than 10 kg/h} \\ U = 6 R_A^{0.5} \quad (6)$$

$$\text{If } R_A \text{ is from 10 to 100 kg/h} \\ U = 12 R_A^{0.2} \quad (7)$$

$$\text{If } R_A \text{ is from 100 to 800 kg/h} \\ U = 5 R_A^{0.5} - 0.9 R_A^{0.67} \quad (8)$$

Determination of U for other fuels from alignment charts

20. The sulphur dioxide emission rate (R) calculated in paragraph 15 is used with one of the charts II to VI. A line starting from the sulphur dioxide emission rate on the left-hand side and produced through the points A, B, C, D or E (representing the category into which the district falls) will indicate on the right-hand side of the chart the appropriate uncorrected chimney height (U).

Correction of chimney height for building effects

21. It may be necessary to increase the uncorrected chimney height (U) to take account of the effect of nearby buildings. If the calculated value for U is less than $2\frac{1}{2}$ times the height of the building to which it is attached or any other building within 5 U of the chimney, then (except where the emission is fan diluted from a furnace of less than 6 MW using VLS fuel and conforms to the other requirements set out in paragraph 25) the following calculations should be performed.

22. The correction procedure requires the determination of the dimensions of all buildings within a distance of 5 U from the chimney. With experience, it will be relatively easy to discount some nearby small buildings. The following procedure should be used for all buildings which need to be considered:

Notation

U = uncorrected chimney height

H = building height (measured to the ridge or other highest point ignoring lift or tank rooms and other protrusions less than 1% of roof area).

B = Building width (measured at right angles to a line joining the chimney and the nearest point*)

K = the lesser of building height (H) or building width (B)

T = height of disturbed flow over building = $H + 1.5K$

T_m = maximum T considering all relevant buildings

H_m = maximum H considering all relevant buildings

C = corrected chimney height

23. In the common case where there is only a single building wider than it is high in the area to be considered the corrected chimney height should be found from the following equation:

$$C = H + 0.6 U \quad (9)$$

24. In other cases:

1. List all the relevant buildings ie those within a distance of 5 U and record H and B for each building.
2. Evaluate K for each building.
3. Calculate T for each building ($T = H + 1.5K$)
4. Find H_m (the largest value of H).
5. Find T_m (the largest value of T).
6. If U is greater than T_m then $C = U$ and the height needs no correction.
7. Otherwise calculate the corrected chimney height from the following equation:

$$C = H_m + U \left(1 - \frac{H_m}{T_m} \right) \quad (10)$$

Overriding minimum requirements for chimney height

25. The final corrected chimney height determined by the above procedures should be checked against the following requirements. If it does not satisfy them it should be increased appropriately:

- a. a chimney should terminate at least 3m above the level of any adjacent area to which there is general access (ie ground level, roof areas or adjacent openable windows);
- b. a chimney should never be less than the calculated uncorrected chimney height;
- c. a chimney should never be less than the height of any part of an attached building within a distance of 5 U.

Provisions for certain fan diluted emissions

26. For fan diluted emissions from furnaces rated at less than 6 MW using VLS fuel (or a fuel between 0.04% and 0.2% S for which the VLS procedure gives the greater value of U) the corrections for building effects and the minimum requirements in paragraph 25 do not apply.

27. Flue gas may be emitted from such furnaces at height U, which may be below the roof level of the building, so long as the following requirements are met:

- a. The emission velocity must be at least $75/F$ m/s, where 'F' is the fan dilution factor, defined as $F = V/V_O$, where V is the actual flue gas volume and V_O is the stoichiometric combustion volume. For natural gas V_O is $0.26 Q$ m³/s.
- b. The outlet must not be within $50U/F$ of a fan assisted intake (except for intakes for combustion air or fan dilution air).
- c. The outlet must not be within $20U/F$ of an openable window on the emitting building.

* Examples to illustrate the determination of chimney distance and building width are given in Figure 2. The treatment of tower blocks is illustrated in Figure 3.

- d. The distance to the nearest building must be at least 60U/F.
- e. The lower edges of all outlets must be at least 3m above the ground, with the exception of inputs of less than 1 MW where 2m is permissible.
- f. The outlets must be directed at an angle above the horizontal — preferably at about 30° — and must not be under a canopy.
- g. Flue gas should not be emitted into an enclosed, or almost totally enclosed, 'well' or courtyard.

28. A definite chimney is not required for fan diluted emissions from furnaces rated at less than 6MW and using VLS fuels where the effluent is emitted through the roof and the conditions in paragraph 27a-c are met. However, if there is general access to the roof a chimney of 3m minimum height above the roof should be provided.

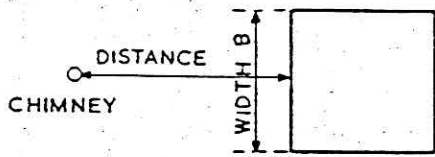
The use of the Memorandum in practice

29. It must be stressed that the procedures above do not give uniquely accurate results applicable in all circumstances. There are likely to be many cases in which local knowledge and experience suggest that the result obtained by calculation should be varied. Similarly experience will indicate circumstances in which the relatively complex procedure in relation to nearby buildings need not be fully applied. Worked examples illustrating the procedures are given in Appendix 1.

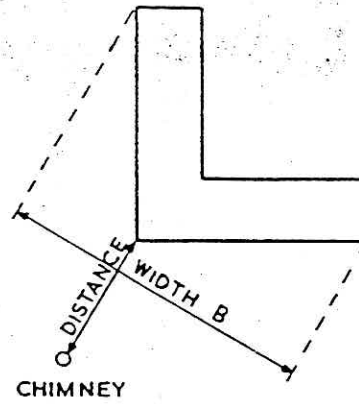
30. Those using the Memorandum should also bear in mind the following points:
- a. Although intermediate stages in the calculations should be performed to reasonable levels of accuracy the final result should normally be rounded to the nearest metre.
 - b. The procedure is concerned only with normal emissions of gaseous pollutants; it does not deal with grit and dust or in the case of VLS fuels afford protection against excessive concentrations of carbon monoxide produced by inefficient combustion.
 - c. The height of a chimney may be of considerable significance in the granting of planning permission for a new development and the relevant authorities should consider the issue together.
 - d. There are circumstances in which the Memorandum will not provide adequate guidance eg where a chimney is to discharge on a roof with complicated structures or in difficult topography or where there are a number of closely adjacent chimneys. Specialist advice should be sought in such cases.

Suggestions for further reading

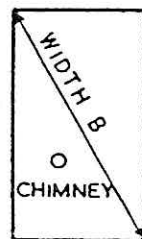
31. The basis for this Memorandum may be found in a paper by C. F. Barrett and S. C. Wallin entitled "Determination of Chimney Heights: technical basis of the third edition of the DOE memorandum" in 'Energy World'.



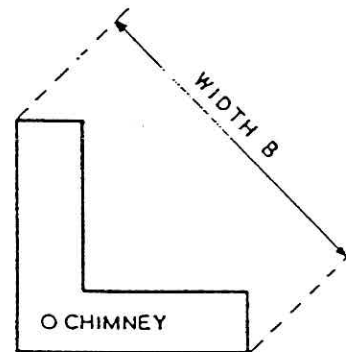
EXAMPLE (i)



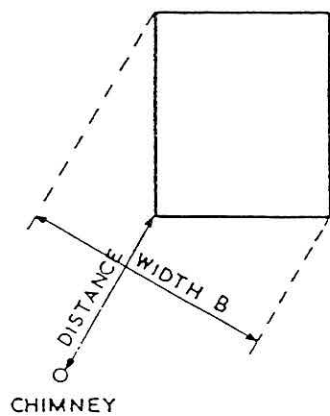
EXAMPLE (ii)



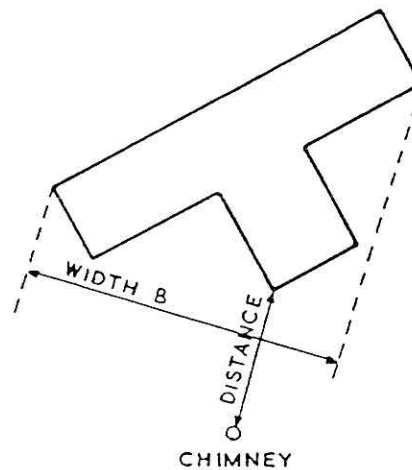
EXAMPLE (iii)



EXAMPLE (vi)



EXAMPLE (iv)



EXAMPLE (v)

FIG. 2 METHOD FOR DETERMINING CHIMNEY DISTANCE AND BUILDING WIDTH

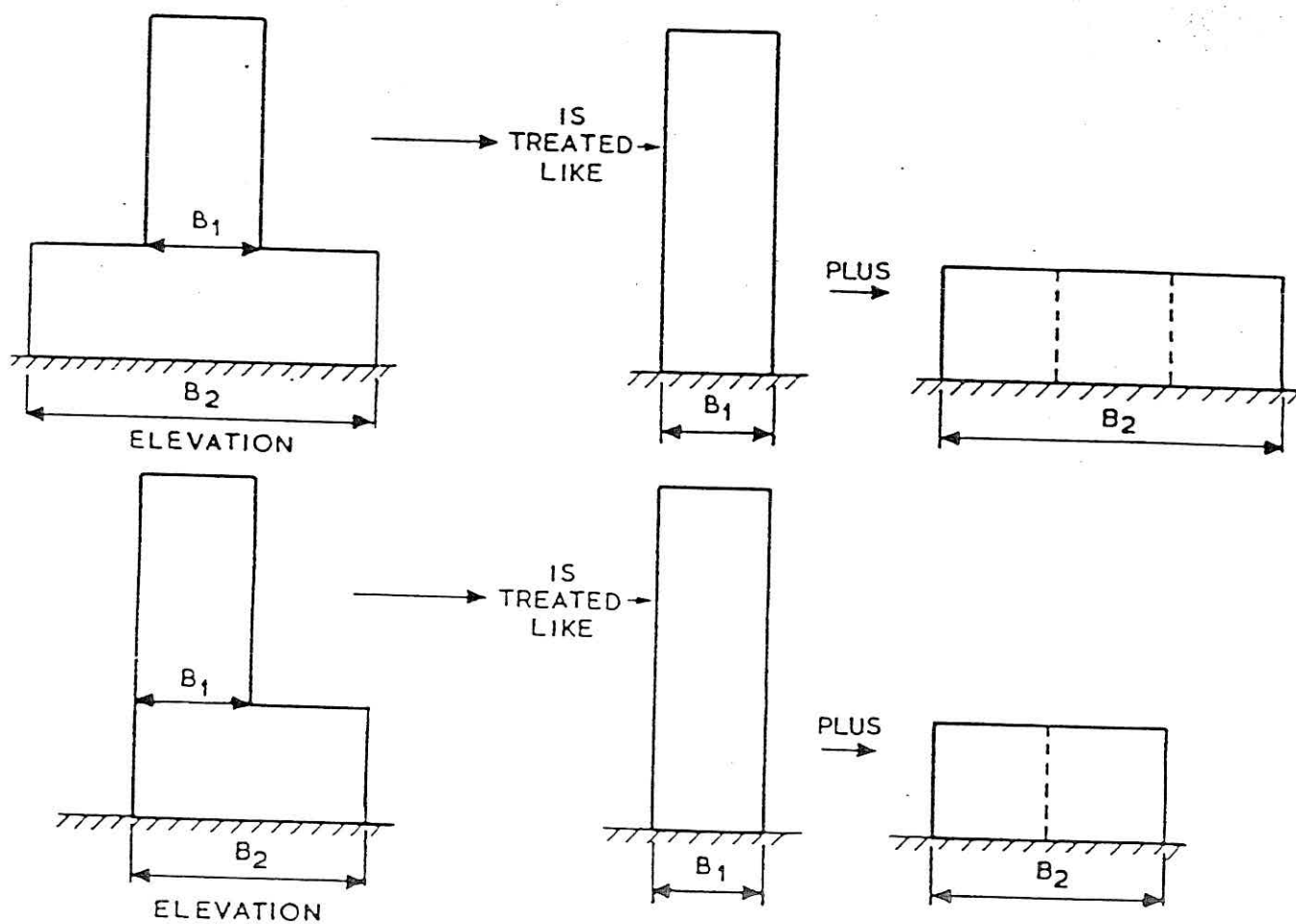


FIG.3 TREATMENT OF TOWER BLOCKS ON WIDE BLOCKS

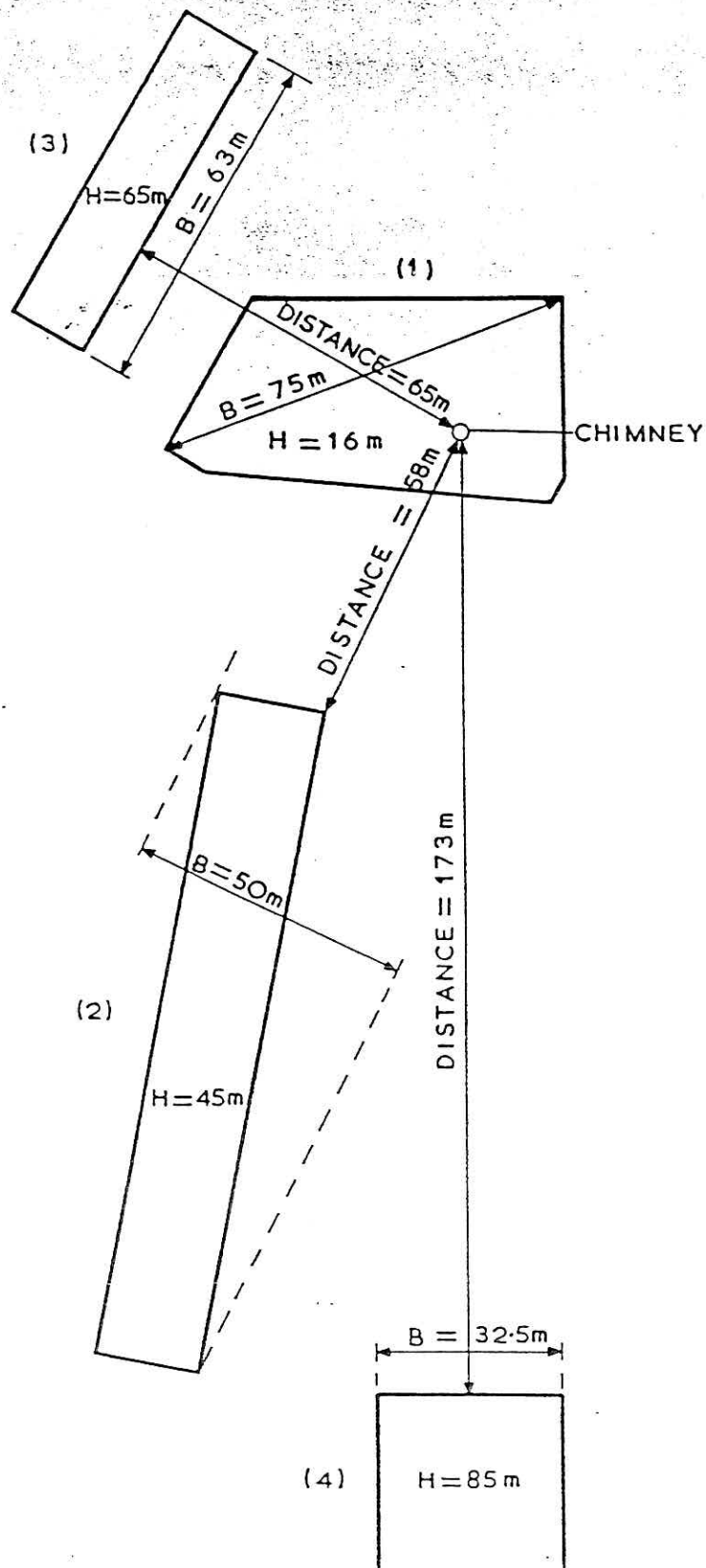


FIG.4 DIMENSIONS USED IN CORRECTING FOR BUILDING EFFECTS (EXAMPLE '3')

Appendix I

Example 1: Gas fired installation in an isolated building.

A natural gas fired boiler with a gross heat input of 15 MW is to be installed in an isolated building.

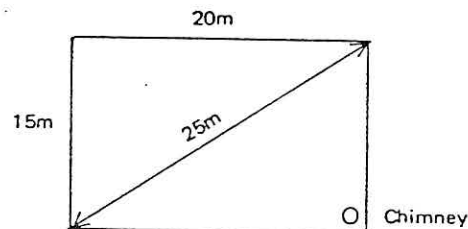
Uncorrected chimney height determination

Refer to paras 12-13 equation (3) or chart I

$$U = 6.9\text{m}$$

Building correction

- Building dimensions 45m x 20m x 15m high
The uncorrected chimney height is less than the building height therefore building correction is necessary see paragraphs 21-23. Only a single building is involved which is wider than it is high and the corrected chimney height should be found from equation (9) of para 23.
$$C = H + 0.6U$$
$$= 15 + 0.6 \times 6.9$$
$$= 19\text{ m to the nearest metre.}$$
- Building dimensions 15m x 20m x 45m high
The uncorrected chimney height is less than the building height therefore building correction is necessary: see paragraphs 21-24. Only a single building is involved but it is not wider than it is high and therefore the procedure of paragraph 24 must be used.



$$H = 45\text{m}$$

$$B = 25\text{m} \text{ — see para 22}$$

$$K = 25\text{m i.e. lesser of building height and building width}$$

$$T = H + 1.5K = 45 + 37.5 = 82.5\text{m}$$

Since there is only one building these values of H and T are H_m and T_m .

Using equation (10) $C = 45 + 6.9 (1 - 45/82.5) = 48\text{m to the nearest metre.}$

Example 2 Coal fired installation in an isolated building.

A boiler burning 2780kg/h of 1.6% sulphur coal is to be installed in an isolated building in an area firstly assessed as Category C and alternatively assessed as category E (para 17).

Calculation of rate of emission of sulphur dioxide (R)

$$R = 0.018 \text{ WS (from equation (5) of para 15)}$$

$$= 0.018 \times 2780 \times 1.6$$

$$= 80 \text{ kg/h}$$

Uncorrected chimney height.

From Chart IV

in Category C, $U = 28.8\text{m}$

in Category E, $U = 33.3\text{m}$

Alternatively U can be calculated from equations (paras 18 and 19) thus:

For Category C, $R_A = 80 \times 1.00 = 80 \text{ kg/h (Table I)}$

Since R_A is between 10 and 100 kg/h, equation (7) is used

$$U = 12 (80)^{0.2}$$

$$= 28.8m$$

For Category E, $R_A = 80 \times 1.60 = 128$ kg/h (Table I)

Since R_A is between 100 and 800 kg/h, equation (8) is used:

$$U = 5 \times (128)^{0.5} - 0.9 (128)^{0.67}$$

$$= 33.3m$$

Building correction

The building dimensions are 20m x 45m x 15m high.

Since the uncorrected chimney height (U) is less than $2\frac{1}{2}$ times the building height a building correction must be made. Only a single building is relevant which is wider than it is high, therefore the corrected chimney height should be found from equation (9) of para 23.

$$\begin{aligned} \text{For Category C, corrected chimney height} &= 15 + 0.6 \times 28.8 \\ &= 32m \end{aligned}$$

$$\begin{aligned} \text{For Category E, corrected chimney height} &= 15 + 0.6 \times 33.3 \\ &= 35m \end{aligned}$$

Example 3. Oil fired installations in the vicinity of several buildings.

An installation of heat input 1.9 MW (ie 1.9 MJ/s) is required in a district of category E. The chimney heights are calculated for two different fuels. The information is given in tabular form together with the resultant uncorrected chimney heights.

Heat Input	Fuel Type	Calorific value	Burning rate	Sulphur content	Sulphur dioxide emission (R)	Uncorrected chimney height (U)
MW		MJ/kg	kg/h	%	kg/h	m
1.9	gas oil	45.9	149.0	0.5	1.5	9.3
1.9	medium fuel oil	43.6	156.9	3.0	9.4	20.6

R (sulphur dioxide emission) is calculated from paragraph 15 equation (4).

