

Appendix 3.1 Comparison of Target Emission Levels with other Relevant Standards

Air Pollutant	Target Emission Levels (mg/m ³) ^(a)		Hong Kong's Emission Limits in BPM for Municipal Waste Incineration (mg/m ³) ^(a)		European's Emission Limits in EC's Waste Incineration Directive (mg/m ³) ^(a)		USEPA Title 40 CFR Part 60 on Large Municipal Waste Combustors (mg/m ³) ^(a)	Mainland's Standard on Municipal Waste Incineration, GB 18485-2001 (mg/m ³) ^(a)
	Daily	Half - Hourly	Daily	Half - Hourly	Daily	Half - Hourly	Daily	Hourly
Particulates ^(b)	10	30	10	30	10	30	14 ⁽ⁱ⁾	80 ^(k)
Organic Compounds	10	20	10	20	10	20	-	-
Hydrogen Chloride (HCl)	10	60	10	60	10	60	29 ⁽ⁱ⁾	75 ^(k)
Hydrogen Fluoride (HF)	1	4	1	4	1	4	-	-
Sulphur Dioxide (SO ₂)	50	200	50	200	50	200	61 ⁽ⁱ⁾	260
Carbon Monoxide (CO)	50	100	50	100	50	100	89 ^{(i) (j)}	150
Nitrogen Oxides (NO _x) as Nitrogen Dioxide (NO ₂)	100 ^(m)	200 ^(m)	200	400	200	400	219 ⁽ⁱ⁾	400
Mercury	0.05 ^(e)	-	0.05 ^(e)	-	0.05 ^(e)	-	0.036 ⁽ⁱ⁾	0.2 ^(k)
Total Cadmium & Thallium	0.05 ^(e)	-	0.05 ^(e)	-	0.05 ^(e)	-	-	-
Total Heavy Metals ^(c)	0.5 ^(e)	-	0.5 ^(e)	-	0.5 ^(e)	-	-	-
Dioxins & Furans (in mg I-TEQ m ⁻³)	1x10 ^{-7(d)}	-	1x10 ^{-7(d)}	-	1x10 ^{-7(d)}	-	9x10 ^{-6 (h) (l)}	1x10 ^{-6(l)}
Cadmium (Cd)	^(f)	-	^(f)	-	^(f)	-	0.007 ⁽ⁱ⁾	0.1 ^(k)
Lead (Pb)	^(g)	-	^(g)	-	^(g)	-	0.100 ⁽ⁱ⁾	1.6 ^(k)

Notes:

- (a) Emission limits are reference to 0°C and 101.325 kPa, dry and 11% oxygen content conditions.
- (b) The particulate emission limit is assumed to be RSP.
- (c) Including Sb, As, Pb, Co, Cr, Cu, Mn, V and Ni.
- (d) The averaging time is 6 to 8 hours.
- (e) Average values over a sampling period of a minimum of 30 minutes and a maximum of 8 hours.
- (f) Emission of Cadmium is controlled by the emission limit of Total Cadmium & Thallium.
- (g) Emission of Lead is controlled by the emission limit of Total Heavy Metals.

- (h) The averaging time is 4 hours.
- (i) The average time is 4 hours or 24 hours depends on the incineration technology.

(j) Conversion from ppm to mg/m³,

Emission limit in mg/m³, at 7% oxygen = US emission limit in ppm × molecular weight / (gas constant × standard temperature/standard pressure) × 10⁻³

$$\begin{aligned} \text{Emission limit for HCl in mg/m}^3, \text{ at 7\% oxygen} &= 25 \times 36.5 / (8.314\text{N-m}/(\text{mol-K}) \times 273\text{K} / 101325\text{N/m}^2) \times 10^{-3} = 40.7 \text{ mg/m}^3 \\ \text{Emission limit for SO}_2 \text{ in mg/m}^3, \text{ at 7\% oxygen} &= 30 \times 64 / (8.314\text{N-m}/(\text{mol-K}) \times 273\text{K} / 101325\text{N/m}^2) \times 10^{-3} = 85.7 \text{ mg/m}^3 \\ \text{Emission limit for CO in mg/m}^3, \text{ at 7\% oxygen} &= 100 \times 28 / (8.314\text{N-m}/(\text{mol-K}) \times 273\text{K} / 101325\text{N/m}^2) \times 10^{-3} = 125.0 \text{ mg/m}^3 \\ \text{Emission limit for NO}_x \text{ in mg/m}^3, \text{ at 7\% oxygen} &= 150 \times 46 / (8.314\text{N-m}/(\text{mol-K}) \times 273\text{K} / 101325\text{N/m}^2) \times 10^{-3} = 308.0 \text{ mg/m}^3 \end{aligned}$$

In accordance with Annex VI of EU Directive 200/76/EC,

$$C_{a, \text{ dry, } O_a} = C_{a, \text{ dry, } O_s} \times (20.9 - O_a) / (20.9 - O_s)$$

where $C_{a, \text{ dry, } O_a}$ is flue gas concentration, dry gas, at 11% oxygen,
 $C_{a, \text{ dry, } O_s}$ is flue gas concentration, dry gas, at 7% oxygen

$$\begin{aligned} \text{Emission limit for HCl in mg/m}^3, \text{ at 11\% oxygen} &= 40.7 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 29 \text{ mg/m}^3 \\ \text{Emission limit for SO}_2 \text{ in mg/m}^3, \text{ at 11\% oxygen} &= 85.7 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 61 \text{ mg/m}^3 \\ \text{Emission limit for CO in mg/m}^3, \text{ at 11\% oxygen} &= 125.0 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 89 \text{ mg/m}^3 \\ \text{Emission limit for NO}_x \text{ in mg/m}^3, \text{ at 11\% oxygen} &= 308.0 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 219 \text{ mg/m}^3 \\ \text{Emission limit for particulates in mg/m}^3, \text{ at 11\% oxygen} &= 20.0 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 14 \text{ mg/m}^3 \\ \text{Emission limit for Mercury in mg/m}^3, \text{ at 11\% oxygen} &= 0.05 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 0.036 \text{ mg/m}^3 \\ \text{Emission limit for Dioxins \& Furans in I-TEQ, at 11\% oxygen} &= 1.3 \times 10^{-5} \text{ mg I-TEQ m}^{-3} \times (20.9 - 11) / (20.9 - 7) = 9 \times 10^{-6} \text{ mg I-TEQ m}^{-3} \\ \text{Emission limit for Cd in mg/m}^3, \text{ at 11\% oxygen} &= 0.01 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 0.007 \text{ mg/m}^3 \\ \text{Emission limit for Pb in mg/m}^3, \text{ at 11\% oxygen} &= 0.14 \text{ mg/m}^3 \times (20.9 - 11) / (20.9 - 7) = 0.100 \text{ mg/m}^3 \end{aligned}$$

- (k) Continuous hourly sampling result or average of regular sampling results in an hour. (PRC Standard HJ/T 397-2007).
- (l) Sampling period of not less than 2 hours (PRC Standard HJ77.2-2008).
- (m) 50% of the concentration limit stipulated in BPM 12/1 (08).