

Municipal Waste EFW Facility Emission Limits Comparison Summary

| Contaminant | Concentration Units | Ontario MOE A-7 (February 2004) | Canadian Council of Ministers of the Environment (CCME) | US EPA 40 CFR Part 60 (May-10-06 Edition) Standards of Performance for Large Municipal Waste Combustors (New Facilities) (b), (c) | EU Directive 2000/76/EC of the European Parliament And Council on the incineration of waste (c) | Typical Performance of Modern EFW Facilities |
|--------------------------------------|--------------------------|------------------------------------|--|---|--|---|
| Total Particulate Matter (TPM) | mg/Rm3 @ 11% O2 | 17 | 20 (p) | 14.0 | 9.2 (n) | 6.9 |
| Sulphur Dioxide (SO2) | mg/Rm3 @ 11% O2 | 56 | 260 (q) | 55.0 (d) | 45.8 (n) | 10.8 |
| Hydrogen Chloride (HCl) | mg/Rm3 @ 11% O2 | 27 | 75 or 90% removal (p) | 26.1 (e) | 9.2 (n) | 10.0 |
| Nitrogen Oxides (NOx) (as NO2) | mg/Rm3 @ 11% O2 | 207 | 400 (q) | 197.5 (g) | 183.2 (n) | 94.8 |
| Carbon Monoxide (CO) | mg/Rm3 @ 11% O2 | N.Def. | 57 (114 for RDF Systems) (p) | 41 to 200 (m1) | 45.8 (n) | 10.5 |
| Cadmium (Cd) | ug/Rm3 @ 11% O2 | 14 | 100 (q) | 7.0 | N.Def. | 4.9 |
| Lead (Pb) | ug/Rm3 @ 11% O2 | 142 | 50 (q) | 98.0 | N.Def. | 44.5 |
| Mercury (Hg) | ug/Rm3 @ 11% O2 | 20 | 20 (r) | 35.0 | 45.8 (o) | 10.0 |
| Cd + Tl | ug/Rm3 @ 11% O2 | N.Def. | N.Def. | N.Def. | 45.8 (o) | N.Def. |
| Sum (Sb, As, Pb, Cr, Co, Cu, Mn, Ni) | ug/Rm3 @ 11% O2 | N.Def. | N.Def. | N.Def. | 458.1 (o) | N.Def. |
| PCDD/F TEQ (l) | ng/Rm3 @ 11% O2 | 0.08 | 0.08 (s) | 9.1 (k) | 0.092 | 0.020 |
| Organic Matter (as Methane) | ppmv undiluted mg/Rm3 | 100 65.6 | | | | 1.1 |

Concentration units: Mass per reference cubic metres corrected to 11% oxygen. Reference conditions: 25 deg. C, 101.3 kPa.
N.Def. = Not Defined

Table Notes:

- (a) 'Small' = Small municipal waste combustion (MWC) units with an individual MWC capacity of 250 tons/d or less
- (b) 'Large' = Large MWC units with an individual MWC capacity greater than 250 tons/d
- (c) Units have been converted to Ontario MOE A-7 concentration units to allow direct comparison
- (d) or 80% reduction by weight or volume of potential SO2 emissions, whichever is less stringent
- (e1) or 90% reduction by weight or volume of potential SO2 emissions, whichever is less stringent
- (e2) or 75% reduction by weight or volume of potential SO2 emissions, whichever is less stringent
- (e) or 95% reduction of potential HCl emissions by weight, whichever is less stringent
- (e1) or 97% reduction of potential HCl emissions by weight, whichever is less stringent
- (e2) or 98% reduction of potential HCl emissions by weight, whichever is less stringent
- (f) Limit for Class I MWC. Class I = small MW combustion unit located at MW combustion plant with an aggregate plant combustion capacity of more than 250 tons/d of MSW
- (g) 180 ppmvd @ 7% O2 for 1st year of operation, 150 ppmvd @ 7% O2 after 1st year of operation
- (g1) NOx limit varies by combustor type: 158 ppmvd @ 7% O2 for Mass Burn Rotary Waterwall, 180 ppmvd @ 7% O2 for Fluidized Bed, 205 ppmvd @ 7% O2 for Mass Burn Waterwall, 219 ppmvd @ 7% O2 for Refuse-derived fuel, no limit for Mass Burn Refractory (after Apr. 28, 2009)
- (g2) NOx limit varies by combustor type: 210 ppmvd @ 7% O2 for Mass Burn Rotary Waterwall, 180 ppmvd @ 7% O2 for Fluidized Bed, 205 ppmvd @ 7% O2 for Mass Burn Waterwall, 250 ppmvd @ 7% O2 for Refuse-derived fuel, no limit for Mass Burn Refractory (after Apr. 28, 2009)
- (h) Limit for Class II MWC. Class II = small MW combustion unit located at MW combustion plant with an aggregate plant combustion capacity no more than 250 tons/d of MSW
- (i) CO limit varies per technology: 41 mg/Rm3 @11% O2 for Modular Starved-Air & Excess Air Unit; 163 mg/Rm3 @11% O2 for Fluidized Bed, Mixed Fuel, (Wood/Refuse Derived Fuel) Unit
- (j) or 85% reduction by weight of potential Hg emissions, whichever is less stringent
- (j1) or 90% reduction by weight of potential Hg emissions, whichever is less stringent
- (k) Limit not comparable to Canadian and European limits. Dioxins/furans on total mass basis measured as tetra- through octachlorinated dibenzo-p-dioxins and dibenzofurans. Not TEQ values
- (l) TEQ = Toxicity Equivalent. Per MOE, International Toxicity Equivalency Factors (I-TEFs) are applied to 17 dioxin and furan isomers of concern to convert them into 2,3,7,8-TCDD (tetrachlorobenzo-p-dioxin) toxicity equivalents (most toxic compound). The conversion involves multiplying the concentration of each isomer by the appropriate I-TEF to yield the TEQ for each isomer. Summing the individual TEQ values for each isomer of concern provides the total toxicity equivalent level for the sample mixture. The I-TEF scheme is intended to be used with isomer specific analytical results, rather than results reported by congener group only.
- (m) CO limit varies per technology: 40 mg/Rm3 @11% O2 for Modular Starved-Air & Excess Air Unit; 120 mg/Rm3 @11% O2 for Spreader Stoker, Mixed Fuel-Fired (Coal/Refuse-derived fuel)
- (m1) CO limit varies per technology: 40 mg/Rm3 @11% O2 for Modular Starved-Air & Excess Air Unit; 200 mg/Rm3 @11% O2 for Spreader Stoker Refuse-derived fuel
- (n) Daily average value
- (o) Average values over the sample period of a minimum of 30-minutes and a maximum of 8 h
- (p) CCME Operating & Emissions Guidelines for MSW Incinerators Report CCME-TS/WM-TRE003, June 1989. Table 4.2: Stack Discharge Limits (at 11% O2)
- (q) CCME Operating & Emissions Guidelines for MSW Incinerators Report CCME-TS/WM-TRE003, June 1989. Table 4.3: Anticipated Emissions From MSW Incinerators Operating Under Good combustion conditions and equipped with dry scrubber fabric filter systems (at 11% O2)
- (r) CCME Canada-Wide Standards for Mercury Emissions (2000)
- (s) CCME Canada-Wide Standards for Dioxins & Furans (2001)