U (uncorrected chimney heights) can be obtained from chart III

Alternative procedure for calculating U

$$\begin{aligned} \text{For gas oil} \quad R_A &= 1.5 \times 1.6 \text{ (from para 18)} \\ &= 2.4 \text{ kg/h} \\ U &= 6 \times (2.4)^{0.5} \text{ (from para 19 equation (6))} \\ &= 9.3m \end{aligned}$$

$$\begin{aligned} \text{For medium fuel oil} \quad R_A &= 9.4 \times 1.6 \text{ (from para 18)} \\ &= 15.0 \text{ kg/h} \\ U &= 12 \times (15)^{0.2} \text{ (from para 19 equation (7))} \\ &= 20.6m \end{aligned}$$

Correction for buildings:

Fig 4 shows the dimensions of the salient buildings near the chimney.

The values of H_m and T_m are calculated following the procedures of paragraphs 22 and 24 and presented in the table.

All dimensions in metres

Building	Distance	Height	Width	K	1.5 K	T
		H	B	Lesser of H and B		H + 1.5K
1	0	16*	75	16	24	40†
2	58	45	50	45	67.5	112.5
3	65	65†	63	63	94.5	159.5§
4	173	85	32.5	32.5	48.8	133.8

* H_m for gas oil

† H_m for medium fuel oil

‡ T_m for gas oil

§ T_m for medium fuel oil

Gas oil: $U = 9.3\text{m}$

Buildings 2, 3 and 4 are at distances greater than $5U$ and thus only building 1 needs to be considered.

Since only one building is relevant and it is wider than it is high, from paragraph 23 equation (9), corrected chimney height

$$C = 16 + 0.6 \times 9.3 \\ = 22\text{m to the nearest metre.}$$

Medium fuel oil: $U = 20.6\text{m}$

Building 4 is at a greater distance than $5U$ and is excluded.

Thus $H_m = 65\text{m}$ and $T_m = 159.5\text{m}$

From para 24 equation (10) corrected chimney height

$$C = 65 + 20.6 (1 - 65/159.5) \\ = 77\text{m to the nearest metre.}$$

Example 4: Gas fired fan diluted installations

Calculations for three sizes of natural gas fired installations are set out in the following table. The fan dilution factor F is ten, and minimum velocity $75/F \text{ m/s}$ is 7.5 in each case. (Note 3).

Heat Input Q	Uncorrected chimney height U	Stoichiometric combustion volume V_0 m^3/s ($= 0.26 Q$)	Flue gas volume $V_0 \times F$ m^3/s	Minimum distance to			Minimum height above ground
				fan assisted intake	openable window	nearest building	
MW	m			m	m	m	m
Note 1	Note 2	Note 3		Note 4	Note 5	Note 6	Note 7
0.5	0.9	0.13	1.3	4.5	1.8	5.4	2
3.0	2.6	0.78	7.8	13.0	5.2	15.6	3
5.0	3.6	1.30	13.0	18.0	7.2	21.6	3

Note 1 Para 11 equation 1

Note 2 Paras 12-13 equation 3 or chart 1

Note 3 Para 27a

Note 4 Para 27b

Note 5 Para 27c

Note 6 Para 27d

Note 7 Para 27e

Appendix II

To convert to SI units multiply by the indicated factors

Length inches x 0.0254 → metres (m)

feet x 0.305 → metres (m)

Mass lb x 0.454 → kilogramme (kg)

Calorific value Btu/lb x 0.556 → kilogramme calorie/kilogramme (kcal/kg)

Btu/lb x 2326 → joules/kilogramme (J/kg)

kcal/kg x 4187 → J/kg

Btu/ft³ x 8.9 → kcal/m³

Btu/ft³ x 37260 → J/m³

Energy Btu x 1055 → joules (J)

