

TECHNICAL MEMORANDUM FOR ISSUING AIR POLLUTION
ABATEMENT NOTICES TO CONTROL AIR POLLUTION
FROM STATIONARY POLLUTING PROCESSES E127

PLANNING, ENVIRONMENT AND LANDS BRANCH

This Technical Memorandum is published under Section 37B(1) of the Air Pollution Control Ordinance (Cap. 311) and shall commence to have effect in accordance with Section 37C of that Ordinance.

TECHNICAL MEMORANDUM FOR ISSUING AIR
POLLUTION ABATEMENT NOTICES
TO CONTROL AIR POLLUTION FROM
STATIONARY POLLUTING PROCESSES

TABLE OF CONTENTS

	Page
1. PRELIMINARY	E129
1.1 Citation and Commencement	E129
1.2 Application and Scope	E129
1.3 Interpretation	E129
2. PRINCIPLES FOR THE ISSUING OF AIR POLLUTION ABATEMENT NOTICES	E130
3. PROCEDURES FOR THE DETERMINATION OF AIR POLLUTION	E130
4. DETERMINATION OF AIR POLLUTION WHICH IS A NUISANCE	E131
5. DETERMINATION OF AIR POLLUTION WHICH IS PREJUDICIAL TO HEALTH USING HEALTH PROTECTION CONCENTRATION LEVELS	E132
5.1 Determination of Sensitive Receptor	E132
5.2 Determination of Air Pollutants Emitted from the Stationary Source	E132
5.3 Determination of the Receptor Concentration Levels	E133
5.4 Determination of Compliance with the Health Protection Concentration Levels	E133
6. DETERMINATION OF AIR POLLUTION WHICH IS PREJUDICIAL TO HEALTH OTHER THAN USING HEALTH PROTECTION CONCENTRATION LEVELS	E133
7. DETERMINATION OF AIR POLLUTION IF SAFETY OR OPERATION OF AIRCRAFT IS AFFECTED	E134
ANNEX—ASSESSMENT OF RECEPTOR CONCENTRATION LEVEL BY CALCULATION	E135

LIST OF TABLES

Table 1	AIR POLLUTANTS AND HEALTH PROTECTION CONCENTRATION LEVELS	E137
Table 2	2, 3, 7, 8-TCDD EQUIVALENT FACTORS FOR THE CONGENERS OF CONCERN	E139

TECHNICAL MEMORANDUM FOR ISSUING AIR POLLUTION ABATEMENT NOTICES TO CONTROL AIR POLLUTION FROM STATIONARY POLLUTING PROCESSES

1. PRELIMINARY

1.1 *Citation and Commencement*

This Technical Memorandum is issued pursuant to Section 9 of the Air Pollution Control Ordinance and may be cited as the "Technical Memorandum for Issuing Air Pollution Abatement Notices to Control Air Pollution from Stationary Polluting Processes". This Technical Memorandum shall come into operation in accordance with Section 37C of the Air Pollution Control Ordinance.

1.2 *Application and Scope*

This Technical Memorandum details the principles, procedures and standards for the assessment and measurement of air pollution from stationary polluting processes for the issuing of an Air Pollution Abatement Notice pursuant to Section 10 of the Ordinance. It should be noted that Section 10(1) does not apply to air pollution emitted from a specified process which is operated under a licence issued under Section 15 of the Ordinance.

1.3 *Interpretation*

In this Technical Memorandum, unless the context otherwise requires, the following definitions apply:—

"*Air Pollution*" has the same meaning as in the Ordinance.

"*Authority*" has the same meaning as in the Ordinance.

"*Ordinance*" means the Air Pollution Control Ordinance.

"*Stationary Polluting Process*" includes an activity, process or the operation of a chimney, relevant plant, machinery or equipment that evolves any air pollutant other than the livestock farming activities and the operation of any motor vehicle, ship and aircraft.

"*US CFR 40*" means the Code of Federal Regulations Title 40 of the United States of America.

"*USEPA*" means the Environmental Protection Agency of the United States of America.

Standard air pollution control terminology is used throughout this Technical Memorandum. Other terms are as defined in the Ordinance or in the text of the Technical Memorandum.

2. PRINCIPLES FOR THE ISSUING OF AIR POLLUTION ABATEMENT NOTICES

2.1 When the existence or imminence of a nuisance is established in accordance with Section 4 of this Technical Memorandum, the Authority may issue an air pollution abatement notice to require the owner of premises or the person carrying out the activity to reduce the emissions of air pollutants.

2.2 When the air pollutant emission as determined in accordance with Section 5 of this Technical Memorandum is causing or contributing to air pollution which is prejudicial to health to such an extent as to exceed Health Protection Concentration Levels by more than 100%, the Authority may issue an air pollution abatement notice to require the owner of premises or the person carrying out the activity to cease the emission of air pollutants from the premises or operation of any relevant process.

