

# 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. “Nm<sup>3</sup>” 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/Nm<sup>3</sup>.
- V. “Q” means emission quantity corrected to Basic Oxygen Standard, measured in Nm<sup>3</sup>/min.
- VI. “C<sub>s</sub>” means measured pollutant concentration based on test method, not corrected to Standard Oxygen Basis, measured in ng-TEQ/Nm<sup>3</sup>.
- VII. “O<sub>s</sub>” 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<sup>3</sup>.

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
<b>2,3,7,8-TeCDD</b>	1.0
<b>1,2,3,7,8-PeCDD</b>	0.5
<b>1,2,3,4,7,8-HxCDD</b>	0.1
<b>1,2,3,6,7,8-HxCDD</b>	0.1
<b>1,2,3,7,8,9-HxCDD</b>	0.1
<b>1,2,3,4,6,7,8-HpCDD</b>	0.01
<b>OCDD</b>	0.001
<b>2,3,7,8-TeCDF</b>	0.1
<b>1,2,3,7,8,PeCDF</b>	0.05
<b>2,3,4,7,8-PeCDF</b>	0.5
<b>1,2,3,4,7,8-HxCDF</b>	0.1
<b>1,2,3,6,7,8-HxCDF</b>	0.1
<b>1,2,3,7,8,9-HxCDF</b>	0.1
<b>2,3,4,6,7,8-HxCDF</b>	0.1
<b>1,2,3,4,6,7,8-HpCDF</b>	0.01
<b>1,2,3,4,7,8,9-HpCDF</b>	0.01
<b>OCDF</b>	0.001
<b>Other PCDDs and PCDFs</b>	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