therm x 1055 x 10⁵ → J

kcal x 4187 → J

1 joule/second = 1 watt

1 million Btu/h x 0.293 → MW

CHART I UNCORRECTED CHIMNEY HEIGHT
 VERY LOW SULPHUR FUELS HEAT INPUT UP TO 150 MW

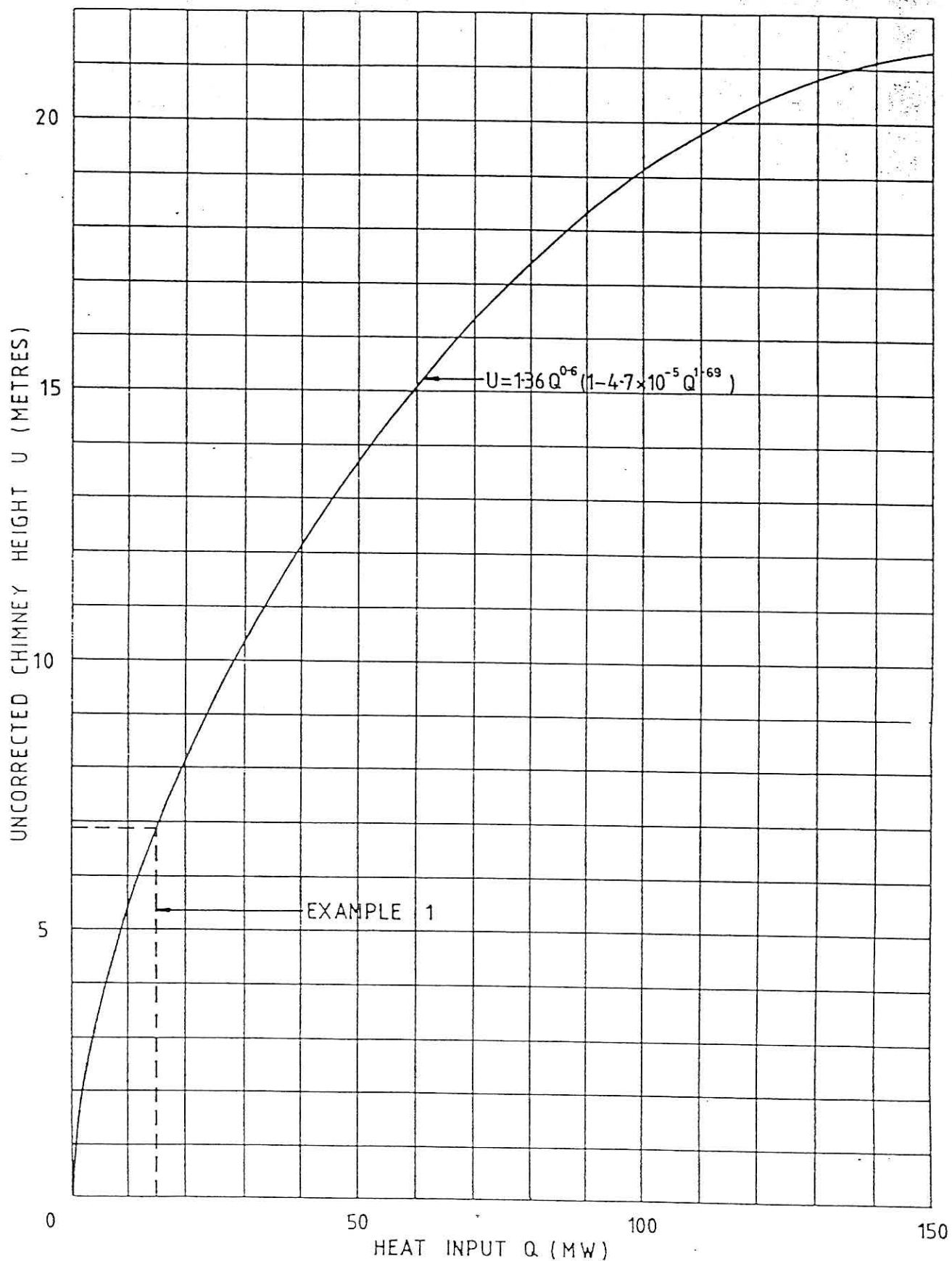


CHART II UNCORRECTED CHIMNEY HEIGHT FOR SULPHUR DIOXIDE
EMISSIONS FROM 0.1-1.0 Kg h⁻¹

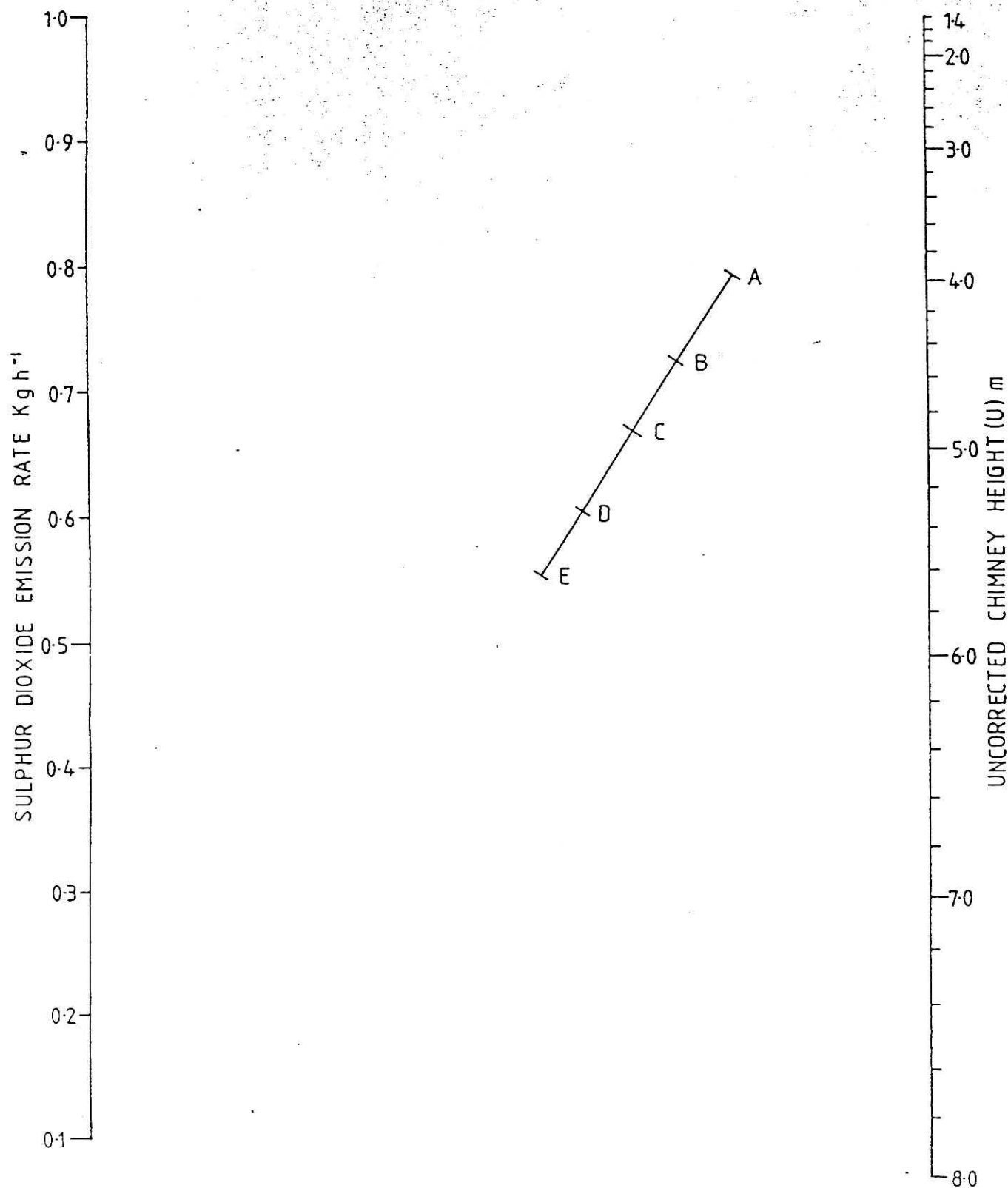


CHART III UNCORRECTED CHIMNEY HEIGHT FOR SULPHUR DIOXIDE
EMISSIONS FROM 1-10 Kg h⁻¹

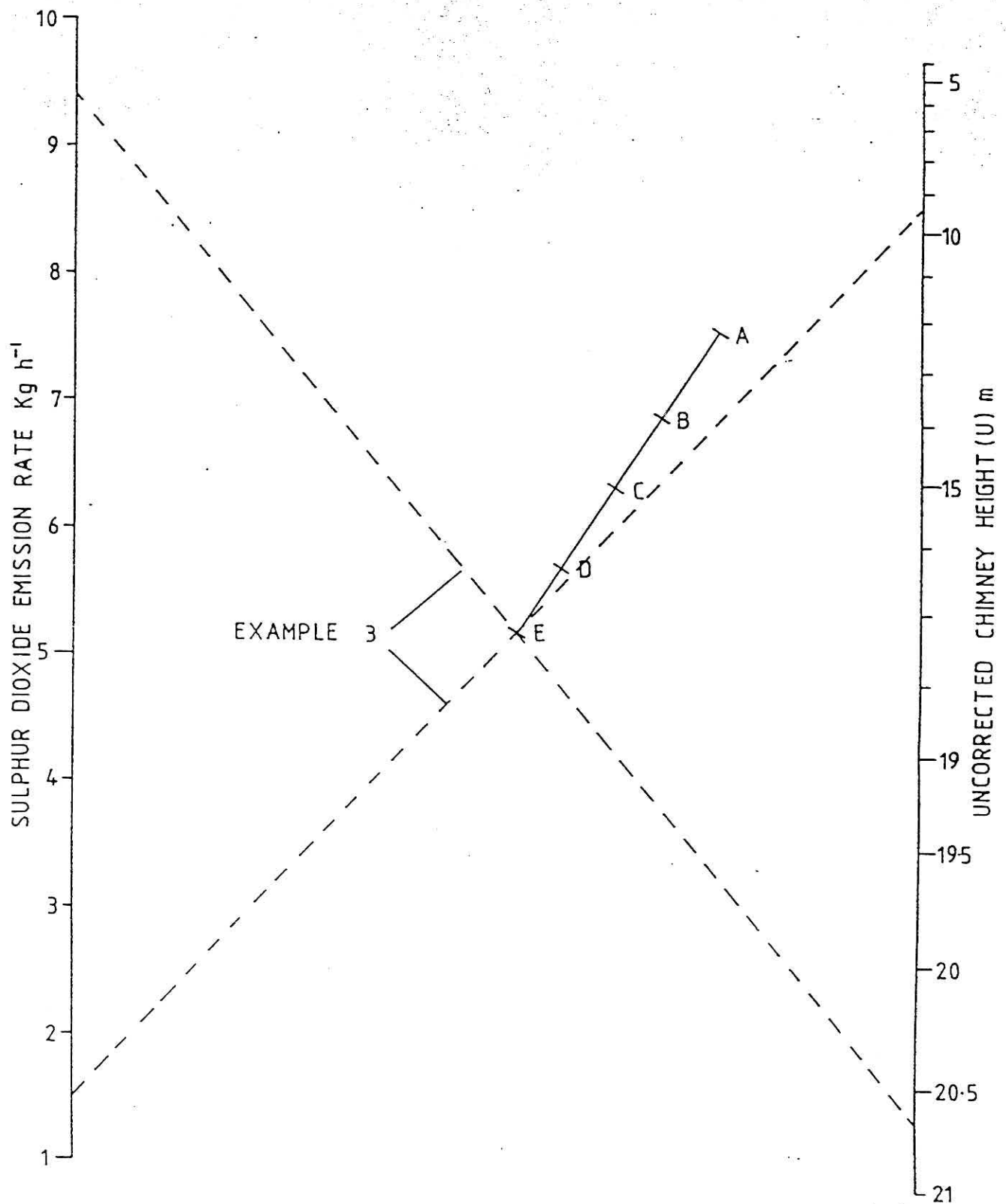


CHART IV UNCORRECTED CHIMNEY HEIGHT FOR SULPHUR DIOXIDE
EMISSIONS FROM 10-100 Kg h⁻¹

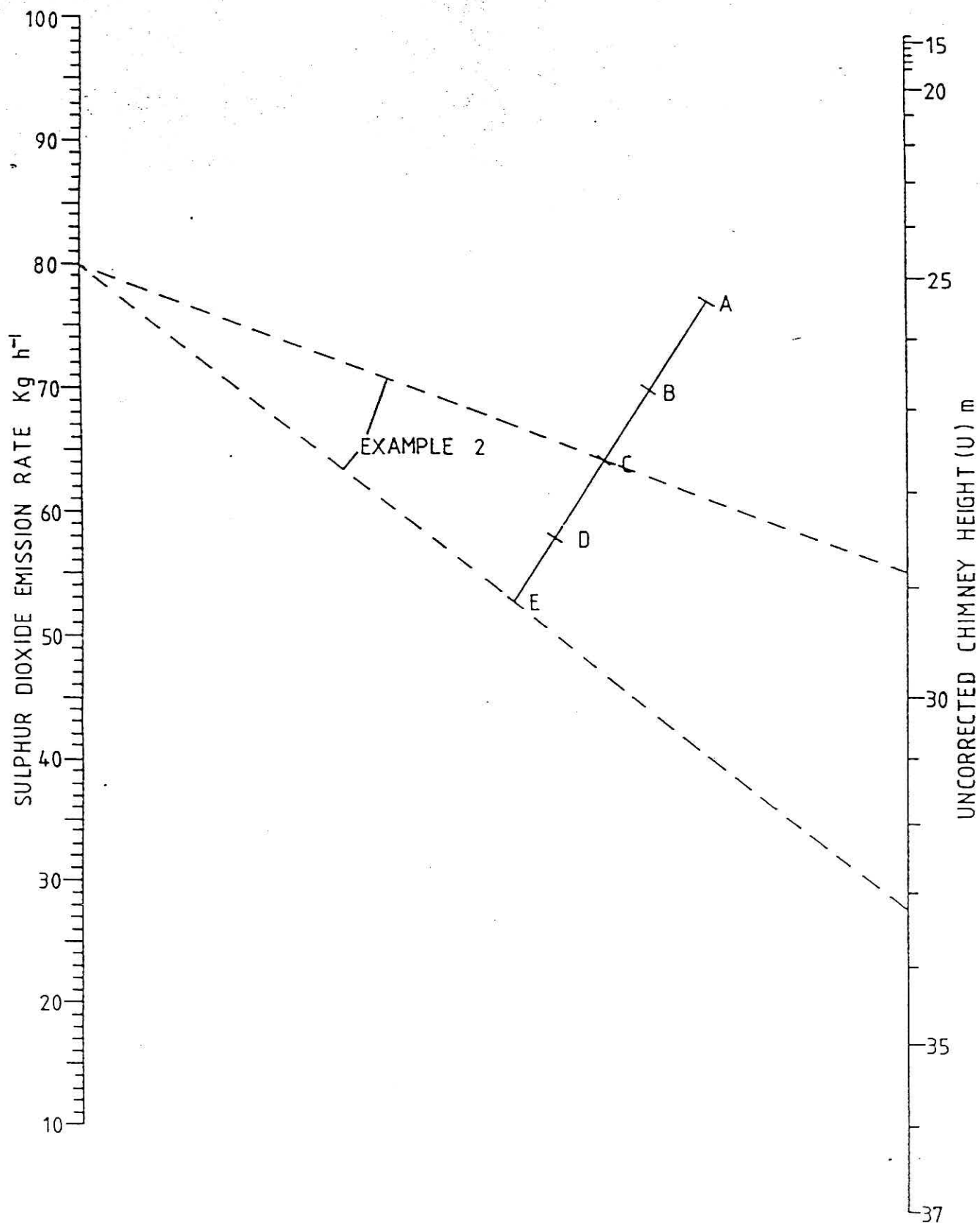


CHART V UNCORRECTED CHIMNEY HEIGHT FOR SULPHUR DIOXIDE
EMISSIONS FROM 100-500 Kg h⁻¹

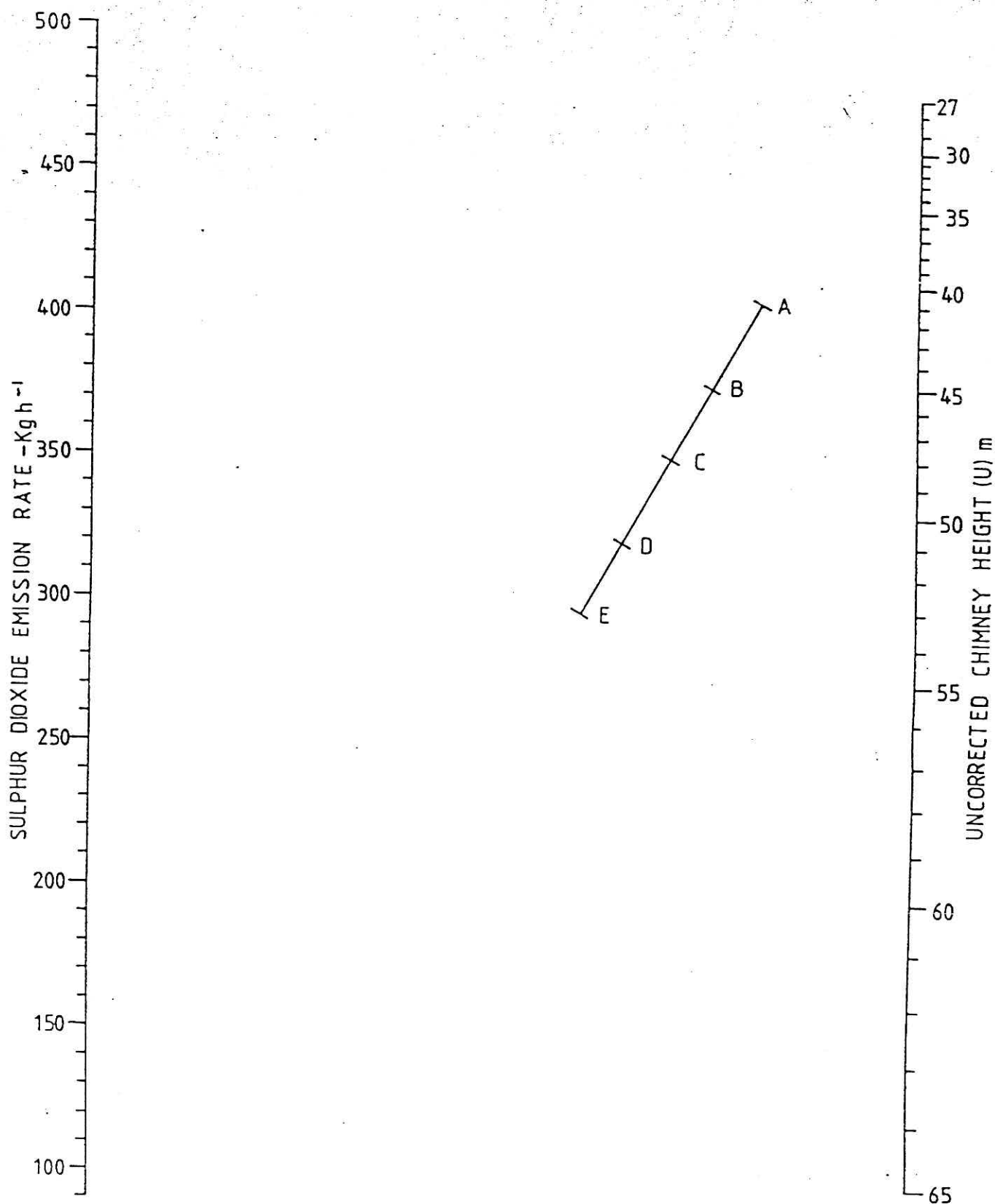
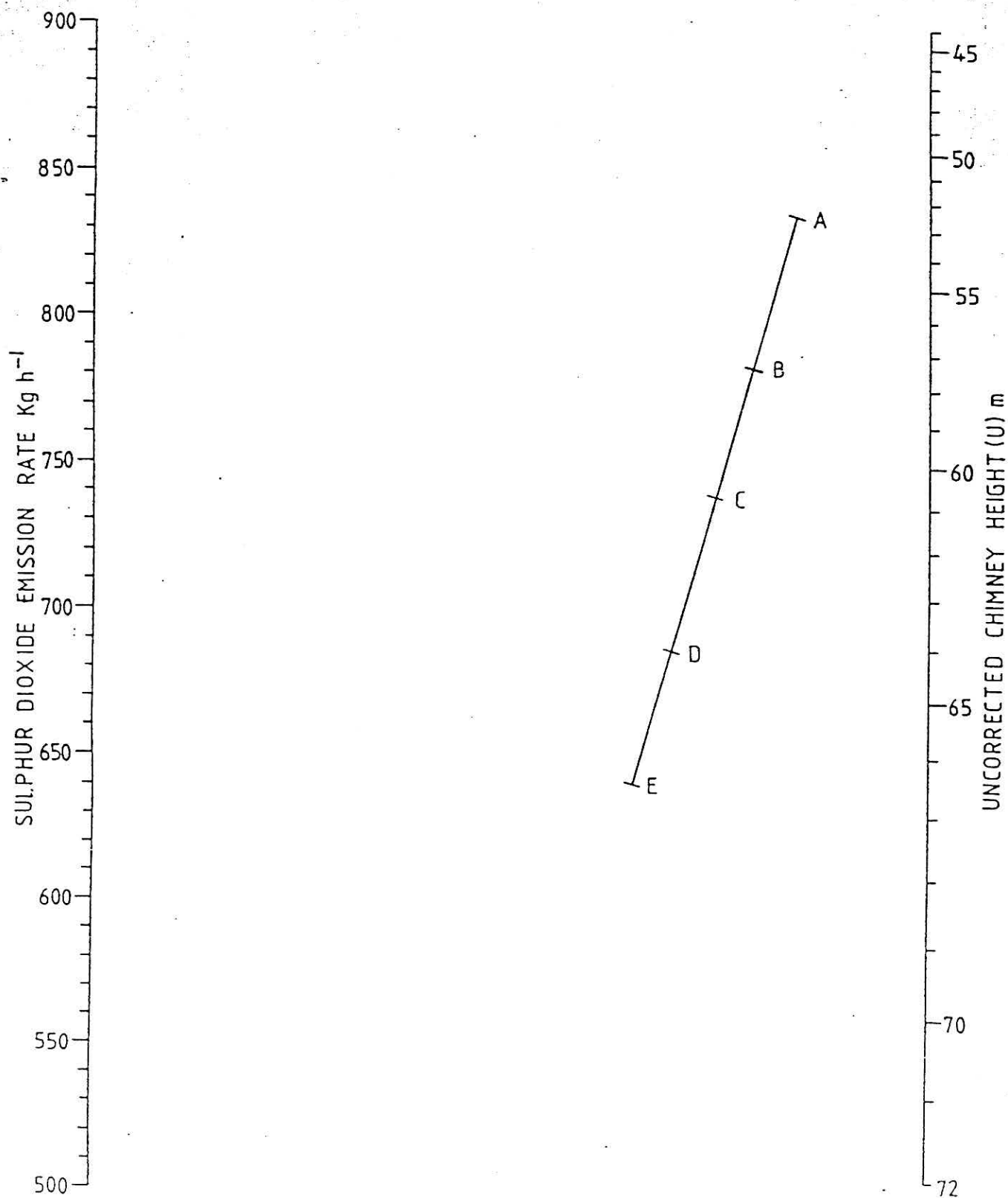


CHART VI UNCORRECTED CHIMNEY HEIGHT FOR SULPHUR DIOXIDE
EMISSIONS FROM 500-900 Kg h⁻¹



APPENDIX C
WRITTEN
APPROVAL FORMS

FORMS FOR BOILER



Catatan: Mana-mana maklumat yang berhubungan dengan proses pengeluaran atau rahsia perdagangan yang terdapat dalam Borang ini, tertakluk kepada peruntukan di bawah Seksyen 50, Akta Kualiti Alam Sekeliling, 1974.

Note: *Any information in relation to any manufacturing process or trade secret contained in this Form will be subject to provision under Section 50, of the Environmental Quality Act, 1974.*

Tuan,

Borang AP/E/1/98 Alat Pembakaran Bahanapi
(Form AP/E/1/98 Fuel Burning Equipment)

Saya ingin memohon kelulusan memasang, menempatkan semula/mengubah alat pembakaran bahanapi seperti dikehendaki di bawah Peraturan 36 dan 38, Peraturan-Peraturan Kualiti Alam Sekeliling (udara Bersih) 1978.

I apply for an approval to install/resite/alter a fuel burning equipment as required under Regulations 36 and 38, Environmental Quality (Clean Air) Regulations, 1978.

SEKSYEN I PENGENALAN
SECTION I IDENTIFICATION

1. Nama dan alamat pemohon
Name and address of applicant

2. Lokasi alat pembakaran bahanapi (sila kemukakan pelan yang menunjukkan bangunan-bangunan dan kegunaan tanah dalam lingkungan 1000 meter)
Location of fuel burning equipment (Please attach plan showing the surrounding buildings and landuse within 1000 metres)

Pelan lokasi berkenaan disertakan
Location plan is attached

Tajuk : _____
Title

Bil.: _____
Ref. Number

3. Tinggi rumah alat pembakaran bahanapi/bangunan alat pembakaran bahanapi ditempatkan: _____ meter
Height of fuel burning equipment house/structure housing the fuel burning equipment _____ meters
Lukisan berkenaan disertakan
Drawing is attached

Tajuk : _____
Title

Bil.: _____
Ref. Number

4. Bangunan tertinggi dan lebarnya dalam jarak 250 meter dari rumah alat pembakaran bahanapi (berhubung dengan paras bumi rumah alat pembakaran bahanapi)
Maximum height and width of building within 250 meters of the fuel burning equipment house (with reference to ground level of fuel burning equipment house)

_____ meter
_____ metres

Lukisan berkenaan disertakan
Drawing is attached

Tajuk : _____
Title

Bil.: _____
Ref. Number

SEKSYEN II MAKLUMAT ALAT PEMBAKARAN BAHANAPI
SECTION II INFORMATION OF THE FUEL BURNING EQUIPMENT

5. Butir-Butir Alat Pembakaran Bahanapi
Details of Fuel Burning Equipment

(i) Jenis Alat Pembakaran Bahanapi _____
Type of Fuel Burning Equipment

(ii) Nama Pembuat _____
Manufacturer

- (iii) Model: _____
 Kepilkan katalog/Attach the relevant catalogue
- (iv) Keupayaan: _____ kg.wap/jam
 Capacity _____ kg.steam/hour
- (v) Nombor siri: _____
 Serial no.
- (vi) Gross output: _____

SEKSYEN III MAKLUMAT BAHANAPI
SECTION III INFORMATION OF FUEL

6. Butir-Butir Bahanapi Yang Digunakan
Details of Fuel Used

- (i) Kadar penggunaan bahanapi: _____ kg/jam
 Rate of fuel consumption _____ kg/hr
- (ii) Jenis bahanapi: _____
 Type of fuel used
- (iii) Analisa bahanapi (sertakan spesifikasi bahanapi yang hendak digunakan)
Analysis of fuel (Please attach specification of fuel to be used)
- Kandungan sulfur: _____ %
 Sulphur content
- Kandungan abu: _____ %
 Ash content
- Nilai kasar kalori: _____
 Gross calorific value
- (iv) Kaedah penyuaipan dan kawalan bahanapi
 Method of fuel feeding and control
- _____
- _____

SEKSYEN IV MAKLUMAT CEROBONG
SECTION IV INFORMATION OF CHIMNEY

7. Butir-Butir Cerobong
Details of Chimney

- (i) Tinggi cerobong yang dicadangkan _____ meter
 Proposed chimney height _____ metres
- Nyatakan asas pengiraan yang digunakan _____
 Specify basis calculation
- (ii) Garis pusat di bahagian bawah _____ meter
 Diameter at the base _____ metres
- (iii) Garis pusat di bahagian atas _____ meter
 Diameter at the top _____ metres
- (iv) Nombor pengenalan pada cerobong yang dicadangkan _____
 Identification number at the proposed chimney
- (v) Halaju pelepasan _____ (meter/saat, drauf, paksaan/semulajadi)
 Efflux velocity _____ (Metre/second, forced/natural draught)
- (vi) Parameter rekabentuk tinggi cerobong
 Chimney height design parameter

- (a) Kepilkan cara pengiraan cerobong. Sekiranya ada rancangan pembesaran, tunjukkan kiraan yang digabungkan.
Attach calculations on chimney height. If there is plan for future expansion, indicate consideration incorporated

Tajuk _____ Bil. _____
 Title _____ Ref. No. _____

- (b) Kepilkan lukisan-lukisan yang menunjukkan butir-butir lengkap pembinaan cerobong, takat percontohan gas cerobong dan kemudahan laluan ke takat percontohan tersebut sekiranya bahanapi pepejal digunakan
Attach drawings showing the construction details of chimney, flue gas sampling point and the necessary safe access leading to it if solid fuel is used

Tajuk _____ Bil. _____
 Title _____ Ref. No. _____

- (vii) Suhu pelepasan gas di salur masuk cerobong _____ °C
(Flue gas temperature at inlet of chimney)

di salur keluar cerobong _____ °C
(at exit of chimney)

- (viii) Kandungan habuk dalam gas cerobong sebelum kawalan _____ g/Nm³ atau m³/hr
Flue gas dust content before dust collector g/Nm³ or m³/hr

SEKSYEN V MAKLUMAT KAWALAN PENCEMARAN
SECTION V INFORMATION OR CONTROL EQUIPMENT

8. Huraikan teknikal alat kawalan pencemaran
Technical description of pollution control equipment

(i) Jenis/Type: _____

(ii) Nama Pembuat : _____
Manufacturer

(iii) Model:
 Kepilkan katalog/lukisan berkenaan
Attach catalogue/drawing of control equipment

Tajuk: _____ Bil.: _____
 Title _____ Ref. No. _____

(iv) Kecekapan: _____ %
Efficiency

(v) Paras pelepasan habuk: _____ g/Nm³
Final dust emission

(vi) Kepilkan cara pengiraan rekabentuk alat perangkap habuk dan asas pilihan alat kawalan tersebut
Attach calculation sheets on the design and basis of selection of the particular pollution control equipment

Tajuk: _____ Bil.: _____
 Title _____ Ref. No. _____

(vii) Pelan pandangan sisi bagi pemasangan alat perangkap habuk

Plan showing elevation view of the proposed control equipment installed

Tajuk: _____ Bil.: _____
Title _____ Ref. No. _____

(viii) Kepilkan jaminan prestasi dari pembuat alat perangkap habuk
Attach performance guarantee from the manufacturer

9. Kipas
Fan

- (i) Jenis Kipas: _____
Type of fan
- (ii) Keupayaan pada suhu tertentu: _____ m³/min pada _____ °C
Capacity at specified temperature
- (iii) Tekanan statik: _____
Static pressure
- (iv) Tenaga motor: _____ HP
Motor output

10. Keterangan ringkas mengenai penggunaan wap dan kadar penggunaan
Brief description of steam uses and rated steam consumption

11. Kekerapan dan tempoh operasi 'soot blowing' dan 'steam blowdown' dan rancangan mengurangkan pelepasan habuk dan bunyi bising.
Frequency and duration of soot blowing and steam blowdown operation AND proposal to limit dust and noise emissions

12. Alat penganalisa dan pencatit ketumpatan asap dan alat kecemasan
Smoke density recorder and alarm

Jenis: _____ Model: _____
Type Model

13. Maklumat mengenai lain-lain alat pembakaran bahanapi di permis tersebut
Information on other fuel burning equipment within the premises

Jenis	Keupayaan	Jenis Bahanapi & Kadar Penggunaan	Tinggi Cerobong
Type	Capacity	Type of fuel & rate of consumption	Chimney height
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Nyatakan sama ada alat tersebut 'tunggu sedia', cerobong gabungan dan lain-lain
(State the status of the equipment, either standby, combined stack, etc.)

14. Lain-lain cerobong di dalam jarak 100 meter dari cerobong cadangan dan pemunya
Other chimney within 100 metres of proposed chimney and name of owner

PENGAKUAN
ACKNOWLEDGEMENT

Saya pemohon/agen*
yang diberi kuasa bagi pemohon, dengan ini mengaku bahawa segala maklumat yang diberi di dalam borang ini
adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

I..... the applicant/authorised agent of
the applicant, hereby declare that all the information given in this application is to the best of my knowledge
and belief true and correct.*

Tarikh: _____
Date

Tandatangan Pemohon/*: _____
Agen yang diberi kuasa
*Signature of applicant/
Authorised agent*

Telefon/Telephone: _____

Nama Penuh: _____
Full Name

Fak/Fax: _____

Jawatan: _____
Designation

Cop Rasmi Syarikat: _____
Official Stamp of the Company

Untuk dan bagi pihak: _____
For and on behalf of: _____

Telefon/Telephone: _____

Fak/Fax: _____

* Potong yang mana tidak berkenaan
Delete whichever is not applicable

Semua lukisan hendaklah disahkan oleh seorang jurutera profesional berdaftar
All drawings shall be certified by a registered professional engineer

FORMS FOR AIR POLLUTION CONTROL SYSTEM



**BORANG AS 16 D-1
FORM AS 16 D-1**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN
SEMULA/MENGUBAH ALAT KAWALAN PENCEMARAN UDARA BAGI PENCEMAR GAS
(PENGGAHAR DAN CEROBONG)
DI BAWAH PERATURAN 38, PERATURAN-PERATURAN
KUALITI ALAM SEKELILING (UDARA BERSIH), 1978**

**APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTER
AIR POLLUTION CONTROL EQUIPMENT FOR GASEOUS POLLUTANTS
(SCRUBBER AND CHIMNEY)
UNDER REGULATION 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR)
REGULATIONS, 1978**

Sila kemukakan borang yang telah lengkap diisi
ke pejabat Jabatan Alam Sekitar Negeri di mana projek/premis ini ditempatkan.
*Please submit completed form to the Department of Environment State Office
where the project/premise is located*

**JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

BORANG PERMOHONAN PEMASANGAN ALAT KAWALAN PENCEMARAN UDARA BAGI PENCEMAR GAS (PENGGAHAR DAN CEROBONG)

APPLICATION FORM FOR AIR POLLUTION CONTROL EQUIPMENT INSTALLATION FOR GASEOUS POLLUTANTS (SCRUBBER AND CHIMNEY)

UNTUK KEGUNAAN PEJABAT(FOR OFFICE USE ONLY)		
NO.REKOD:	TARIKH	TANDATANGAN

Perhatian/Attention.

- Sila penuhkan borang dengan jelas atau bertaip. Satu borang untuk satu alat kawalan.
(Please fill in the form clearly or type). One form for each control equipment.
- Borang dan semua maklumat perlu dijilidkan sebelum dikemukakan ke Jabatan ini.
(Forms and all relevant information must be bound before submitting to the Department)

**A. MAKLUMAT ASAS PERMOHONAN
GENERAL INFORMATION FOR APPLICATION**

1. Nama dan alamat pemunya/pemohon : <i>Name and address of applicant:</i>	4. Nama dan alamat pembuat/jururunding * <i>Name and address of manufacturer/consultant*</i>
2. Pegawai yang boleh dihubungi(<i>Contact person</i>)	5. Pembuat/Perunding yang boleh dihubungi(<i>Contact person</i>)
3. No. Telefon(<i>tel. no.</i>): No. Faks(<i>Fax no.</i>):	6. No. Telefon Pembuat/Perunding(<i>tel. no.</i>): No. Faks Pembuat/Perunding (<i>Fax no.</i>):
7. Alamat pemasangan (jika lain dari di atas) (<i>Installation address (if other than above)</i>)	8. Jenis pengeluaran kilang : <i>Type of manufacturing facility.</i>
9. Nama kemudahan awam seperti sekolah, klinik, hospital dan lain-lain dalam lingkungan 300 meter dari lokasi pemasangan penggaahar. <i>Names of public facilities such as school, clinic, hospital etc. within 300 metre radius from the location of proposed scrubber.</i>	

**B. MAKLUMAT PELEPASAN GAS
GAS EMISSION DATA**

10. Jenis Gas <i>Type of gas</i>	11. Kepekatan sebelum alat kawalan (<i>Concentration before control equipment</i>) gm/Nm ³	12. Standard pelepasan* (<i>Emission Standard</i>)* gm/Nm ³

- * Rujuk kepada standard pelepasan di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 1978 atau jika tiada sila rujuk standard yang diamalkan di negara lain seperti USA atau Eropah
Refer to emission standard under the Environmental Quality (Clean Air) Regulations, 1978 or if not available please refer to standard being enforced in other countries such as USA or Europe

Punca pelepasan gas (Kepilkan carta alir proses pengeluaran dan tandakan punca pelepasan gas dikeluarkan dari proses).
Source of gaseous emission (attach manufacturing process flow chart and highlight the generating points in the process).