2.3 When the air pollutant emission as determined in accordance with Section 6 of this Technical Memorandum is causing or contributing to air pollution which is prejudicial to health to such an extent as to exceed a Health Risk Level, the Authority may issue an air pollution abatement notice to require the owner of premises or the person carrying out the activity to cease the emission of air pollutants from the premises or operation of any relevant process.

2.4 When the air pollutant emission as determined in accordance with Section 7 of this Technical Memorandum, imperils or is likely to imperil the safety of or otherwise interferes with normal operation of any aircraft, the Authority may issue an air pollution abatement notice to require the owner of premises or the person carrying out the activity to cease the emission of air pollutants from the premises or operation of any relevant process.

2.5 In any case the Authority, when issuing the air pollution abatement notices, may require the owner of premises or the person carrying out the activity to take any other steps to abate the emissions.

3. PROCEDURES FOR THE DETERMINATION OF AIR POLLUTION

In determining whether the emission of any air pollutant from any stationary polluting process is causing or contributing to the existence or imminence of air pollution, the Authority shall, as appropriate:—

- (a) determine whether the existence or imminence of any nuisance is established (in accordance with Section 4).
- (b) identify any air pollutant present in the emission which is included in Table 1 and determine whether the Reference Receptor Concentration Level (RRCL) of this air pollutant at any sensitive receptor is in compliance with the corresponding Health Protection Concentration Level (HPCL) (in accordance with Section 5).
- (c) identify any air pollutant present in the emission which is not included in Table 1 and determine whether its RRCL at any sensitive receptor is prejudicial to health, by making reference to relevant research results and publications or the advice of a medical doctor (in accordance with Section 6).
- (d) determine whether the safety or operation of any aircraft may be affected (in accordance with Section 7).

4. DETERMINATION OF AIR POLLUTION WHICH IS A NUISANCE

When determining whether the emission of any air pollutant from any stationary source has caused or contributed to the existence or imminence of a nuisance, the Authority may have regard to:

- (a) the relative location of the emission source and the place affected;
- (b) the locality of the place affected;
- (c) the time, duration and frequency of the emission;
- (d) any of the following effects caused by or contributed to by the emission:—
 - deposit of dust, grit or particles of any kind;
 - objectionable odour;
 - staining, corrosion, or damage of any building, plant, equipment or materials;
 - irritation of eye, nose, skin or any sensory discomfort;
 - disturbance of normal activities by the colour or opacity of the emission;
 - effect which in the opinion of the Authority or an authorized officer may affect public safety; or
 - any other effect which in the opinion of the Authority or an authorized officer is unreasonable for a member of the public to suffer.

5. DETERMINATION OF AIR POLLUTION WHICH IS PRE-JUDICIAL TO HEALTH USING HEALTH PROTECTION CONCENTRATION LEVELS

The Health Protection Concentration Levels (HPCLs) for the air pollutants given in Table 1 are for the purpose of protection of health. When determining whether the emission of any air pollutant from any source or sources is in compliance with the HPCL, the Authority shall adopt the following procedures.

5.1 Determination of Sensitive Receptor

For the purpose of determining compliance with the HPCL, any domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre shall be considered to be a sensitive receptor.

Any other premises or place which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants listed in Table 1 as the aforelisted premises and places shall also be considered to be a sensitive receptor.

5.2 Determination of Air Pollutants Emitted from the Stationary Source

In determining the type and quantity of any air pollutant emitted from any stationary source, and in determining the relevant emission source characteristics, the Authority shall have regard to:—

- (a) maximum design capacity of any furnace, chimney, relevant plant or process and the type and quantity of any fuel, chemical, raw material or substance used;
- (b) descriptions and specifications contained in any relevant manual, explanatory note or document produced by the owner, manufacturer or operator of the relevant furnace, chimney, relevant plant or process;
- (c) emission factors established by relevant studies or contained in relevant publications including the "Emission Factor Database" and "Compilation of Air Pollutant Emission Factors, AP-42" published by the USEPA and any other publication which is appropriate for the emission source; or
- (d) measurements carried out by the Authority on the emission source in accordance with relevant reference methods contained in the US CFR 40 or any other method which the Authority considers appropriate.

5.3 Determination of the Receptor Concentration Levels

In determining the Receptor Concentration Level (RCL) at any sensitive receptor, the Authority shall have regard to:—

- (a) the assessment procedures in the Annex to this Technical Memorandum; or
- (b) any measurement carried out in accordance with relevant reference methods contained in the US CFR 40 or any other method which is agreed by the Government Chemist to be appropriate.