Senarai peralatan dan infrastruktur lain yang menghasilkan pencemaran gas yang akan dikawal oleh penggahar yang direkabentuk dalam Seksyen C hingga G.
List all machineries and the other infrastructure emitting gaseous emission that will be controlled by the scrubber as designed in Section C to G.

No. Item/ Item No.	Keterangan peralatan <i>Description of machine</i>	Dimensi/Kapasiti <i>Dimension / Capacity</i>	Pembuat <i>Manufacturer</i>	Catatan <i>Note</i>

13. Senarai bahankimia yang digunakan dalam proses di atas.
List of chemicals used in the above process.

i) _____
 ii) _____
 iii) _____

C. REKABENTUK SISTEM PENGUDARAAN DESIGN OF VENTILATION SYSTEM

14. Dengan menggunakan lampiran kemukakan pengiraan terperinci rekabentuk sistem pengudaraan dengan merujuk kepada *American Conference of Governmental Industrial Hygienists (ACGIH)* atau sumber rujukan lain. Nyatakan ringkasan butir-butir sistem pengudaraan sebagaimana dikehendaki dalam para i - iv
Using separate attachment provide a complete design calculation of ventilation system by referring to American Conference of Governmental Industrial Hygienists (ACGIH) or other source of reference. Provide a summary of details of ventilation system as required in para i - iv

i.) Jumlah kejatuhan tekanan melalui salur <i>Total pressure loss through duct</i> _____ (mm WG)	ii.) Jumlah kejatuhan tekanan melalui penggahar <i>Total pressure loss through scrubber</i> _____ (mm WG)
iii.) Jumlah kejatuhan tekanan melalui cerobong (mm WG) <i>Total pressure loss through stack (mm WG)</i> _____ (mm WG)	iv.) Jumlah kejatuhan tekanan sistem (mm WG) <i>Total system pressure loss (mm WG)</i> _____ (mm WG)

15. Bahan binaan salur: _____
Material of duct construction:

Kepilkan Pelan Susun Atur dan Pelan Keratan Bangunan yang menunjukkan lokasi kurungan, peniup, sistem pengudaraan, penggahar dan alat kawalan lain atau cerobong
Attach building layout and elevation plan showing location of hood, blower, ventilation system, scrubber and other control equipment or chimney

Tajuk _____ No. Rujukan _____
 Title _____ Reference no. _____

D.

MAKLUMAT KIPAS
FAN DATA.

Sila kemukakan pengiraan terperinci kipas. Kepilkan katalog dan graf keupayaan kipas yang berkaitan. Gunakan lampiran jika menggunakan lebih daripada satu kipas.

(Please compute for fan details. Attach catalogue and fan performance curve. Use extra sheets if more than one fan is used).

16. Jenis kipas: Type of fan: ☐ Empar (aliran jejarian) Centrifugal (radial flow) ☐ Aliran paksi (pendorong) Axial-flow (propeller)	17. Pembuat: Manufacturer: _____	18. Model No Kipas: Fan model No: _____
19. Keupayaan pada suhu operasi Capacity at temperature of operation _____ (m ³ /s atau cfm). _____ °C	20. Kelajuan Kipas Fan speed: _____ rpm	21. Tekanan static Static pressure _____ (mm WG)
22. Jenis kipas Blade type ☐ Forward curve ☐ Backward curve ☐ Tube Axial ☐ Straight ☐ Propeller ☐ Vane axial	23. Garispusat bilah Blade diameter _____ cm	
24. Lebar bilah Blade width _____ cm	25. Saiz salur masuk Inlet duct size _____ cm	26. Saiz salur keluar Outlet duct size _____ cm

E

MAKLUMAT MOTOR
MOTOR DATA

27. Tenaga motor: Motor output: _____ (hp/kw)	28. Kelajuan motor: Motor speed: _____ rpm	29. Nisbah kelajuan: Speed ratio: _____
30. Manufacturer: _____	31. Motor model No: _____	

F.

REKABENTUK CEROBONG
CHIMNEY DESIGN

32. Tinggi cerobong: Chimney height _____ m	33. Tinggi bangunan tertinggi : Height of highest building : _____ m	34. Halaju pelepasan** Efflux velocity** _____ (m/s)
35. Nombor cerobong (Rujuk no sediaada) Chimney No. (refer to existing chimney). _____	36. Garis pusat/Dimensi di bahagian atas Diameter/Dimension at the top _____ m	37. Bahan binaan : Material of construction _____
38. Suhu / Temperature Masuk/ Inlet : _____ °C Keluar/Outlet : _____ °C	39. Adakah cerobong dilengkapi dengan topi hujan? Does stack have rain cap? ☐ Ya/Yes ☐ Tidak/No Jika ya, tunjukkan lukisan topi. Lihat para 36 If yes show drawing of cap. See para 36	

* Tinggi bangunan dalam radius 50 meters. Highest building in 50-meter radius.

** Sediakan Pengiraan. Perform calculation.

40. Kepilkan lukisan-lukisan yang menunjukkan butir-butir lengkap pembinaan cerobong, takat percontohan gas cerobong dan kemudahan laluan ke takat percontohan tersebut termasuk platform percontohan. Berikan justifikasi lokasi takat percontohan yang dipilih.
Attach drawings showing the construction details of chimney, flue gas sampling point and the necessary safe access leading to the sampling point including the sampling platform. Justify the location of the sampling point selected.

Tajuk _____ No. Rujukan _____
 Title _____ Reference no. _____

G.

**REKABENTUK SCRUBBER
 SCRUBBER DESIGN**

Rujuk kepada nota penerangan yang dilampirkan kepada borang ini untuk panduan cara mereka bentuk penggahar. Kemukakan pengiraan terperinci. Nyatakan ringkasan butir-butir penggahar sebagaimana dikehendaki dalam para 41 - 48
Refer to explanatory note attach to this form for guidance on the method of design of the scrubber. Attach detailed design calculation. Provide a summary of scrubber details as required in para 41 - 48

Data Peralatan / Equipment data		
41. Pembuat: Manufacturer: _____	42. Jenis penggahar: Type of scrubber: ☐ Empar ☐ Centrifugal ☐ Orifis ☐ Orifice type ☐ Kebuk sembur ☐ Spray Chamber ☐ Siklon ☐ Cyclonic ☐ Turus terpadat ☐ Packed Column ☐ Dulang ☐ Tray ☐ Venturi ☐ Venturi ☐ Lain-lain (nyatakan) ☐ Other (specify) _____	43. Model penggahar (jika berkaitan): Scrubber model (if relevant): _____
44. Keratan rentas /dimensi penggahar Diameter or dimension of scrubber _____(m)	45. Luas permukaan basahan Irrigation surface area _____(m ²)	46. Bahan binaan penggahar Material of construction _____
47. Bentuk penggahar Shape of scrubber ☐ Segi empat tepat ☐ Rectangular ☐ Selinder ☐ Cylindrical ☐ Lain-lain ☐ Other	48. Adakah penggahar dilengkapi dengan alat berikut? Is the scrubber equipped with the following equipment? Penghalang kabus Mist eliminator ☐ Tidak No ☐ Ada Yes Kalau ya, nyatakan dimensi: If yes, specify dimension: Garispusat / Diameter : _____m Panjang / Length : _____m Tinggi / Height : _____m Lebar / Width : _____m	

49. Kepilkan lukisan-lukisan pandangan atas dan sisi penggahar.
Attach drawings of plan and side view of scrubber.

Tajuk _____ No. Rujukan _____
 Title _____ Reference no. _____

Data Operasi /Operational Data		
50. Operasi penggahar Scrubber operation ☐ Berterusan /Continuous ☐ Tidak berterusan / Intermittent	51. Perbezaan tekanan merentasi penggahar Differential pressure drop across scrubber _____(mm WG)	52. Bebanan Gas Gas loading _____(kg/h)

53. Bebanan Pencecair <i>Liquid loading</i> _____ (kg/h)	54. Halaju gas dalam scrubber <i>Superficial gas velocity across scrubber</i> _____ (m/s)	55 Kadar alir air tambahan <i>Fresh water make up rate</i> _____ L/min								
56 Bilangan unit pindah <i>Number of transfer unit</i> _____	57 Tinggi unit pindah <i>Height of transfer unit</i> _____ m	58 Tinggi pematat dicadangkan <i>Proposed packing height</i> _____ m								
59. Jenis pematat: <i>Type of packing:</i> ☐ Raschig ring ☐ Berl saddle ☐ Intalox saddle ☐ Pall ring ☐ Spiral ring ☐ Teller rosette ☐ Lessing ring ☐ Ball ☐ Wire mesh or goodloe ☐ Cross-partition ring ☐ Other	60. Ciri-ciri pematat <i>Packing characteristic</i> Saiz pematat: <i>Packing size:</i> _____ (mm) Faktor pematat: <i>Packing factor:</i> _____	61. Maklumat larutan penggahar <i>Scrubbing solution information</i> Senarai bahan kimia dan bahan tambah dalam larutan penggahar termasuk air <i>List all chemical constituents and additives in scrubbing solution including water</i> <table border="0"> <tr> <td>Bahan / Bahan tambah <i>Constituent/Additives</i></td> <td>Isipadu % <i>Volume %</i></td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </table> Kadar alir bekalan <i>Supply line flow rate:</i> _____ L/min Kadar alir edaran semula <i>Recirculation line flow rate:</i> _____ L/min pH Operasi <i>Operating PH</i> Maksimum: _____ Minimum: _____ Maximum Minimum	Bahan / Bahan tambah <i>Constituent/Additives</i>	Isipadu % <i>Volume %</i>	_____	_____	_____	_____	_____	_____
Bahan / Bahan tambah <i>Constituent/Additives</i>	Isipadu % <i>Volume %</i>									
_____	_____									
_____	_____									
_____	_____									
62. Pelupusan cecair penggahar <i>Scrubber liquid disposal</i> ☐ Sistem pengolahan effluen industri <i>Industrial effluent treatment system</i> ☐ Lain-lain (nyatakan) <i>Others (specify)</i> _____	63. Kecekapan penggahar <i>Scrubber efficiency</i> _____ % **Kemukakan data sebagai bukti <i>Supply data to substantiate</i> Jika ada, data hendaklah diperolehi dari ujian ke atas penggahar sedia ada yang mempunyai rekabentuk yang sama di industri yang serupa. <i>If available data should be obtained from testing on an existing scrubber with similar design in similar industry.</i>									

* Rujuk scrubber sedia ada (jika ada)
Refer to existing scrubber (if any)

** Serta katalog dan data yang berkaitan
Attach catalogue and relevant data

H. MAKLUMAT PAM PUMP DATA

64. Jenis Pam <i>Type of pump</i>	65. Model No Pam : <i>Pump Model No.:</i>	66 Tekanan Statik Pam: <i>Pump static pressure in water gauge:</i>
67. Keupayaan Pam <i>Pump capacity</i> L/s	68 Model No Motor <i>Motor Model No</i>	69. Tenaga motor (hp/kw) <i>Motor output (hp/kw)</i>
70. Kelajuan motor: <i>Motor speed:</i> rpm	71 Nisbah kelajuan: <i>Speed ratio:</i>	

I.

**PENGAWASAN PRESTASI
PERFORMANCE MONITORING**

- 72 Terangkan lokasi jangka tekanan, sensor suhu, meter pH dan meter kadar alir yang dipasang untuk tujuan operasi dan pengawasan prestasi. Sertakan lukisan paip dan instrumentasi.
Describe location of pressure gauges, temperature sensors, pH meter and flowrate meters installed for the purpose of operation and performance monitoring. Attach piping and instrumentation drawing.

- 73 Kemukakan dengan menggunakan lampiran tambahan cadangan terperinci program pengawasan prestasi dan penyelenggaraan scrubber. Sila rujuk dokumen bertajuk 'Performance Monitoring of Air Pollution Control Systems' yang dikeluarkan oleh JAS untuk panduan
Submit using attachment detailed proposal on performance monitoring programme for the operation and maintenance of the scrubber. Please refer to the document entitled 'Technical Guidance Documents No. DOE-2-2004 Performance Monitoring of Air Pollution Control Systems' issued by DOE for guidance.

Nyatakan kaedah pelupusan atau rawatan cecair penggahar
State or describe the method of disposal or treatment of scrubbing liquid

- 74 . Anggaran kepekatan gas pencemar yang dilepaskan melalui cerobong. Sertakan pengiraan berkaitan.
Estimated concentration of gaseous pollutant concentration discharge at the outlet of the chimney. Attach the calculation.
_____ gm/NM³

75. Lukisan dan maklumat yang perlu dikemukakan bersama borang permohonan.
Drawing and information to be submitted together with application form.

- i) Pelan Petunjuk & Lokasi premis (*key and location plan of the premise*)
- ii) Pelan Susun Atur dan Pelan Keratan Bangunan yang menunjukkan lokasi alat kawalan dan sistem pengudaraan.
(*Building layout and elevation plans showing location of the control equipment and ventilation system*)
- iii) Lukisan Kejuruteraan (pandangan atas dan sisi) penggahar dan cerobong
(*Engineering drawings (plan and side view) of scrubber and chimney.*)
- iv) Semua pelan dan lukisan kejuruteraan hendaklah bersaiz A1 dan disahkan oleh Jurutera Profesional
(*All plans and engineering drawings should be in A1 size and certified by professional engineer.*)
- v) Carta alir proses pengeluaran yang berkaitan.
(*Relevant manufacturing process flow diagram.*)
- vi) Katalog kipas dan motor yang berkaitan.
(*Fan and motor catalogues.*)

J.

**PENGAKUAN
DECLARATION**

Saya pemohon/agen* yang diberi kuasa bagi pemohon, dengan ini mengaku bahawa segala maklumat yang diberi di dalam borang ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

I the applicant/authorised agent* of the applicant, hereby declare that all the information given in this application is to the best of my knowledge and belief true and correct.

Tarikh; _____
Date

Tandatangan pemohon/*: _____
Agen yang diberi kuasa
Signature of applicant/*Authorised agent

NomborTelefon/Telephone No.: _____ Nama Penuh: _____
Full Name
Nombor Kad Pengenalan: _____
Identity card no.

Nombor Faks/Fax No: _____ Jawatan: _____
Designation

Cop Rasmi Syarikat: _____
Official Stamp of the Company

Untuk dan bagi pihak: _____
For and on behalf of: _____

Nombor Telefon .: _____ Nombor Faks: _____
Telephone No Fax No.

* Potong yang mana tidak berkenaan
Delete whichever is not applicable

EXPLANATORY NOTES ON THE DESIGN OF PACKED TOWERS (SCRUBBERS)

The following discussion describes the information and factors that are commonly taken into consideration in the design of scrubbers.

1. INFORMATION ON GASEOUS POLLUTANTS TO BE ABSORBED

Consider the types of gaseous pollutants and the following information on: concentration of the pollutants; temperature ($^{\circ}\text{C}$) and volumetric flowrate of the of gas stream (m^3s^{-1} or cfm); gas stream dew point ($^{\circ}\text{C}$); gas density (ρ in kgm^{-3} or lbff^{-3}); humidity (g or lb of water per g or lb of dry air); gas stream molecular weight (MW) (gmol^{-1} or lbmol^{-1}), and other relevant information. Relevant references such as psychometric chart, etc. must be provided)

2. SCRUBBER DETAILS

Consider the following:

2.1 INFORMATION ON SCRUBBING LIQUID

Temperature ($^{\circ}\text{C}$); density (ρ in kgm^{-3} or lbft^{-3}); and viscosity ($\text{kgm}^{-1}\text{s}^{-1}$ or $\text{lbft}^{-1}\text{h}^{-1}$ or centipoise).

2.2 INFORMATION ON PACKING MATERIAL

Type/model of packing; material of construction; specific packed surface (a); fractional void (ϵ); and packing factor ($F = a^3/\epsilon$)

2.3 SCRUBBER DESIGN CALCULATIONS

Liquid mass flowrate (L) (kg h^{-1} or lb h^{-1}); Gas mass flowrate (G) (kg h^{-1} or lb h^{-1}); L/G ratio; Gas Mass Velocity (GM) ($\text{kg h}^{-1}\text{m}^{-2}$ or $\text{lb h}^{-1}\text{ff}^2$) using the Sherwood Holloway Curve or Generalized Pressure Drop Correlation; scrubber diameter (m); Number of transfer unit (NTU) using equilibrium data or appropriate assumptions; Height of transfer unit (HTU) using the graph of HTU versus gas rate or any other method; packing height (m).

3. ANCILLIARY EQUIPMENT/INSTRUMENTATION

Consider the installation of the following wherever relevant: pressure gages, temperature sensors/thermocouple, pH meter and flowrate meters should be installed (and their locations identified) for the purpose of performance monitoring.

This explanatory note has been referred to in section G of the form AS16D-1: APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTERAIR POLLUTION CONTROL EQUIPMENT FOR GASEOUS POLLUTANTS (SCRUBBER AND CHIMNEY) UNDER REGULATION 38 OF THE ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATIONS, 1978

First Edition: Mei 2006



**BORANG AS 16 D-2
FORM AS 16 D-2**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN
SEMULA/MENGUBAH ALAT KAWALAN PENCEMARAN UDARA
(PERANGKAP HABUK EMPAR* DAN CEROBONG)
DI BAWAH PERATURAN 38, PERATURAN-PERATURAN
KUALITI ALAM SEKELILING (UDARA BERSIH), 1978**

**APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTER
AIR POLLUTION CONTROL EQUIPMENT
(CENTRIFUGAL DUST COLLECTOR* AND CHIMNEY)
UNDER REGULATION 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR)
REGULATIONS, 1978**

Sila kemukakan borang yang telah lengkap diisi
ke pejabat Jabatan Alam Sekitar Negeri di mana projek/premis ini ditempatkan.
*Please submit completed form to the Department of Environment State Office
where the project/premise is located*

**JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

* Alat perangkap habuk empar yang paling dikenali ialah siklon
The most common type of centrifugal dust collector is cyclone

BORANG PERMOHONAN PEMASANGAN ALAT KAWALAN PENCEMARAN UDARA-PERANGKAP HABUK EMPAR DAN CEROBONG

APPLICATION FORM FOR AIR POLLUTION CONTROL EQUIPMENT INSTALLATION- CENTRIFUGAL DUST COLLECTOR AND CHIMNEY

UNTUK KEGUNAAN PEJABAT(FOR OFFICE USE ONLY)

NO.REKOD:	TARIKH	TANDATANGAN
------------------	---------------	--------------------

Perhatian/Attention.

- Sila penuhkan borang dengan jelas atau bertaip. Satu borang untuk satu alat kawalan.
(Please fill in the form clearly or type). One form for each control equipment.
- Borang dan semua maklumat perlu dijilidkan sebelum dikemukakan ke Jabatan ini.
(Forms and all relevant information must be bound before submitting to the Department)

**A. MAKLUMAT ASAS PERMOHONAN
GENERAL INFORMATION FOR APPLICATION**

1. Nama dan alamat pemunya/pemohon : <i>Name and address of applicant:</i> _____ _____ _____	2. Nama dan alamat pembuat/jururunding * <i>Name and address of manufacturer/consultant*</i> _____ _____ _____
3. Pegawai yang boleh dihubungi(<i>Contact person</i>) _____	4. Pembuat/Perunding yang boleh dihubungi(<i>Contact person</i>) _____
5. No. Telefon(<i>tel. no.</i>): No. Faks(<i>Fax no.</i>) _____:	6. No. Telefon Pembuat/Perunding(<i>tel. no.</i>): No. Faks Pembuat/Perunding (<i>Fax no.</i>): _____
7. Alamat pemasangan (jika lain dari di atas) (<i>Installation address (if different from above)</i>) _____ _____ _____	8. Jenis pengeluaran kilang : <i>Type of manufacturing facility.</i> _____ _____ _____
9. Nama kemudahan awam seperti sekolah, klinik, hospital dan lain-lain dalam lingkungan 300 meter dari lokasi pemasangan perangkap habuk empar <i>Names of public facilities such as school, clinic, hospital etc. within 300 metre radius from the location of proposed centrifugal dust collector.</i> _____	

**B. MAKLUMAT PELEPASAN PARTIKULAT
SOLID PARTICULATE EMISSION STREAM DATA**

10. Jenis partikulat <i>Type of particulate (general description)</i>	11. Standard pelepasan* (<i>Emission Standard</i>)* g/Nm ³	12. Ketumpatan partikulat (<i>Particle density</i>) g/cm ³	13. Kepekatan partikulat sebelum alat kawalan (<i>Particulate concentration before control equipment</i>)* g/Nm ³	14. Garispusat partikulat <i>Particle diameter</i> (μ m) Attach full particle size analysis, summarize it below
		Bulk density: Specific gravity:		**D[m,0.1] **D[m,0.5] **D[m,0.9]

* Rujuk kepada standard pelepasan di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 1978

Refer to emission standard under the Environmental Quality (Clean Air) Regulations, 1978

** D[m.0.1]:10% , D[m.0.5]:50% , D[m.0.9]:90% of the dust below this diameter.

15. Punca habuk (Kepilkan carta alir proses pengeluaran dan tandakan punca-punca habuk dikeluarkan dari proses).
Sources of solid particulate (attach manufacturing process flow chart and highlight the generating points in the process).

Senarai peralatan dan infrastruktur lain yang menghasilkan habuk yang akan dikawal oleh siklon yang direkabentuk dalam Seksyen C hingga G.

List all machineries and the other infrastructure emitting dust that will be controlled by the cyclone as designed in Section C to G.

No. Item/ Item No.	Keterangan peralatan <i>Description of machine</i>	Dimensi/Kapasiti <i>Dimension / Capacity</i>	Pembuat <i>Manufacturer</i>	Catatan <i>Note</i>

C. REKABENTUK SISTEM PENGUDARAAN DESIGN OF DUST EXTRACTION SYSTEM

16. Dengan menggunakan lampiran kemukakan pengiraan terperinci rekabentuk sistem pengudaraan dengan merujuk kepada *American Conference of Governmental Industrial Hygienists (ACGIH)* atau sumber rujukan lain. Nyatakan ringkasan butir-butir sistem pengudaraan sebagaimana dikehendaki dalam para i - iv

Using separate attachment provide a complete design calculation of dust extraction system by referring to American Conference of Governmental Industrial Hygienists (ACGIH) or other source of reference. Provide a summary of details of dust extraction system as required in para i - vi

i.) Jumlah isipadu udara melalui salur utama <i>Total volume flow through main duct</i> _____ (m ³ /s)	ii.) Anggaran suhu udara di salur masuk perangkap habuk <i>Estimated temperature of the air at the inlet of the Dust Collector</i> _____ (°C)
iii.) Jumlah kejatuhan tekanan melalui salur <i>Total pressure loss through duct</i> _____ (kPa/mmWG)	iv.) Jumlah kejatuhan tekanan melalui perangkap habuk <i>Total pressure loss through dust collector</i> _____ (kPa/mmWG)
v.) Jumlah kejatuhan tekanan melalui cerobong <i>Total pressure loss through stack</i> _____ (kPa/mmWG)	vi.) Jumlah kejatuhan tekanan sistem <i>Total system pressure loss</i> _____ (kPa/mmWG)

17. Bahan binaan salur: _____
Material of duct construction:

Kepilkan Pelan Susun Atur dan Pelan Keratan Bangunan yang menunjukkan lokasi kurungan, penghembus, sistem pengudaraan, siklon dan alat kawalan lain seperti bag filter atau cerobong

Attach building layout and elevation plan showing location of hood, blower, extraction system, centrifugal dust collector and other control equipment such as filter bag or chimney

Tajuk _____ No. Rujukan _____
Title _____ Reference no. _____

D.

MAKLUMAT KIPAS FAN DATA

Sila kemukakan pengiraan terperinci kipas. Kepilkan katalog dan graf keupayaan kipas yang berkaitan. Gunakan lampiran jika menggunakan lebih daripada satu kipas.

(Please compute for fan details. Attach catalogue and fan performance curve. Use extra sheets if more than one fan is used)

18. Jenis kipas: Type of fan: ☐ Centrifugal (radial flow) ☐ Axial-flow (propeller)	19. Pembuat: Manufacturer: _____	20. Model No Kipas: Fan model No: _____
21. Keupayaan pada suhu operasi Capacity at temperature of operation (m ³ /s atau cfm) _____ °C	22. Kelajuan Kipas Fan speed: _____ rpm	23. Tekanan statik: Static pressure: _____ mm WG
24. Jenis kipas Blade type ☐ Forward curve ☐ Backward curve ☐ Straight ☐ Propeller ☐ Tube Axial ☐ Vane axial	25. Garispusat bilah: Blade diameter: _____ cm	26. Lebar bilah: Blade width: _____ cm
27. Saiz salur masuk: Inlet duct size: _____ cm	28. Saiz salur keluar: Outlet duct size: _____ cm	29. Kuasa kipas: Fan Power: _____ KW
30. Absorbed Power: _____ KW		

E

MAKLUMAT MOTOR MOTOR DATA

31. Tenaga motor: _____ hp/kw Motor output:	32. Kelajuan motor: _____ rpm Motor speed:	33. Nisbah kelajuan: _____ Speed ratio:
34. Manufacturer: _____	35. Motor model No: _____	

F.

REKABENTUK CEROBONG CHIMNEY DESIGN

36. Tinggi cerobong: _____ m Chimney height	37. Ketinggian bangunan tertinggi : * Height of highest building : * _____ m	38. Halaju pelepasan ** Efflux velocity ** _____ m/s
39. ***Nombor pengenalan cerobong (Rujuk no sedia ada) Chimney identification Number. (refer to existing chimney) _____	40. Garis pusat di bahagian salur keluar: Diameter at the outlet: _____ m	41. Bahan binaan : Material of construction: _____

* Bangunan dalam radius 50 meters. (Building within 50-meter radius.)

** Sediakan Pengiraan. (Perform calculation).

***Rujuk kepada bilangan cerobong sedia ada, gunakan nombor yang berikutnya (Refer to existing number of chimney, use the next number)

42. Kepilkan lukisan-lukisan yang menunjukkan butir-butir lengkap pembinaan cerobong, takat percontohan gas cerobong dan kemudahan laluan ke takat percontohan tersebut termasuk platform percontohan. Sila rujuk Malaysian Standard MS 1596:2003 dan MS1723 untuk menentukan lokasi takat percontohan yang sesuai.

(Attach drawings showing the construction details of chimney, flue gas sampling point and the necessary safe access leading to the sampling point including the sampling platform. Please refer to Malaysian Standard MS 1596:2003 'Determination of Concentration and Mass Flow of Particulate Matter in Flue Gas for Stationary Sources Emission' and MS1723 'Performance Evaluation of Air Pollution Control and Treatment Systems: Mechanical Dust Collectors' to determine the suitable sampling locations.)

Tajuk _____ No. Rujukan _____
Title _____ Reference no.:

**G. REKABENTUK PERANGKAP HABUK EMPAR
CENTRIFUGAL DUST COLLECTOR DESIGN**

43. Jenis siklon ☐ tunggal ☐ berbilang
Type of cyclone ☐ single cyclone ☐ multi cyclone
☐ Tangential Flow Cyclone ☐ Axial Flow Vortex Tube
☐ Others

44. Adakah sendat udara dipasang? ☐ ya ☐ tidak
Is there an air lock? ☐ yes ☐ no

Jika tidak, beri penjelasan
If no, give an explanation

45. Kemukakan penerangan dan kembangkan lukisan sistem pengendalian habuk yang terkumpul
Give description and attach a drawing of the system to handle the collected dust

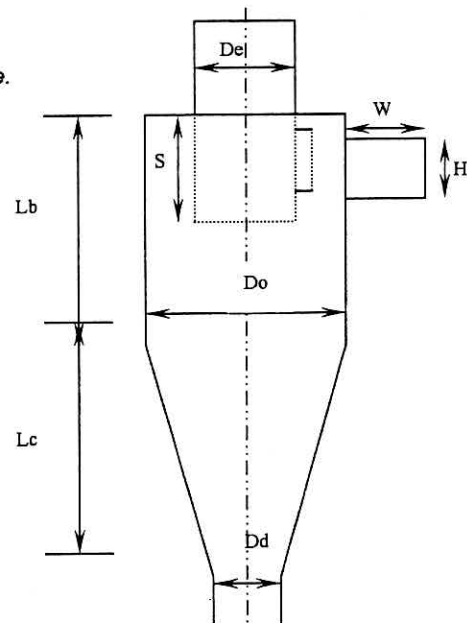
Jika siklon tunggal teruskan ke 46 jika tidak ke 48. (If single cyclone proceed to 46 otherwise to 48)

46. Siklon tunggal (Single cyclone)

Dimensi siklon yang dicadangkan. Proposed dimension of single cyclone.

Bahagian siklon/cyclone parts	Dimensi/dimension (mm)
D_o	
H	
W	
D_e	
S	
L_b	
L_c	
D_b	

Rujuk kepada rajah di sebelah untuk bahagian siklon berkaitan
(Refer to the figure on the right for related cyclone parts)



- 47 Nombor pusingan berkesan N_e
Effective number of turn N_e
- 48 Siklon berbilang/*Multi cyclone*
Kemukakan dalam lampiran pengiraan untuk menentukan dimensi dan jumlah tiub siklon berbilang yang dicadangkan
(*Using attachment submit calculation to determine dimensions and number of tubes of multi cyclone proposed*)
- 49 **Kecekapan perangkap habuk / *Dust collector efficiency* _____ %
50. Anggaran kepekatan partikulat yang dilepaskan melalui cerobong. Sertakan pengiraan berkaitan.
(*Estimated particulate concentration discharged at the outlet of the chimney. Attach relevant calculation*)
_____ g/NM³
- 51 Lukisan dan maklumat yang perlu dikemukakan bersama borang permohonan.
(*Drawings and information to be submitted together with application form.*)
- i) Pelan lokasi premis menunjukkan perangkap habuk dan cerobong dalam lingkungan 250 meter ke 1000 meter dari cerobong
(*Location plan showing dust collector and chimney within the radius of 250 metre to 1000 metre from proposed chimney*)
 - ii) Pelan Susun Atur dan Pelan Keratan Bangunan yang menunjukkan lokasi perangkap habuk dan sistem pengudaraan.
(*Building layout and elevation plan showing location of the dust collector and ventilation system*)
 - iii) # Lukisan Kejuruteraan (termasuk pandangan atas dan sisi) perangkap habuk serta kedudukan peralatan pengawasan prestasi dan cerobong
(*Engineering drawings (including plan and side view) of dust collector as well as location of performance monitoring equipment and chimney*)
 - iv) Carta alir proses pengeluaran yang berkaitan.
(*Relevant manufacturing process flow diagram.*)
 - v) Katalog kipas dan motor yang berkaitan.
(*Fan and motor catalogues.*)
- # Semua pelan dan lukisan kejuruteraan hendaklah bersaiz A1 dan disahkan oleh Jurutera Profesional
(*All plans and engineering drawings should be in A1 size and certified by professional engineer.*)
- ** Penilaian prestasi** - prestasi sebenar perangkap habuk hendaklah dibuktikan dengan mengemukakan laporan penilaian prestasi mengikut Standard Malaysia MS1723:2003 *Performance Evaluation of Air Pollution Control and Treatment System: Mechanical Dust Collectors*. Setelah mendapat kelulusan permohonan pemasangan alat perangkap habuk daripada Jabatan Alam Sekitar, laporan Penilaian Prestasi hendaklah dikemukakan selepas kilang beroperasi sepenuhnya.
- ** Performance evaluation** – the actual efficiency of the dust collector can be proven by submitting the performance evaluation report determined according to Malaysian Standard MS1723:2003 'Performance Evaluation of Air Pollution Control and Treatment System: Mechanical Dust Collectors'. After the application for the installation of the centrifugal dust collector has been approved by the Department of Environment, the Performance Evaluation report must be submitted after the factory has come into full operation

H.

PROGRAM PENGAWASAN PRESTASI PERANGKAP HABUK PERFORMANCE MONITORING PROGRAMME FOR DUST COLLECTOR

- 52 Kemukakan dengan menggunakan lampiran tambahan cadangan terperinci program pengawasan prestasi perangkap habuk, termasuk pemantauan tekanan dan program operasi dan penyelenggaraan.
(*Submit using attachment detailed proposal on performance monitoring programme for the dust collector, including pressure monitoring and operation and maintenance programme.*)

I.

**PENGAKUAN
DECLARATION**

Saya pemohon/agen* yang diberi kuasa bagi pemohon, dengan ini mengaku bahawa segala maklumat yang diberi di dalam borang ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

I the applicant/authorised agent* of the applicant, hereby declare that all the information given in this application is to the best of my knowledge and belief true and correct.

Tarikh; Tandatangan pemohon/*:
Date Agen yang diberi kuasa

Signature of applicant/*
Authorised agent

Nombor Telefon/Telephone No.: Nama Penuh:
Full Name
Nombor Kad Pengenalan:
Identity card no.

Nombor Faks/Fax No: Jawatan:
Designation

Cop Rasmi Syarikat:
Official Stamp of the Company

Untuk dan bagi pihak:
For and on behalf of:
.....

Nombor Telefon : Nombor Faks:
Telephone No Fax No.

* Potong yang mana tidak berkenaan
Delete whichever is not applicable



**BORANG AS 16 D-3
FORM AS 16 D-3**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN
SEMULA/MENGUBAH SISTEM KAWALAN PENCEMARAN UDARA
(PENAPIS BAG DAN CEROBONG)
DI BAWAH PERATURAN 38, PERATURAN-PERATURAN
KUALITI ALAM SEKELILING (UDARA BERSIH), 1978**

***APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTER
AIR POLLUTION CONTROL SYSTEM
(BAG FILTER AND CHIMNEY)
UNDER REGULATION 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR)
REGULATIONS, 1978***

Sila kemukakan borang yang telah lengkap diisi ke pejabat Jabatan Alam Sekitar Negeri di mana projek/premis ini ditempatkan. Kandungan borang ini tidak dibenar dipinda.

Please submit completed form to the Department of Environment State Office where the project/premise is located. The contents of this form must not be altered.

**JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

Issued on September 1, 2006

APPLICATION FORM FOR INSTALLATION OF AIR POLLUTION CONTROL SYSTEM - BAG FILTER

FOR OFFICE USE ONLY		
RECORD NO:	DATE	SIGNATURE

Attention.

- Please fill in the form clearly or type. One form for each air pollution control system
- Preferably, forms and all relevant information should be presented in a suitable folder for submission to the Department

A. GENERAL INFORMATION

1. Name and address of applicant _____ _____ _____	2. Name and address of consultant _____ _____ _____
3. Contact person _____	4. Contact person _____
5. Telephone no.: _____ Fax no.: _____	6. Telephone no.: _____ Fax no.: _____
7. Installation address (if different from above) _____ _____ _____	8. Type of manufacturing facility. _____ _____ _____
9. Names of public facilities such as school, clinic, hospital etc. within 300 metre radius from the location of proposed bag filter. _____	

B. SOLID PARTICULATE EMISSION STREAM DATA

10. Type of particulate : _____
(general description)

11. Emission Standard*: _____ g/Nm³

12. Characteristic of gas stream/dust

- ☐ Wet ☐ Oily ☐ Adhesive ☐ Corrosive ☐ Abrasive
☐ Tacky ☐ Acidic ☐ Alkaline ☐ Others (please specify) _____

Gas stream dew point _____ °C

Temperature of gas stream _____ °C

Gaseous contaminants in the gas stream if any. Please describe _____

* Refer to emission standard under the Environmental Quality (Clean Air) Regulations, 1978

13. Sources of solid particulate (attach manufacturing process flow chart and highlight the generating points in the process).

List all machineries and the other infrastructure emitting dust that will be controlled by the bag filter as designed in Section C to G.

Item No.	Description of machine	Dimension / Capacity	Manufacturer	Note

C.

DESIGN OF DUST EXTRACTION SYSTEM

14 Using separate attachment provide a complete design calculation of dust extraction system by referring to American Conference of Governmental Industrial Hygienists (ACGIH) or other reference. Provide a summary of details of dust extraction system as required in para i - vi

i.) Volume flow through main duct _____ (m ³ /s)	ii.) Estimated temperature of the air at the inlet of the bag filter _____ (°C)
iii.) Total pressure loss through duct _____ (kPa/mmWG)	iv.) Total pressure loss through bag filter _____ (kPa/mmWG)
v.) Total pressure loss through stack _____ (kPa/mmWG)	vi.) Total system pressure loss _____ (kPa/mmWG)

15. Material of duct construction : _____

Attach building layout and elevation plan showing location of hood, blower, extraction system, bag filter and other control equipment

Title _____ Reference no. _____

D.

FAN DATA

Please compute for fan details. Attach catalogue and fan performance curve. Use extra sheets if more than one fan is used.

16. Type of fan: ☐ Centrifugal (radial flow) ☐ Axial-flow (propeller) ☐ Others	17. Manufacturer: _____	18. Fan model No: _____
19. Capacity at temperature of operation _____ (m ³ /s or cfm) _____ °C	20. Fan speed: _____ rpm	21. Static pressure: _____ mm WG

22. Blade type ☐ Forward curve ☐ Backward curve ☐ Straight ☐ Propeller ☐ Tube Axial ☐ Vane axial	23. Blade diameter: _____ cm	24. Blade width: _____ cm
25. Inlet duct size: _____ cm	26. Outlet duct size: _____ cm	27. Fan Power: _____ KW
28. Absorbed Power: _____ KW		

E. MOTOR DATA

29. Motor output: _____ hp/kw	30. Motor speed: _____ rpm	31. Speed ratio: _____
32. Manufacturer: _____	33. Motor model No: _____	

F. CHIMNEY DESIGN

34. Chimney height: _____ m	35. Height of tallest building: * _____ m	36. Efflux velocity ** _____ m/s
37. *** Chimney identification Number (refer to existing chimney) _____	38. Diameter at the outlet: _____ m	39. Material of construction: _____

* Building within 50-metre radius

** Perform calculation

*** Refer to existing chimney number, use the next number.

40. Attach drawings showing the construction details of chimney, flue gas sampling point and the necessary safe access leading to the sampling point including the sampling platform. Please refer to Malaysian Standard MS 1596:2003 'Determination of Concentration and Mass Flow of Particulate Matter in Flue Gas for Stationary Sources Emission' to determine the suitable sampling locations.

Title _____ Reference no.: _____

G. BAG FILTER DESIGN

Attach detailed design calculation. Provide a summary of bag filter details as required in para 41 – 46

41. Bag house type. Check wherever relevant

- | | | |
|--|--|---|
| ☐ Pulse jet | ☐ Reverse jet | |
| ☐ Shaker | ☐ Sonic horns | ☐ Others. Please specify _____ |
| ☐ Positive pressure | ☐ Negative pressure | |

42. Bag house design. Fill in wherever relevant

Generic name of filter cloth: _____ Commercial name of filter cloth: _____

Manufacturer of filter cloth _____

Filter thermal stability: _____ °C, (Maximum temperature)

Chemical resistance of filter (please describe) _____

Diameter of filter cloth: _____ mm Length of filter cloth _____ m

Total filter area provided: _____ m²

Number of bags: _____

Filtration velocity: _____ m/s

Can velocity: _____ m/s

Bag spacing: _____ mm

Range of working pressure from _____ mm WG to _____ mm WG

Bag cleaning frequency. Every _____ min for _____ sec

Number of compartments _____

43. Monitoring and indicating devices. Check wherever relevant

<u>Device</u>	<u>Purpose</u>
☐ Pilot lights	to show motors operating, compartment on or off line, row of bags being pulsed
☐ Manometer or magnehelic gauges and recorder	to determine pressure drop at various points in the bag house
☐ temperature indicators	to determine temperature at critical points in the bag house
☐ gas flow meters	to measure actual gas flow rate through bag house
☐ fan current, fan bearing temperature and the fan vibrator indicators	to identify early warning sign indicating maintenance to the fan
☐ Magnehelic gauge	to determine pressure of compressed air supply line for pulse jet
☐ Bag leak detection system If checked specify type _____	to monitor if bags develop leak
☐ Explosion relief vents	to protect dust collector and for safety reason

44 Dust storage and disposal

(i) Give description and attach a drawing of the system to handle the collected dust

(ii) Hopper equipped with dust level sensor? ☐ Yes ☐ No

(iii) Dust removal from hopper

☐ Continuous. Describe method _____

☐ Manual. Describe method _____

(iv) Final disposal of collected dust. Please describe

45 ** Dust collector efficiency _____ %
** Supply data to substantiate

46. Estimated particulate concentration discharged at the outlet of the chimney. Attach relevant calculation
_____ g/NM³

47 Drawings and information to be submitted together with application form.

- i) Location plan showing dust collector and chimney within the radius of 250 metre to 1000 metre from proposed chimney
- ii) Building layout and elevation plan showing location of the dust collector and ventilation system
- iii) #Engineering drawings (including plan and side view) of bag filter as well as location of performance monitoring equipment (eg. Pilot lights; manometer, magnehelic gauges and recorder; temperature, gas flow meters, fan current, fan bearing temperature, and fan vibrator indicators; bag leak detection system; explosion relief vents), flue gas sampling point and the necessary safe access leading to the sampling point including the sampling platform and chimney.
- iv) Relevant manufacturing process flow diagram.
- v) Fan and motor catalogues.