5.4 Determination of Compliance with the Health Protection Concentration Levels

In determining compliance with the Health Protection Concentration Level (HPCL) for any air pollutant, the Authority shall

- (a) where the RCL is determined according to paragraph 5.3 (a), compare the RCL with the HPCL to determine compliance.
- (b) where the RCL is determined using equipment with continuous readouts according to paragraph 5.3 (b), compare the highest RCL averaged over any period of one hour with the HPCL to determine compliance.
- (c) where the RCL is determined using equipment which does not provide continuous readouts according to paragraph 5.3 (b), convert the RCL to the Reference Receptor Concentration Level (RRCL) using the following formula:—

$$RRCL = RCL(t_{HPCL}/t_{RCL})^{-0.28047}$$

where t_{HPCL} is the averaging time for the relevant HPCL;
 t_{RCL} is the averaging time, not being shorter than one hour, for the RCL.

The RRCL shall then be compared with the HPCL to determine compliance.

6. DETERMINATION OF AIR POLLUTION WHICH IS PRE-JUDICIAL TO HEALTH OTHER THAN USING HEALTH PROTECTION CONCENTRATION LEVELS

For the purpose of this Technical Memorandum, the Authority may determine, other than by making reference to the HPCLs listed in Table 1, whether the emission of any air pollutant is causing or contributing to air pollution which is prejudicial to health by adopting the following procedures.

6.1 The sensitive receptors, air pollutants and the RCL shall be determined in accordance with paragraph 5.1 to 5.3 of this Technical Memorandum.

6.2 The concentration level for any air pollutant not listed in Table 1 which is prejudicial to health, the Health Risk Level (HRL), shall be determined by:—
— reference to relevant research results and publications; or
— the advice of a medical practitioner,

6.3 The RCL shall be converted to the RRCL using the following formula:—

$$RRCL = RCL(t_{HRL}/t_{RCL})^{-0.28047}$$

where t_{HRL} is the averaging time for the relevant HRL;

t_{RCL} is the averaging time, not being shorter than one hour, for the RCL.

The RRCL shall then be compared with the HRL to determine compliance.

7. DETERMINATION OF AIR POLLUTION IF SAFETY OR OPERATION OF AIRCRAFT IS AFFECTED

In determining whether the emission of any air pollutant imperils or is likely to imperil the safety of or otherwise interferes with normal operation of any aircraft, the Authority shall have regard to:—

- (a) the height, colour, opacity, temperature, volume or any other characteristic of the emission and the distance of the emission source from any airport or normal flight path of any aircraft; or
- (b) the advice of the Director of Civil Aviation.

ANNEX—ASSESSMENT OF RECEPTOR CONCENTRATION LEVEL BY CALCULATION

Step 1 Determine the values of the following source parameters
— mass discharge rate, Q (gramme/second);
— elevation of the discharge point, h (metre);
— discharge velocity, v_s (metre/second);
— discharge temperature, T_s (K);
— equivalent diameter of the discharge point, d (metre).

Step 2 Use the following data
— neutral atmospheric stability;
— ambient temperature, T_a of 298K;
— wind speed, u of 2 m/s;
— acceleration due to gravity, g of 9.81 m/s².

Step 3 For a receptor of distance x(m) and cross-wind distance y(m) from the emission source, the RCL (1 hour average in microgrammes/cubic metre) is determined by:—

$$RCL = (0.5 \cdot 10^6 Q (3.142 u S_y S_z)^{-1} \exp[-0.5(H/S_z)^2] \exp[-0.5(y/S_y)^2])$$

where H, S_y and S_z are determined as given in the following steps.

Step 4 Determination of H

$$H = h' + H' + Z_s - Z_r - RHT$$

where Z_s is the source terrain above the mean sea level (metre);
 Z_r is the receptor terrain above the mean sea level (metre);
RHT is the receptor height above Z_r , the terrain level (metre);
 $h' = h - 3d[1 - (2v_s/3u)]$ for $v_s \leq 1.5u$;
 $h' = h$ for $v_s > 1.5u$;
 H' = is determined by Step 5.

Step 5 Determination of H'

(a) Calculate the Buoyancy Flux (F) by

$$F = 0.25 g v_s d^2 [1 - (T_a/T_s)]$$

where g is the acceleration due to gravity

(b) Calculate the Crossover Temperature Difference (T_c) for neutral stability category by

TECHNICAL MEMORANDUM FOR ISSUING AIR POLLUTION
ABATEMENT NOTICES TO CONTROL AIR POLLUTION
FROM STATIONARY POLLUTING PROCESSES

$$T_c = 0.0297T_s v_s^{1/3}/d^{2/3} \text{ for } F < 55$$

$$T_c = 0.00575 T_s v_s^{2/3}/d^{1/3} \text{ for } F \geq 55$$

(c) Calculate H' for neutral stability category as below:

IF $(T_s - T_a) > T_c$

$H' = \text{the lesser of } H'_g \text{ or } H'_f$

where

$$H'_g = [160F^{1/3}(0.001x)^{2/3}]/u$$

$$H'_f = 21.425F^{0.75}/u \text{ for } F < 55; \text{ or}$$

$$= 38.71F^{0.6}/u \text{ for } F \geq 55$$

IF $T_s \leq T_a$ or $(T_s - T_a) < T_c$

$$H' = 3dv_s/u$$

Step 6 Determination of S_y and S_z

$$S_{y1} = 0.16x/(1 + 0.0004x)^{0.5}$$

$$S_{z1} = 0.14x/(1 + 0.0003x)^{0.5}$$

S_{y1} and S_{z1} are then adjusted as follows, to account for buoyancy rise:

$$S_y = [S_{y1}^2 + (H'/3.5)^2]^{0.5}$$

$$S_z = [S_{z1}^2 + (H'/3.5)^2]^{0.5}$$

Step 7 Multiple Sources Calculation

Where the RCL due to more than one source is to be determined, repeat STEP 1-6 for each source and add together all the calculated RCLs to give the final RCL at the receptor.

TECHNICAL MEMORANDUM FOR ISSUING AIR POLLUTION
ABATEMENT NOTICES TO CONTROL AIR POLLUTION
FROM STATIONARY POLLUTING PROCESSES

Table 1—Air Pollutants and Health Protection Concentration Levels

Item	Compound Chemical Name	Health Protection Concentration Level (HPCL), One Hour Average Microgrammes Per Cubic Metre ⁽ⁱ⁾
1	Acrylamide	75.0
2	Acrylonitrile	18.8
3	Allyl chloride	216
4	Arsenic	0.30
5	Benzene	185
6	Benzidine	0.019
7	Benzo (a) Pyrene	0.387
8	Beryllium	0.53
9	bis (2-Chloro-ethyl) ether	3.87
10	bis (Chloromethyl) ether	4.72×10^{-4}
11	1, 3 - Butadiene	19.0
12	Carbon Monoxide	30,000
13	Carbon tetrachloride	30.4
14	Chlorinated dioxins and dibenzofurans, as 2,3,7,8-TCDD ⁽ⁱⁱ⁾	3.36×10^{-5}
15	Chloroform	55.5
16	Chromium VI Compounds	8.5×10^{-3}
17	Dibromoethane (Ethylene dibromide)	2.50
18	Dibutylnitrosamine	0.797
19	Dichlorobenzidine	2.66
20	1, 2-Dichloroethane (Ethylene Dichloride)	58.0

Table 1 (Cont'd)

Item	Compound Chemical Name	Health Protection Concentration Level (HPCL), One Hour Average Microgrammes Per Cubic Metre ⁽ⁱ⁾
21	Dichloromethane (Methylene Chloride)	311
22	Diethylnitrosamine	0.03
23	Dimethylnitrosamine	0.091
24	2, 4-Dinitrotoluene	6.71
25	Dioxane	399
26	Diphenyl hydrazine	5.80
27	Epichlorohydrin	1060
28	Ethylene Oxide	3.54
29	Formaldehyde	98.1
30	Hexachlorobenzene	2.60
31	Nickel (metal and insoluble compounds)	3.87
32	Nitrogen dioxide	300
33	2,4,6-Trichlorophenol	224
34	Polychlorinated biphenyls (PCBs)	1.06
35	Sulphur dioxide	800
36	1,1,2,2-Tetrachloro- ethane	22.0
37	Trichloroethylene	311
38	Vinyl chloride	472

(i) As at 298 K(25°C) and 101.325 KPa (one atmosphere).

(ii) The total TCDD-equivalent concentration is obtained by multiplying the concentrations of individual PCDD and PCDF concentrations by their respective 2,3,7,8-TCDD equivalent toxic factors set out in Table 2 and summing.

Table 2—2,3,7,8-TCDD Equivalent Factors for the Congeners of Concern

2,3,7,8-TCDD	1	2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDD	0.5	2,3,4,7,8-PeCDF	0.5
		1,2,3,7,8-PeCDF	0.05
1,2,3,4,7,8-HxCDD	} 0.1	1,2,3,4,7,8-HxCDF	} 0.1
1,2,3,6,7,8-HxCDD		1,2,3,7,8,9-HxCDF	
1,2,3,7,8,9-HxCDD		1,2,3,6,7,8-HxCDF	
		2,3,4,6,7,8-HxCDF	
1,2,3,4,6,7,8-HpCDD	0.01	1,2,3,4,6,7,8-HpCDF	} 0.01
		1,2,3,4,7,8,9-HpCDF	
OCDD	0.001	OCDF	0.001