All plans and engineering drawings should be in A1 size and certified by a professional engineer preferably in the discipline of Environmental Engineering, Chemical Engineering, Civil Engineering or Mechanical Engineering with experience in industrial air pollution control engineering

H. PERFORMANCE MONITORING PROGRAMME FOR BAG FILTER

48 Describe location of pressure gauges, temperature sensors, gas flow meters and other instruments installed for the purpose of operation and performance monitoring. Attach piping and instrumentation drawing.

49 Submit using attachment detailed proposal on performance monitoring programme for the bag filter and operation and maintenance programme. Please refer to the document entitled 'Technical Guidance Document on Performance Monitoring of Air Pollution Control Systems' issued by DOE for guidance.

I. DECLARATION

I the applicant/authorised agent* of the applicant, hereby declare that all the information given in this application is to the best of my knowledge and belief true and correct.

Date: _____ Signature of applicant/*
Authorised agent

Telephone No.: _____ Full Name: _____

Identity card no.: _____

Fax No: _____ Designation: _____

Official Stamp of the Company: _____

For and on behalf of: _____

Telephone No.: _____ Fax No.: _____

* Delete whichever is not applicable

Ref: Sham/mhb/010906/AS16D-3.doc

FORMS FOR GENERATOR



**BORANG AS 16B
FORM AS 16B**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN
SEMULA/MENGUBAH ALAT PEMBAKARAN BAHANAPI (JANAKUASA)
DI BAWAH PERATURAN 36 DAN 38, PERATURAN -PERATURAN
KUALITI ALAM SEKELILING (UDARA BERSIH), 1978**

*APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTERA FUEL
BURNING EQUIPMENT (GENERATOR) UNDER REGULATIONS 36 AND 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATION, 1978*

Sila kemukakan borang yang telah lengkap diisi
ke pejabat Jabatan Alam Sekitar Negeri di mana projek/pre mis ini ditempatkan.
*Please submit completed form to the Department of Environment State Office
where the project/premise is located.*

**JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN SEMULA/MENGUBAH
ALAT PEMBAKARAN BAHANAPI (JANAKUASA) DI BAWAH PERATURAN 36 DAN 38,
PERATURAN-PERATURAN KUALITI ALAM SEKELILING (UDARA BERSIH), 1978
APPLICATION FOR APPROVAL TO INSTALL/RESITE/ALTER A FUEL
BURNING EQUIPMENT (GENERATOR) UNDER REGULATIONS 36 AND 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATIONS, 1978**

A **Pengenalan
IDENTIFICATION**

1. Nama Perusahaan/Penduduk/Pemunya
Name of Industry/Occupier/Owner

2. Jenis perusahaan/perniagaan
Type of industry/business

3. Alamat premis janakuasa ditempatkan
Address of premises where generator is to be placed

Garis lintang ____ darjah ____ minit ____ saat Garis bujur ____ darjah ____ minit ____ saat
Latitude degree minutes second Longitude degree minutes second

Pelan lokasi berkenaan disertakan. Jenis kegunaan tanah premis jiran hendaklah ditunjukkan dengan terang.
Location plan is attached. Type of landuse of neighbouring premises should be shown clearly.

Tajuk: _____
Title

Nombor rujukan: _____
Reference number

B **Maklumat Janakuasa
INFORMATION OF THE GENERATOR**

4. Butiran Janakuasa (Injin)
Details of Generator (Engine)

Nama Pembuat: _____
Manufacturer

Model: _____
Model

Keupayaan: _____ KVA@ _____ rpm
Capacity KVA@ rpm

- Sertakan katalog injin dan carta/sijil 'noise rating'
Attach engine catalogue and noise rating chart/certificate

5. Jenis bahanapai: _____
Type of fuel

6. Kadar penggunaan bahanapai:
Rate of fuel consumption

Beban penuh: _____ kg/jam
Full load kg/hr

Beban setengah: _____ kg/jam
Half load kg/hr

7. Masa Operasi:

Operational Hours:

- ☐ Dari jam _____ sehingga _____ kecuali hari _____
From time until except on (day)
- ☐ Tunggu sedia sahaja
Standby only

8. Penerangan tentang cara mencegah bunyi bising/Explanation on the prevention of noise generation
 Pertimbangan akustik telah digabungkan dalam 'lukisan/kertas kiraan'
Acoustic consideration had been incorporated in drawing/working paper

Punca Source	Bilangan Number	Tajuk Lukisan Title of Drawing	Nombor Lukisan Drawing No.	Attenuation dBA	Bahanbina insulation/ Absorptive material used for insulation
Rumah Janakuasa Generator House					
Pintu Masuk Entrance					
Kemasukan udara/ Udara penyejuk/ Attenuator Kemasukan dan keluaran intake air/Cooling air/ Inlet and outlet attenuators				Takat kemasukan: Inlet(s): Takat keluaran: Outlet(s):	
Penyenap reaktif 'residential' utama Primary reactive 'residential silencer'			Model: Model Buatan: Made by		
Penyenap 'absorptive' sekunder Secondary absorptive silencer			Model: Model Buatan: Made by		

Catit: Kedua-dua penyenap hendaklah dipasang dalam rumah janakuasa. Sekiranya penyenap dipasang di luar rumah, maka ia hendaklah dibina dalam cerobong batu-bata.

Note: Both silencers should be installed in a generator house. If silencer is installed outside the generator house, it should be installed in a stoned chimney.

9. Paras bunyi bising di sempadan berhampiran _____ dBA
*Noise level at nearest boundary*10. Takat pelepasan ekzos
Exhaust outlet

Tingginya yang dicadangkan adalah _____ meter daripada paras bumi.
Proposed height of exhaust is meters from ground level

Pelan tegak menunjukkan tingginya dan arah pelepasan disertai
Vertical elevation plan showing height and direction of exhaust is attached

Tajuk _____ No. Rujukan _____
Title Reference No.

11. Tarikh mula operasi pengeluaran : _____
Date of starting production
- Tarikh mula kerja pemasangan janakuasa : _____
Date of installation of generator
- Tarikh siap pemasangan : _____
Date of completion of installation
- Tarikh ujian pertama : _____
Date of first test-run

C

**PENGAKUAN
 DECLARATION**

Saya permohonan/agen* yang diberi kuasa bagi pemohon, dengan ini mengaku bahawa segala maklumat yang diberi di dalam borang ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

I The applicant/authorised agent of the applicant, hereby declare that all the information given in this application is to the best of my knowledge and belief true and correct.*

Tarikh; _____ Tandatangan pemohon/*: _____
Date *Agan yang diberi kuasa*
*Signature of applicant/**
Authorised agent

Telefon/Telephone: _____ Nama Penuh: _____
Full Name

Faks/Fax: _____ Jawatan: _____
Designation

Cop Rasmi Syarikat: _____
Official Stamp of the Company

Untuk dan bagi pihak: _____
For and on behalf of: _____

Telefon/Telephone: _____ Faks/Fax: _____

* Potong yang mana tidak berkenaan
Delete whichever is not applicable

Semua lukisan hendaklah disahkan oleh seorang jurutera professional berdaftar
All drawing shall be certified by a registered professional engineer

SENARAI SEMAK PERMOHONAN
CHECKLIST OF APPLICATION

Bil. Bil.	Perkara Subject	Ada Yes		Tiada No
		Lengkap Complete	Tidak Lengkap Incomplete	
1.	Borang AS 16b (lengkap ditaip) <i>Form AS 16A (typed script)</i>			
2.	Asas kiraan paras bunyi bising (Pertimbangan akustik) <i>Basis of noise level calculation (Acoustic consideration)</i>			
3.	Pelan tapakbina berskil menunjukkan tempat cerobong yang dicadangkan dan bangunan-bangunan dalam lingkungan 1000 meter dan tingginya bangunan tertinggi dalam lingkungan jejari 50 meter <i>Site plan of approved scale indicating clearly the location of the proposed chimney and building within 1000 meters and height of the highest building within 50 meters radius</i>			
4.	Pelan kedudukan janakuasa dalam premis kilang <i>Layout plan of generator in the factory</i>			
5.	Pelan kejuruteraan janakuasa dan pertimbangan akustik yang disahkan oleh Jurutera Berdaftar <i>Engineering plan of generator and acoustic consideration endorsed by a Registered Engineer</i>			
6.	Dokumen/katalog peralatan berkaitan <i>Document/Catalogue of relevant equipment</i>			
7.	Jaminan prestasi <i>Performance guarantee</i>			

FORMS FOR INCINERATOR SYSTEM



**BORANG AS 16A
FORM AS 16A**

**PERMOHONAN KELULUSAN MEMASANG, MENEMPATKAN
SEMULA/MENGUBAH ALAT PEMBAKARAN BAHANAPI
DI BAWAH PERATURAN 36 DAN 38, PERATURAN -PERATURAN
KUALITI ALAM SEKELILING (UDARA BERSIH), 1978**

*APPLICATION FOR APPROVAL TO INSTALL / RESITE / ALTER FUEL
BURNING EQUIPMENT UNDER REGULATIONS 36 AND 38
OF THE ENVIRONMENTAL QUALITY (CLEAN AIR)
REGULATION, 1978*

Sila kemukakan borang yang telah lengkap diisi
ke pejabat Jabatan Alam Sekitar Negeri di mana projek/premis ini ditempatkan.
*Please submit completed form to the Department of Environment State Office
where the project/premise is located.*

**JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

1. Nama dan alamat pemohon
Name and address of applicant

2. Lokasi alat pembakaran bahanapi (Sila kemukakan pelan yang menunjukkan bangunan -bangunan dan kegunaan tanah dalam lingkungan 1000 meter)
Location of fuel burning equipment (Please attach a plan showing the surrounding buildings and landuse within 1000 meters)

Pelan lokasi berkenaan disertakan
Location plan is attached

Tajuk: _____ Nombor rujukan: _____
Title Reference number

(a) Garislintang dan garisbujur premis
Latitude and longitude of the premises
Garis lintang _____ darjah _____ minit _____ saat Garis bujur _____ darjah _____ minit _____ saat
Latitude degree minutes second Longitude degree minutes second

3. Tinggi rumah alat pembakaran bahanapi/bangunan alat pembakaran bahanapi ditempatkan: _____ meter Height of
fuel burning equipment house/structure housing the fuel burning equipment _____ meters

Tajuk: _____ Nombor rujukan: _____
Title Reference number

4. Bangunan tertinggi dan lebarnya dalam jarak 250 meter dari rumah alat pembakaran bahanapi (berhubung dengan paras bumi rumah alat pembakaran bahanapi)
Maximum height and width of building within 250 meters from the fuel burning equipment house (with reference to ground level of fuel burning equipment house)

_____ meter
meters

Lukisan berkenaan disertakan
Drawing is attached

Tajuk: _____ Nombor Rujukan: _____
Title Reference number

B
MAKLUMAT ALAT PEMBAKARAN BAHANAPI
INFORMATION OF THE FUEL BURNING EQUIPMENT

 5. Butir-Butir Alat Pembakaran Bahanapi
Details of Fuel Burning Equipment

- (i) Jenis Alat Pembakaran Bahanapi: _____
Type of Fuel Burning Equipment
- (ii) Nama Pembuat: _____
Manufacturer
- (iii) Model: _____
Model
 Kepilkan katalog berkenaan/ *Attach the relevant catalogue*
- (iv) Keupayaan: _____ kg.wap/jam
Capacity kg.steam/hour
- (v) Nombor siri: _____
Serial no.
- (vi) Keluaran kasar: _____
Gross output

C
MAKLUMAT BAHANAPI
INFORMATION OF FUEL

 6. Butir-Butir Bahanapi Yang Digunakan
Detail of Fuel Used

- (i) Kadar penggunaan bahanapi: _____ kg/jam
Rate of fuel consumption kg/hr
- (ii) Jenis bahanapi: _____
Type of fuel used
- (iii) Analisa bahanapi (Sertakan spesifikasi bahanapi yang hendak digunakan)
Analysis of fuel (Please attach specification of fuel to be used)
- Kandungan Sulfur: _____ %
Sulphur content
- Kandungan abu: _____ %
Ash content
- Nilai kasar kalori: _____
Gross calorific value
- (iv) Kaedah penyusunan dan kawalan bahanapi
Method of fuel feeding and control
- _____
- _____
- _____

D**MAKLUMAT CEROBONG
INFORMATION OF CHIMNEY****7. Butir-Butir Cerobong
Details of Chimney**

- (i) Tinggi cerobong yang dicadangkan _____ meter
Proposed chimney height
 Nyatakan asas pengiraan yang digunakan _____
Specify basis of calculation
- (ii) Garis pusat di bahagian bawah _____ meter
Diameter at the base _____ meters
- (iii) Garis pusat di bahagian atas _____ meter
Diameter at the top _____ meters
- (iv) Nombor pengenalan pada cerobong yang dicadangkan: _____
Identification number on the proposed chimney
- (v) Halaju pelepasan _____ (meter/saat, draf paksaan/semulajadi)
Efflux velocity _____ (meters/second, forced/natural draught)
- (vi) Parameter rekabentuk tinggi cerobong
Chimney height design parameter
- (a) Kepilkan cara pengiraan cerobong. Sekiranya ada rancangan pembesaran, tunjukkan kiraan yang digabungkan.
Attach calculation of chimney height. If there is plan for future expansion, indicate calculation has been incorporated.
- Tajuk _____ No. Rujukan _____
Title _____ *Reference no.* _____
- (b) Kepilkan lukisan-lukisan yang menunjukkan butir-butir lengkap pembinaan cerobong, takat percontohan gas cerobong dan kemudahan laluan ke takat percontohan tersebut sekiranya bahan api pepejal digunakan.
Attach drawings showing the construction details of chimney, flue gas sampling point and the necessary safe access leading to the sampling point if solid fuel is used.
- Tajuk _____ No. Rujukan _____
Title _____ *Reference no.* _____
- (vii) Suhu pelepasan gas di salur masuk cerobong _____ °C
(Flue gas temperature at inlet of chimney)
 di salur keluar cerobong _____ °C
(at exit of chimney)
- (viii) Kandungan habuk dalam gas cerobong sebelum kawalan _____ g/Nm³ atau m³/hr
Flue gas dust content before control _____ g/Nm³ atau m³/hr

E**MAKLUMAT KAWALAN PENCEMARAN
INFORMATION ON CONTROL EQUIPMENT****8. Huraikan teknikal alat kawalan pencemaran
Technical description of pollution control equipment**

(i) Jenis/Type: _____

(ii) Nama Pembuat: _____
Manufacturer

(iii) Model: _____
Model
 Kepilkan katalog/lukisan alat kawalan
Attach catalogue/drawing of control equipment

Tajuk _____ No. Rujukan _____
Title Reference no.

(iv) Kecekapan: _____ %
Efficiency

(v) Paras pelepasan habuk: _____ g/Nm³
Level of dust emission

(vi) Kepilkan cara pengiraan rekabentuk alat perangkap habuk dan asas pilihan alat kawalan tersebut
Attach calculation on the design and basis of selection of the dust collector

Tajuk _____ No. Rujukan _____
Title Reference no.

(vii) Pelan pandangan sisi bagi pemasangan alat perangkap habuk
Plan showing side elevation of the dust collector

Tajuk _____ No. Rujukan _____
Title Reference no.

(viii) Kepilkan jaminan prestasi dari pembuat alat perangkap habuk
Attach performance guarantee from the manufacturer

9. Kipas
Fan

(i) Jenis kipas: _____
Type of fan

(ii) Keupayaan pada suhu tertentu: _____ m³/min pada _____ °C
Capacity at specified temperature

(iii) Tekanan static: _____
Static pressure

(iv) Tenaga motor: _____ HP
Motor output

10. Keterangan ringkas mengenai penggunaan wap dan kadar penggunaan
Brief description of steam uses and rate of steam consumption

11. Kekerapan dan tempoh operasi 'soot blowing' dan 'steam blowdown' dan rancangan mengurangkan pelepasan habuk dan bunyi bising
Frequency and duration of soot blowing and steam blowdown operation and proposal to reduce dust emission and noise generation

12. Pencatit ketumpatan asap dan alat kecemasan
Smoke density recorder and alarm system

Jenis: _____ Model: _____
Type Model

13. Maklumat mengenai lain-lain alat pembakaran bahanapi di premis tersebut
Information on other fuel burning equipment within the premises

Jenis & Keupayaan <i>Type & Capacity</i>	Jenis Bahanapi <i>Type of Fuel</i>	Tinggi Cerobong <i>Chimney Height</i>	Kadar Penggunaan Bahanapi <i>Rate of Fuel Consumption</i>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Nyatakan sama ada alat tersebut 'tunggu sedia', cerobong gabungan dan lain-lain
State the status of the equipment, either standby, combined stack, etc.

14. Lain-lain cerobong di dalam jarak 100 meter dari cerobong cadangan dan pemu nya
Other chimneys within 100 meters of proposed chimney and name of owner

F**PENGAKUAN
DECLARATION**

Saya pemohon/agen* yang diberi kuasa bagi pemohon, dengan ini mengaku bahawa segala maklumat yang diberi di dalam borang ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

I The applicant/authorised agent of the applicant, hereby declare that all the information given in this application is to the best of my knowledge and belief true and correct.*

Tarikh; _____ Tandatangan pemohon/*: _____
Date Agen yang diberi kuasa
*Signature of applicant/**
Authorised agent

Telefon/Telephone: _____ Nama Penuh: _____
Full Name

Faks/Fax: _____ Jawatan: _____
Designation

Cop Rasmi Syarikat: _____
Official Stamp of the Company

Untuk dan bagi pihak: _____
For and on behalf of:

Telefon/Telephone: _____ Faks/Fax: _____

* Potong yang mana tidak berkenaan
Delete whichever is not applicable

Semua lukisan hendaklah disahkan oleh seorang jurutera professional berdaftar
All drawing shall be certified by a registered professional engineer

**SENARAI SEMAK PERMOHONAN
CHECKLIST OF APPLICATION**

Bil. Bil.	Perkara Subject	Ada Yes		Tiada No
		Lengkap Complete	Tidak Lengkap Incomplete	
1.	Borang AS 16A <i>Form AS 16A (typed script)</i>			
2.	Kiraan ketinggian cerobong/efflux velocity <i>Calculation of chimney height/efflux velocity</i>			
3.	Pelan tapakbina berskil menunjukkan tempat cerobong yang dicadangkan dan bangunan-bangunan dalam lingkungan 1000 meter dan tingginya bangunan tertinggi dalam lingkungan jejari 50 meter <i>Site plan of approved scale indicating clearly the location of the proposed chimney and building within 1000 meters and height of the highest building within 50 meters radius</i>			
4.	Pelan kedudukan alat pembakaran bahanapi dalam premis kilang <i>Plan showing the fuel burning equipment in the premises</i>			
5.	Pelan bangunan (pandangan sisi) yang menunjukkan ketinggian cerobong dengan paras bangunan tertinggi <i>Building plan (side view) showing chimney height and the highest building</i>			
6.	Lukisan kejuruteraan cerobong yang disahkan oleh Jurutera Berdaftar <i>Engineering drawing of chimney endorsed by a Registered Engineer</i>			
7.	Dokumen/katalog yang berkaitan <i>Document/Catalogue of relevant equipment</i>			
8.	Jaminan prestasi <i>Performance guarantee</i>			

FORMS FOR PREMISES



BORANG AS 11

FORM AS 11

**PERMOHONAN UNTUK MENDIRIKAN KEMUDAHAN
PEMEROLEHAN KEMBALI LUAR TAPAK**

APPLICATION FOR SETTING UP OFF SITE RECOVERY FACILITIES

JABATAN ALAM SEKITAR
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR
ARAS 3-7, BLOK C4,
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62662 PUTRAJAYA
TEL: 03-88858200
FAKS: 03-88889987

PERMOHONAN LESEN DI BAWAH SEKSYEN 18,
AKTA KUALITI ALAM SEKELILING, 1974 UNTUK
MENDIRIKAN KEMUDAHAN PEMEROLEHAN KEMBALI LUAR TAPAK
*APPLICATION FOR LICENCE UNDER SECTION 18,
ENVIRONMENTAL QUALITY ACT, 1974
TO SET UP OFF SITE RECOVERY FACILITIES*

**A. PENGENALAN
IDENTIFICATION**

1. Nama Pemohon : _____
Name of Applicant
2. Alamat Pemohon : _____
Address of Applicant
3. No. Telefon : _____ No. Faks : _____
Telephone No. Fax No
4. Warganegara : _____
Nationality
5. Nama Premis : _____
Name of Premises
6. Alamat Premis : _____
Address of Premises

(Lampirkan pelan lokasi berskala 1:2500 dan pelan layout berskala 1:500)
(Attach the location plan of scale 1:2500 and layout plan of scale 1:500)

7. Nyatakan tarikh kelulusan yang diberikan oleh JAS ke atas laporan EIA untuk cadangan kemudahan pemerolehan kembali. (sila sertakan salinan surat kelulusan).
Indicate the date of approval of the EIA report for the proposed recovery facility given by the DOE. (Please attach a copy of the approval letter)

**B. MAKLUMAT OPERASI
OPERATIONAL INFORMATION**

8. Cadangan tarikh menduduki atau mengguna premis :
Proposed date of occupation or used of premises :

9. Jadual Operasi/ *Schedule of Operation :*

(i) Bilangan syif sehari : _____	Purata _____	
Number of shift per day :	Average _____	
	Maksimum _____	
	Maximum _____	

(ii) Jam operasi : Purata : _____ Maksimum : _____
Hours of operation Average Maximum

(iii) Bilangan hari operasi : Seminggu _____
Number of operating days Per week _____
Sebulan _____
Per month _____
Setahun _____
Per year _____

(iv) Jadual bermusim : Daripada _____ Hingga _____
Seasonal schedule From To

10. Adakah buangan yang hendak diproses, diimport atau didapati di dalam negeri? Jika diimport, sila senaraikan nama dan alamat pengeluar buangan yang membekalkan buangan.
Is the waste to be processed, imported or obtained locally? If imported, please list the names and addresses of the waste generators supplying the waste.

Nama Buangan
Name of Wastes

Nama/ Alamat Pengeluar Buangan
Names/ Addresses of Waste Generators

11. Jelaskan kaedah pengangkutan buangan daripada pengeluar hingga ke kilang anda. (kontraktor/pengangkutan sendiri).
Describe the method of transporting the waste from the generator to your factory. (contractor/own transport).
12. Senaraikan semua proses pemerolehan kembali yang digunakan dan kategori, nama kimia dan kuantiti buangan yang dikendalikan.
List all recovery processes applied and category, chemical name and quantity of waste handled.

Nama Proses Pemerolehan Kembali
Name of Recovery Process

Kategori dan Nama Kimia Buangan
Category and Chemical Name of Waste

Kuantiti/ Bulan
Quantity/ Month

* Untuk pemerolehan kembali atau kitar semula bekas bahan buangan, sila nyatakan jenis, saiz dan kandungan sisa kimia. (Lampirkan carta alir bagi setiap proses yang digunakan).
For recovery or recycling of waste containers, please indicate their type, size and chemical residue contained. (Attach a flow sheet of each process applied).

13. Jelaskan sifat-sifat kimia, biologi dan fizikal buangan.
Describe the chemical, biological and physical properties of the wastes.

14. Senaraikan keluaran/pelepasan yang dijangkan akan dihasilkan daripada proses yang dinyatakan dalam para 12.
List of emission/ discharges expected to be generated from the process mentioned in para 12.

(i)	<u>Proses</u> <u>Process</u>	Jenis keluaran/pelepasan(gas, cecair, separa pepejal, pepejal) <i>Types of emission/discharges (gaseous, liquid, semisolid, solid)</i>	Kuantiti Sebulan <u>Quantity/Month</u>
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

- (ii) Jelaskan kualiti keluaran atau pelepasan (dalam mg/nm³ atau mg/l atau melainkan sekiranya dikhususkan)

<u>Parameter</u> <u>Parameters</u>	<u>Unit</u> <u>Units</u>
_____	_____
_____	_____
_____	_____

15. Jelaskan kapasiti reka bentuk dan pembinaan kemudahan pemerolehan kembali (lampirkan semua plan reka bentuk kejuruteraan terperinci bagi kemudahan tersebut)
Describe the capacity design and construction of the recovery facility (attach all detailed engineering design plans of the facility).

16. Jelaskan program kecemasan yang menggariskan langkah tebatan untuk mengawal pelepasan/tumpahan yang tidak sengaja daripada tapak.
Describe the emergency programme outlining mitigative measures to control discharges/accidental spillages from the site.

17. Jelaskan plan penutupan yang memperincikan langkah-langkah yang perlu untuk menutup premis sama ada sementara atau menamatkan operasi.
Describe the closure plan which details the step necessary to close the premises temporarily or to cease operation.

Saya sahkan bahawa maklumat yang diberikan adalah benar dan betul sepanjang pengetahuan saya.
I certify that all information provided is true and correct to the best of my knowledge.

Tandatangan Pegawai Pelapor
Signature of Reporting Officer

Nama:
Name
Nombor K/P:
I/C No.
Jawatan:
Designation
Tarikh:
Date

Nota: Sila gunakan lampiran tambahan jika perlu.
Note: Please use additional sheets if necessary

SENARAI SEMAK PERMOHONAN
CHECKLIST OF APPLICATION

Bil. No.	Perkara Subject	Ada Yes		Tiada No
		Lengkap Complete	Tidak Lengkap Incomplete	
1.	Pelan lokasi (skala 1:2500) dan pelan lakaran (skala 1:500) dilampirkan <i>The location plan (scale 1:2500) and layout plan (scale 1:500) are attached.</i>			
2.	Salinan surat kelulusan yang diberikan oleh JAS ke atas laporan EIA bagi cadangan kemudahan pemerolehan kembali dilampirkan <i>A copy of the approval letter given by DOE on the EIA report of the proposed recovery facility is attached</i>			
3.	Carta alir bagi setiap proses perolehan kembali dilampirkan <i>A flow chart of each recovery process is attached</i>			
4.	Semua pelan reka bentuk kejuruteraan terperinci bagi kemudahan tersebut dilampirkan <i>All detailed engineering design plans of the facility are attached</i>			



MAKLUMAT TAMBAHAN

PERMOHONAN UNTUK MEMBAHARUI LESEN PEMBAWA YANG DITETAPKAN DIBAWAH SEKSYEN 18(A) AKTA KUALITI ALAM SEKELILING 1974

[Nota: Borang ini hendaklah dikemukakan bersama-sama Borang
AS.1-Pin.1/86]

A. BUTIR-BUTIR PEMBAWA/PENGANGKUT

1. (i) Jenis Pembawa/ Pengangkut : _____
- (ii) No.Pendaftaran : _____
- (iii) Nama Pemunya : _____
- (iv) Kapasiti Enjin : _____
- (v) Kapasiti Muatan : _____
(Sila kepilkan salinan Sijil Pendaftaran Pembawa/Pengangkut yang disahkan benar)
- (v) Huraian rekabentuk dan spesifikasi teknikal pembawa/pengangkut:

(Sila sertakan katalog pembawa/pengangkut berkenaan)

B. BUTIR-BUTIR ORANG YANG AKAN MENGGUNAKAN PEMBAWA/PENGANGKUT

- | 2. | Nama | Jawatan | No.Kad Pengenalan |
|-------|-------|---------|-------------------|
| (i) | _____ | _____ | _____ |
| (ii) | _____ | _____ | _____ |
| (iii) | _____ | _____ | _____ |

(iv) _____

(v) _____
(Sila kepilkan salinan kad pengenalan yang disahkan benar bagi tiap-tiap penama)

C. BUTIR-BUTIR BUANGAN TERJADUAL YANG AKAN DIANGKUT

3.	Nama Buangan	Kod Buangan	Ciri Fizikal Buangan (Pepejal/Enapcemar/ Cecair)	Kuantiti (Tan metrik/ tahun)
(i)	_____	_____	_____	_____
(ii)	_____	_____	_____	_____
(iii)	_____	_____	_____	_____

D. BUTIR-BUTIR PUNCA BUANGAN TERJADUAL YANG AKAN DIKENDALI

4.	Nama & Alamat Premis Pengeluar Buangan	Nama Buangan dan (Kod Buangan)	Ciri Fizikal Buangan (Pepejal/Enapcemar/ Cecair)	Kuantiti (Tan metrik/ tahun)
(i)	_____ _____ _____	_____ _____	_____	_____
(ii)	_____ _____ _____	_____ _____	_____	_____
(iii)	_____ _____ _____	_____ _____	_____	_____

(Sila lampirkan kertas tambahan jika perlu)

E. BUTIR-BUTIR PREMIS PENGOLAHAN DAN PELUPUSAN BERLESEN YANG AKAN MENERIMA BUANGAN TERJADUAL

5. (i) Nama dan Alamat Premis : _____
 Pengolahan dan Pelupusan _____
 Berlesen _____
- (ii) No.Lesen JAS : _____ Tarikh tamat : _____
- (iii) No.Telefon: _____ No.Telefaks: _____ email: _____
- (iv) Kaedah Pelupusan : (a) Gunasemula sebagai bahan mentah gantian ☐
 (b) Perolehan kembali bahan berfaedah ☐
 (c) Pengolahan fizikal-kimia ☐
 (d) Tapak pelupusan selamat ☐
 (e) Pengolahan atas tanah ☐
 (f) Pembakaran dalam insinerator ☐
 (g) Cara lain (Huraikan): _____

- (v) Huraikan cara buangan dipindahkan daripada premis pembawa buangan ke premis penerima buangan : _____

- (vi) Sila kemukakan satu Dokumen Kontrak Perjanjian atau Surat Akuan Janji yang dibuat antara syarikat pengeluar buangan, syarikat pembawa buangan dan syarikat penerima buangan.
 No.Rujukan dokumen : _____

- (vii) Bagi mengangkut buangan yang dikeluarkan dari kapal, sila kemukakan satu Dokumen Kontrak Perjanjian atau Surat Akuan Janji yang dibuat antara pemunya kapal atau agen pemunya kapal, syarikat pembawa buangan, dan syarikat penerima buangan berkenaan.

No.Rujukan dokumen: _____

F. RANCANGAN BERTINDAK BAGI KEJADIAN PELEPASAN TAK SENGAJA ATAU PERTUMPAHAN BUANGAN

6. Rancangan Tindakan Kecemasan (ERP) bagi persediaan dan tindakan termasuk langkah-langkah membendung, membersihkan dan mengurangkan pelepasan atau pertumpahan semasa pemindahan dan pengangkutan buangan terjadual

(Sila kemukakan satu salinan dokumen Rancangan Tindakan Kecemasan berkenaan)

7. Senarai alat-alat keselamatan yang disediakan:

8. Senarai alat-alat melawan tumpahan buangan yang disediakan:

G. INSURAN BAGI " PUBLIC LIABILITY"

9. Sila kemukakan satu salinan asal sijil "Motor Carrier Insurance for Public Liability" bagi kenderaan berkenaan.

No Rujukan dokumen: _____

H. PERAKUAN

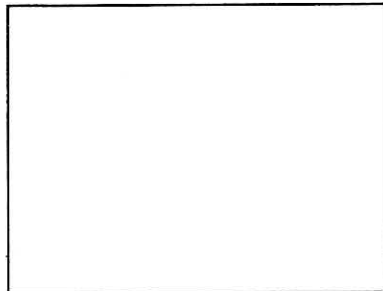
10. Saya dengan ini mengaku bahawa segala maklumat yang diberikan dalam permohonan ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

Tarikh : _____

(Tandatangan Pemohon)

Nama : _____

Meteri atau cop pemohon :





MAKLUMAT TAMBAHAN

PERMOHONAN UNTUK MEMBAHARUI LESEN PEMBAWA YANG DITETAPKAN DIBAWAH SEKSYEN 18(A) AKTA KUALITI ALAM SEKELILING 1974

[Nota: Borang ini hendaklah dikemukakan bersama-sama Borang
AS.1-Pin.1/86]

A. BUTIR-BUTIR PEMBAWA/PENGANGKUT

1. (i) Jenis Pembawa/ Pengangkut : _____
- (ii) No.Pendaftaran : _____
- (iii) Nama Pemunya : _____
- (iv) Kapasiti Enjin : _____
- (v) Kapasiti Muatan : _____
(Sila kepilkan salinan Sijil Pendaftaran Pembawa/Pengangkut yang disahkan benar)
- (v) Huraian rekabentuk dan spesifikasi teknikal pembawa/pengangkut:

(Sila sertakan katalog pembawa/pengangkut berkenaan)

B. BUTIR-BUTIR ORANG YANG AKAN MENGGUNAKAN PEMBAWA/PENGANGKUT

- | 2. | Nama | Jawatan | No.Kad Pengenalan |
|-------|-------|---------|-------------------|
| (i) | _____ | _____ | _____ |
| (ii) | _____ | _____ | _____ |
| (iii) | _____ | _____ | _____ |

(iv) _____

(v) _____

(Sila kepilkan salinan kad pengenalan yang disahkan benar bagi tiap-tiap penama)

C. BUTIR-BUTIR BUANGAN TERJADUAL YANG AKAN DIANGKUT

3.	Nama Buangan	Kod Buangan	Ciri Fizikal Buangan (Pepejal/Enapcemar/ Cecair)	Kuantiti (Tan metrik/ tahun)
(i)	_____	_____	_____	_____
(ii)	_____	_____	_____	_____
(iii)	_____	_____	_____	_____

D. BUTIR-BUTIR PUNCA BUANGAN TERJADUAL YANG AKAN DIKENDALI

4.	Nama & Alamat Premis Pengeluar Buangan	Nama Buangan dan (Kod Buangan)	Ciri Fizikal Buangan (Pepejal/Enapcemar/ Cecair)	Kuantiti (Tan metrik/ tahun)
(i)	_____ _____ _____	_____ _____	_____	_____
(ii)	_____ _____ _____	_____ _____	_____	_____
(iii)	_____ _____ _____	_____ _____	_____	_____

(Sila lampirkan kertas tambahan jika perlu)

E. BUTIR-BUTIR PREMIS PENGOLAHAN DAN PELUPUSAN BERLESEN YANG AKAN MENERIMA BUANGAN TERJADUAL

5. (i) Nama dan Alamat Premis : _____
 Pengolahan dan Pelupusan _____
 Berlesen _____
- (ii) No.Lesen JAS : _____ Tarikh tamat : _____
- (iii) No.Telefon: _____ No.Telefaks: _____ email: _____
- (iv) Kaedah Pelupusan : (a) Gunasemula sebagai bahan mentah gantian ☐
 (b) Perolehan kembali bahan berfaedah ☐
 (c) Pengolahan fizikal-kimia ☐
 (d) Tapak pelupusan selamat ☐
 (e) Pengolahan atas tanah ☐
 (f) Pembakaran dalam insinerator ☐
 (g) Cara lain (Huraikan): _____

- (v) Huraikan cara buangan dipindahkan daripada premis pembawa buangan ke premis penerima buangan : _____

- (vi) Sila kemukakan satu Dokumen Kontrak Perjanjian atau Surat Akuan Janji yang dibuat antara syarikat pengeluar buangan, syarikat pembawa buangan dan syarikat penerima buangan.
 No.Rujukan dokumen : _____

- (vii) Bagi mengangkut buangan yang dikeluarkan dari kapal, sila kemukakan satu Dokumen Kontrak Perjanjian atau Surat Akuan Janji yang dibuat antara pemunya kapal atau agen pemunya kapal, syarikat pembawa buangan, dan syarikat penerima buangan berkenaan.

No.Rujukan dokumen: _____

F. RANCANGAN BERTINDAK BAGI KEJADIAN PELEPASAN TAK SENGAJA ATAU PERTUMPAHAN BUANGAN

6. Rancangan Tindakan Kecemasan (ERP) bagi persediaan dan tindakan termasuk langkah-langkah membendung, membersihkan dan mengurangkan pelepasan atau pertumpahan semasa pemindahan dan pengangkutan buangan terjadual
(Sila kemukakan satu salinan dokumen Rancangan Tindakan Kecemasan berkenaan)

7. Senarai alat-alat keselamatan yang disediakan:

8. Senarai alat-alat melawan tumpahan buangan yang disediakan:

G. INSURAN BAGI "PUBLIC LIABILITY"

9. Sila kemukakan satu salinan asal sijil "Motor Carrier Insurance for Public Liability" bagi kenderaan berkenaan.

No Rujukan dokumen: _____

H. PERAKUAN

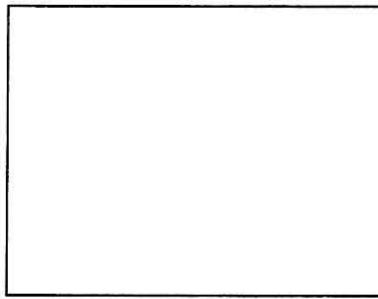
10. Saya dengan ini mengaku bahawa segala maklumat yang diberikan dalam permohonan ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

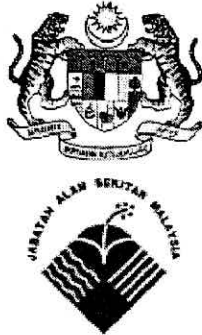
Tarikh : _____

(Tandatangan Pemohon)

Nama : _____

Meteri atau cop pemohon :





**JABATAN ALAM SEKITAR MALAYSIA
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR**

**PERMOHONAN * LESEN/UNTUK MEMBAHARUI LESEN/UNTUK
MEMINDAH MILIK LESEN DI BAWAH AKTA KUALITI ALAM
SEKELILING 1974**

***APPLICATION FOR *A LICENCE/RENEWAL OF A LICENCE/TRANSFER
OF A LICENCE UNDER THE ENVIRONMENTAL QUALITY ACT 1974***
BORANG DITETAPKAN DI BAWAH PERATURAN 2 PERATURAN-

PERATURAN KUALITI

ALAM SEKELILING (PERLESENAN) 1977

***FORM PRESCRIBED UNDER REGULATION 2 OF THE ENVIRONMENTAL
QUALITY***

(LICENSING) REGULATIONS 1977

(Satu salinan hendaklah diisi / One copy to be completed)

**Ketua Pengarah
Jabatan Alam Sekitar
Kementerian Sumber Asli Dan Alam Sekitar
Aras 3-7, Parcel C4
Pusat Pentadbiran Kerajaan Persekutuan
62662 PUTRAJAYA**

**Director General
Department of Environment
Ministry of Natural Resources and Environment
Level 3-7, Block C4**

**Federal Government Administrative Centre
62662 PUTRAJAYA**

SAYA / KAMI memohon suatu lesen[†]

I/WE required by section†

(Nyatakan maksud lesen itu / State purpose of licence)

Dikehendaki oleh seksyen Akta Kualiti Alam Sekeliling
1974

As required by section
Act 1974

of the Environmental Quality

Dan memberi butir-butir yang berikut:
And give the following particulars:

Butir-Butir/Particulars	Panduan Untuk Mengisi Borang/Instructions for Completion
1. (i) Nama pemohon Name of application (ii) Alamat pemohon: Address of application: Pejabat Business Telefon Telephone Tempat Tinggal: Residence Telefon: Telephone (iii) Keturunan Nationality 2. (i) Nama syarikat induk: Name of parent company (ii) Alamat syarikat induk Address of parent company Telefon Telephone 3. (i) Nama premis Name of premises (ii) Alamat premis Address of premises Telefon Telephone (iii) Letaknya premis Location of premises	1. (i) Jika pemohon adalah orang perseorangan, nama penuh mestilah diberi dan jika pemohon adalah pertubuhan perbadanan, nama berdaftar atau berkanunnya mestilah diberi 1. (i) The name must be the full name in the case of an individual and the registered or statutory name in the case of a body corporate (ii) Alamat tempat tinggal perlu diberi hanya jika pemohon adalah orang perseorangan (ii) The residential address need only be given if the applicant is an individual (iii) Jika pemohon adalah pertubuhan perbadanan, nyatakan tempat di mana didaftar atau ditubuhkan (iii) If the applicant is a body corporate, state place where registered or established 2. Dipakai hanya jika pemohon adalah syarikat subsidiari 2. Applicable only if the applicant is a subsidiary company 3. Perkataan "premis" disini dan di tempat-tempat lain dalam Borang ini adalah berkenaan dengan premis yang lesen dikehendaki baginya 3. The word "premises" here and elsewhere in this Form refers to the premises for which a licence is required

2

Butir-Butir/Particulars	Panduan Untuk Mengisi Borang/Instructions for Completion
4. (i) Nama pemegang lesen sebelumnya Name of previous licensee (ii) Alamat pemegang lesen sebelumnya Address of previous licensee	4. (i) Dipakai jika lesen hendak dipindahmilik 4. (i) Application in the case of a transfer of licence

(iii) Nama premis sebelumnya <i>Previous name of premises</i> (iv) Tarikh dikeluarkan <i>Date of issue</i> Tarikh tamat <i>Date of expiry</i> (v) No. Lesen <i>Licence No</i> Rujukan Fail <i>File reference</i>	(iii) Dipakai jika nama premis telah bertukar <i>(iii) Applicable if name of premises has changed</i> (iv) Catatkan tarikh lesen dikeluarkan, tarikh tamatnya, mengikut susunan tarikh, bulan dan tahun <i>(iv) Enter dates of issue and expiry of licence in date-month-year order</i>
--	---

Bayaran yang ditetapkan sebanyak \$ adalah dihantar bersama dengan permohonan ini.

The prescribed fee of \$ is forwarded with this application.

(Jika pemohon tidak dapat menentukan atau menghitung amaun bayaran itu, mintalah nasihat dan bantuan dari

(If the applicant is unable to ascertain or compute the amount of the fee, advice and assistance may be obtained

Jabatan Alam Sekitar atau mana-mana Pejabat cawangannya).

From the Department of Environment or any branch office thereof).

Saya, pemohon/agen yang diberikuasa bagi pemohon, dengan ini

I,, the applicant/authorized agent of the applicant, hereby

Mengaku bahawa segala maklumat yang diberi dalam permohonan ini adalah benar dan betul sepanjang pengetahuan dan kepercayaan saya.

Alamat agen yang diberikuasa:

Address of Authorized Agent:

.....
.....
.....
.....

Tandatangan pemohon atau agen yang diberikuasa,

Signature of applicant or authorized agent,

Untuk dan bagi pihak:

for and on behalf of:

(Bubuh meteri atau cap pemohon)

(Affix seal or stamp of applicant)

Catatan-Note

Lesen-lesen yang berikut adalah dikehendaki oleh Akta Kualiti Alam Sekeliling 1974:

The following licences are required by the Environmental Quality Act 1974:

Seksyen 18 (1) ** Lesen untuk menduduki atau menggunakan premis yang ditetapkan

Section 18 (1) Licence to occupy or use prescribed premises

Seksyen 22 (1) * Lesen untuk mengeluarkan atau melepaskan buangan ke dalam udara dengan melanggar syarat-syarat yang boleh diterima yang ditentukan di bawah seksyen 21

Section 22 (1) Licence to emit or discharge wastes into the atmosphere in contravention of the acceptable conditions specified under section 21

Seksyen 23 (1) ** Lesen untuk mengeluarkan atau menyebabkan atau membenarkan dikeluarkan apa-apa bunyi bising yang lebih kuat bahana, keamanan, atau kualitinya dengan melanggar syarat-syarat yang boleh yang boleh diterima yang ditentukan di bawah seksyen 21.

Section 23 (1) Licence to emit or cause or permit to be emitted any noise greater in volume, intensity, or quality in contravention of the acceptable conditions specified under section 21.

Seksyen 24 (1) ** Lesen untuk mencemarkan atau menyebabkan atau membenarkan dicemarkan mana-mana tanah tanah atau permukaan mana-mana tanah dengan melanggar syarat-syarat yang boleh diterima yang ditentukan di bawah seksyen 21.

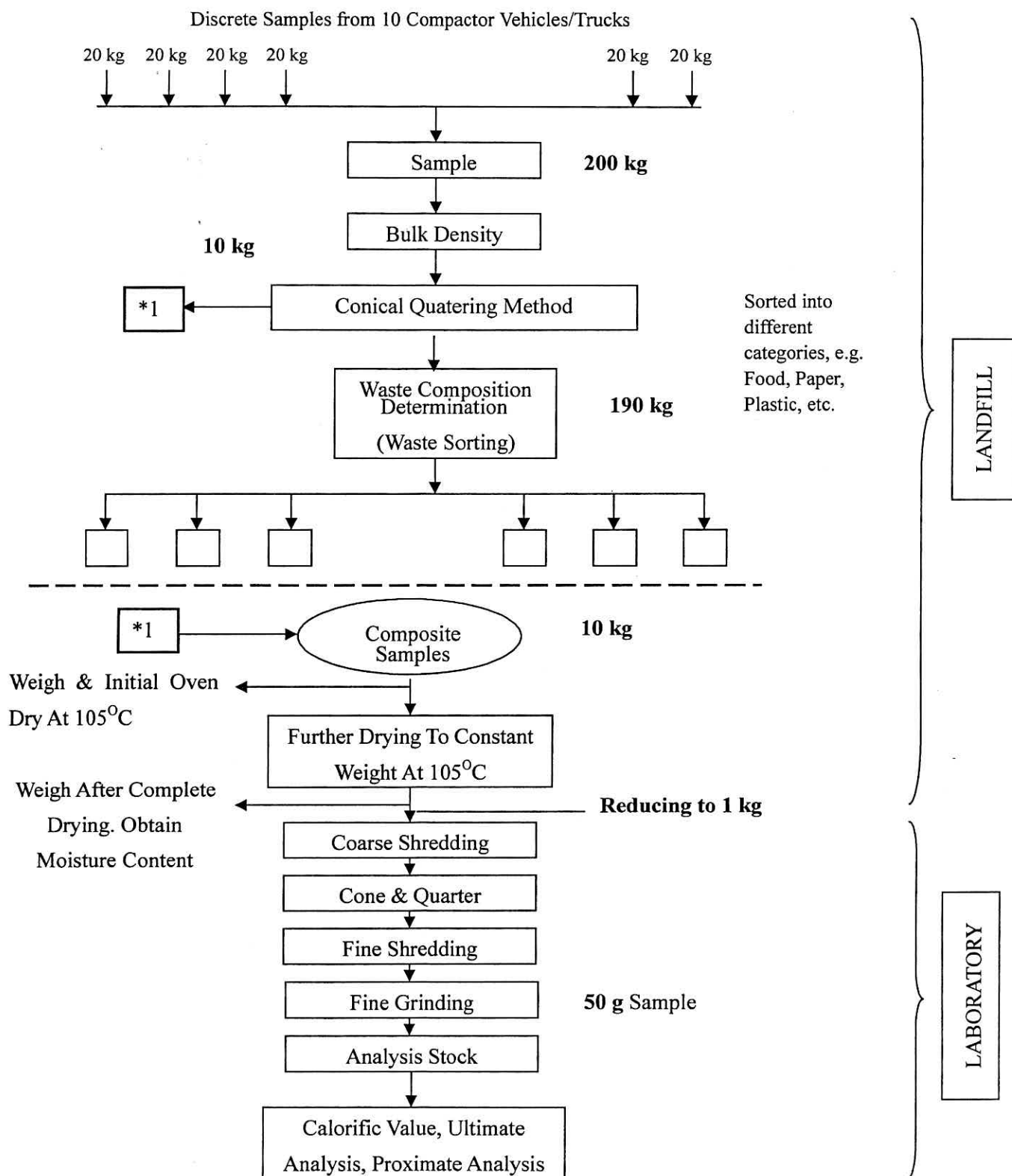
Section 24(1) Licence to pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable conditions specified under section 21.

Seksyen 25 (1) ** Lesen untuk mengeluarkan, melepas, atau meletakkan apa-apa buangan ke dalam mana-mana perairan daratan dengan melanggar syarat-syarat yang boleh diterima yang ditentukan di bawah seksyen 21.

Section 25 (1) Licence to emit, discharge, or deposit any wastes into any inland waters in contravention of the acceptable conditions specified under section 21.

Seksyen 29 (1) ** Lesen untuk melepaskan buangan-buangan ke dalam perairan Malaysia.
Section 29 (1) *Licence to discharge wastes into Malaysia waters.*

APPENDIX D
PROCEDURE FOR
WASTE SAMPLING
PROGRAMME



WASTE SAMPLING & ANALYSIS FLOW CHART
(RANDOM TRUCKLOAD SAMPLING)

SAMPLE OF MSW SAMPLING WORKSHEET

Date: _____

Total weight of sample: _____

Day: _____

Container weight & volume: _____

Source/Sample ID: _____

Truck No.: _____

Weather: _____

No.	Category	1	2	3	4	ΣMass (kg)	Weight (%)
1	Food Waste						
2	Mixed Paper						
3	Newsprint						
4	High Grade Paper						
5	Corrugated Paper						
6	Plastic (Rigid)						
7	Plastic (Film)						
8	Plastic (Foam)						
9	Diaper						
10	Textile						
11	Rubber / Leather						
12	Wood Waste						
13	Yard Waste						
14	Yard (Fruit Husk)						
15	Glass (Clear)						
16	Glass (Coloured)						
17	Metal (Ferrous)						
18	Metal (Non-Ferrous)						
19	Metal (Aluminium)						
20	Batteries / Haz.						
21	Fine						
22	Other Organic						
23	Other In-Organic						
24	Others						
Total (kg)							

No.	Laboratory	Mass (g)
1	Food Waste	
2	Mixed Paper	
3	Newsprint	
4	High Grade Paper	
5	Corrugated Paper	
6	Plastic (Rigid)	
7	Plastic (Film)	
8	Plastic (Foam)	
9	Diaper	
10	Textile	
11	Rubber / Leather	
12	Wood Waste	
13	Yard Waste	
14	Yard (Fruit Husk)	
	Composite	

Remarks :

Person-in-charge: _____

Final weight = _____ g
 Moisture content = _____ %

APPENDIX E
WASTE ANALYSIS
RESULTS

Average Waste Composition for KL Municipal Solid Waste

Waste Composition	Percentage (wt% wet basis)		
	Min.	Max.	Average
Food Waste	18.07	42.86	25.24
Paper	8.33	17.44	13.55
Cardboard	1.32	11.66	4.34
Plastic	11.40	23.48	17.65
Textile	0.14	7.91	2.12
Diaper	1.17	16.97	5.22
Rubber	0	4.67	0.65
Leather	0	1.78	0.20
Yard Waste	0.67	38.72	8.55
Yard (Fruit Husk)	0	25.69	17.74
Wood Waste	0	4.56	1.01
Other Organic	0	5.89	0.33
Glass	0	7.15	2.34
Metal	0.14	6.66	2.38
Batteries / Hazardous Materials	0	0.34	0.05
Other Inorganic	0	2.92	0.24

Note: Study period: July 2001 – Jun 2002

Gross CV = 8.2 MJ/kg

Proximate Analysis (wt% wet basis)

Parameter	Percentage (wt% wet basis)
Moisture	61.7
Volatiles	31.9
Fixed Carbon	3.1
Ash	3.3
GCV (MJ/kg, wet basis)	8.2

Ultimate Analysis (wt% dry basis)

Parameter	Percentage (wt% dry basis)
Carbon	47.71
Hydrogen	6.66
Nitrogen	1.42
Oxygen	34.67
Sulfur	0.07
Chlorine	0.78
Ash	8.69

APPENDIX F
LIST OF US EPA
METHODS FOR
EMISSION
MEASUREMENT

Table 1: Methods of performance tests for emission measurements

Testing Parameter/Pollutant	Estimating Technique ⁽¹⁾
Sample and velocity traverses for stationary sources	USEPA Method 1
Sample and velocity traverses for stationary sources with small stacks or ducts	USEPA Method 1A
Stack gas velocity and volumetric flow rate (Type S pitot tube)	USEPA Method 2
Direct measurement of gas volume through pipes and small ducts	USEPA Method 2A
Exhaust gas volume flow rate from gasoline vapour incinerators	USEPA Method 2B
Stack gas velocity and volumetric flow rate in small stacks and ducts (standard pitot tube)	USEPA Method 2C
Gas volumetric flow rate in small pipes and ducts	USEPA Method 2D
Stack gas velocity and volumetric flow rate with 3-D probes	USEPA Method 2F
Stack gas velocity and volumetric flow rate with 2-D probes	USEPA Method 2G
Stack gas velocity taking into account velocity decay rate near the stack wall	USEPA Method 2H
Gas analysis for CO ₂ , O ₂ , excess air and dry molecular weight	USEPA Method 3
CO ₂ and O ₂ concentrations in emissions from stationary sources	USEPA Method 3A
Moisture content in stack gases	USEPA Method 4
Particulate emissions from stationary sources	USEPA Method 5
Particulate emissions from the asphalt processing and roofing industry	USEPA Method 5A
Non-sulphuric acid particulate matter from stationary sources	USEPA Method 5B
Particulate emissions from positive pressure fabric filters	USEPA Method 5D
Particulate emissions from the wool fibreglass insulation manufacturing industry	USEPA Method 5E
Non-sulphate particulate emissions from stationary sources	USEPA Method 5F
Particulate emissions from wood heaters from a dilution tunnel sampling location	USEPA Method 5G
Particulate emissions from wood heaters from a stack location	USEPA Method 5H
SO ₂ emissions from stationary sources	USEPA Method 6
SO ₂ moisture and CO ₂ emissions from fossil fuel combustion sources	USEPA Method 6A
SO ₂ and CO ₂ daily average emissions from fossil fuel combustion sources	USEPA Method 6B
SO ₂ emissions from stationary sources-Instrumental analyzer procedure	USEPA Method 6C
NO _x emissions from stationary sources	USEPA Method 7
NO _x emissions from stationary sources -Ion chromatographic method	USEPA Method 7A
NO _x emissions from stationary sources -Ultraviolet spectrophotometry	USEPA Method 7B
NO _x emissions from stationary sources -Alkaline permanganate/ colorimetric method	USEPA Method 7C
NO _x emissions from stationary sources -Alkaline permanganate/ Ion chromatographic method	USEPA Method 7D
NO _x emissions from stationary sources-Instrumental analyzer procedure	USEPA Method 7E
Sulphuric acid mist and SO ₂ emissions from stationary sources	USEPA Method 8
Visual determination of opacity of emissions from stationary sources	USEPA Method 9
CO emissions from stationary sources	USEPA Method 10
CO emissions in certifying CEM systems at petroleum refineries	USEPA Method 10A
CO emissions from stationary sources	USEPA Method 10B
Hydrogen sulphide content in flue gas streams in petroleum refineries	USEPA Method 11
Inorganic lead emissions from stationary sources	USEPA Method 12
Total fluoride emissions from stationary sources – SPADNS zirconium lake method	USEPA Method 13A
Total fluoride emissions from stationary sources – Specific ion electrode method	USEPA Method 13B
Fluoride emissions from potroom roof monitors for primary aluminium plants	USEPA Method 14
Hydrogen sulphide, carbonyl sulphide, and carbon disulfide emissions from stationary sources	USEPA Method 15
Total reduced sulphur emissions from sulphur recovery plants in petroleum refineries	USEPA Method 15A
Semicontinuous determination of sulphur emissions from stationary sources	USEPA Method 16
Total reduced sulphur emissions from stationary sources – Impinger technique	USEPA Method 16A
Total reduced sulphur emissions from stationary sources	USEPA Method 16B

Testing Parameter/Pollutant	Estimating Technique ⁽¹⁾
Particulate emissions from stationary sources -Instack filtration method	USEPA Method 17
Gaseous organic compound emissions by gas chromatography	USEPA Method 18
SO ₂ removal efficiency and particulate, SO ₂ and NO _x emissions rates	USEPA Method 19
NO _x , SO ₂ , and diluent emissions from stationary gas turbines	USEPA Method 20
Volatile organic compound leaks	USEPA Method 21
Visual determination of fugitive emissions from material resources and smoke emissions from flares	USEPA Method 22
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from stationary sources	USEPA Method 23
Volatile matter content, water content, density, volume solids, and weight solids of surface coatings	USEPA Method 24
Volatile matter content and density of printing inks and related coatings	USEPA Method 24A
Total gaseous non-methane organic emissions as carbon	USEPA Method 25
Total gaseous organic concentration using a flame ionization analyzer	USEPA Method 25A
Total gaseous organic concentration using a non-dispersive infrared analyzer	USEPA Method 25B
Non-methane organic compounds (NMOC) in MSW landfill gases	USEPA Method 25C
Volatile organic concentration of waste samples	USEPA Method 25D
Vapour phase organic concentration in waste samples	USEPA Method 25E
Hydrogen chloride emissions from stationary sources	USEPA Method 26
Hydrogen halide and halogen emissions from stationary sources –isokinetic method	USEPA Method 26A
Vapour tightness of gasoline delivery tank using pressure vacuum test	USEPA Method 27
Certification and auditing of wood heaters	USEPA Method 28
Air to fuel ratio and minimum achievable burn rates of wood-fired appliances	USEPA Method 28A
Metal emissions from stationary sources	USEPA Method 29

All the above test methods and relevant procedures are described in United States Code of Federal Regulation (CFR), Title 40–Protection of Environment, Chapter 1–Environment Protection Agency (EPA), Part 60–Standards of Performance for New Stationary Sources, Appendix A–Test Methods. The following internet link may be used to obtain more details on these techniques: <http://www.epa.gov/ttn/emc>.

Table 2: Performance specifications for continuous emission monitoring systems

Testing Parameter / Pollutant	Performance Specification ⁽²⁾
Specifications and test procedures for opacity	USEPA PS1
Specifications and test procedures for SO ₂ and NO _x	USEPA PS2
Specifications and test procedures for O ₂ and CO ₂	USEPA PS3
Specifications and test procedures for CO	USEPA PS4 / PS4A
Specifications and test procedures for CO and O ₂ CMS	USEPA PS4B
Specifications and test procedures for TRS	USEPA PS5
Specifications and test procedures for flow rate	USEPA PS6
Specifications and test procedures for H ₂ S	USEPA PS7
Specifications and test procedures for VOC	USEPA PS8
Specifications and test procedures for total Hydrocarbon CEMS	USEPA PS8
Specifications and test procedures for gas chromatographic	USEPA PS9
Specification for extractive FTIR	USEPA PS15

All the above performance specifications are described in United States Code of Federal Regulation (CFR), Title 40–Protection of Environment, Chapter 1–Environment Protection Agency (EPA), Part 60–Standards of Performance for New Stationary Sources, Appendix B– Performance Specification (PS). The following internet link may be used to obtain more details on these performance specifications: <http://www.epa.gov/ttn/emc>.

APPENDIX G
INCINERATOR
DAILY LOG
SHEET

Date : _____

INCINERATION DAILY LOG SHEET

[illegible][illegible]

Daily Summary	
Burnt Hours	
Kgs. Burnt	
Daily Rate/Hour	

[illegible]