

### 3) Ambient Air Quality Standard

#### (A) Ambient Air Standards

Pollutant	1-hr average value		8-hr average value		24-hr average value		1-month average value		1-yr * average value		Measurement Methods
	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	ppm	
Carbon Monoxide (CO)	34.20	30	10.26	9	-	-	-	-	-	-	Non-Dispersive Infrared Detection
Nitrogen Dioxide (NO <sub>2</sub> )	0.32 <sup>4/</sup>	0.17 <sup>4/</sup>	-	-	-	-	-	-	0.057 <sup>4/</sup>	0.03 <sup>4/</sup>	Chemiluminescence
Sulfur Dioxide (SO <sub>2</sub> )	0.78 <sup>1/</sup>	0.30 <sup>1/</sup>	-	-	0.30 <sup>2/</sup>	0.12 <sup>2/</sup>	-	-	0.10 <sup>2/</sup>	0.04 <sup>2/</sup>	UV-Fluorescence (1 hr, 24 hr, 1 yr) or Pararosaniline (1 hr, 24 hr)
Total Suspended Particulates (TSP)	-	-	-	-	0.33 <sup>2/</sup>	-	-	-	0.10 <sup>2/</sup>	-	Gravimetric
Particulate Matter < 10 microns (PM-10)	-	-	-	-	0.12 <sup>2/</sup>	-	-	-	0.05 <sup>2/</sup>	-	Gravimetric or Beta Ray or Taper Element Oscillating Microbalance or Dichotomous
Particulate Matter < 2.5 microns (PM-2.5)	-	-	-	-	0.05 <sup>5/</sup>	-	-	-	0.025 <sup>5/</sup>	-	Federal Reference Method (FRM) **
Ozone (O <sub>3</sub> )	0.20 <sup>3/</sup>	0.10 <sup>3/</sup>	0.14 <sup>3/</sup>	0.07 <sup>3/</sup>	-	-	-	-	-	-	Chemiluminescence or UV Absorption Photometry
Lead (Pb)	-	-	-	-	-	-	1.5	-	-	-	Atomic Absorption Spectrometer

- Remarks :** (1) \* : Arithmetic mean value.  
(2) \*\*: Standard analytical method of PCD is  
a. Beta Ray Attenuation or  
b. Tapered Element Oscillating Microbalance ; TEOM or  
c. Dichotomous  
(3) Concentration is based on 1 atm. and 25 °C .

- Sources :** - Notification of the National Environment Board, No.10, B.E.2538 (1995), dated April 17, B.E.2538 (1995) Except  
- <sup>1/</sup>Notification of the National Environment Board No.21, B.E.2544 (2001), which was published in the Royal Government Gazette Vol. 118 Part 39D dated April 30, B.E.2544 (2001).  
- <sup>2/</sup>Notification of the National Environment Board, No.24, B.E.2547 (2004), dated August 9, B.E.2547 (2004), which was published in the Royal Government Gazette Vol.121 Part 104D dated September 22, B.E.2547 (2004).

- <sup>3/</sup>Notification of the National Environment Board, No.28, B.E.2550 (2007), dated April 10, B.E.2550 (2007), which was published in the Royal Government Gazette Vol.124 Special Part 58D dated May 14, B.E.2550 (2007).
- <sup>4/</sup>Notification of the National Environment Board, No.33, B.E.2552 (2009), dated June 17, B.E.2552 (2009), which was published in the Royal Government Gazette Vol.126 Special Part 114D dated August 14, B.E.2552 (2009).
- <sup>5/</sup>Notification of the National Environment Board, No.36, B.E.2553 (2010), dated January 28, B.E.2553 (2010), which was published in the Royal Government Gazette Vol.127 Special Part 37D dated March 24, B.E.2553 (2010).
- Notification of the Department of Pollution Control, No.26, B.E.2550 (2007), dated June 26, B.E.2550 (2007), which was published in the Royal Government Gazette Vol.124 Special Part 98D dated August 16, B.E.2550 (2007).
- Notification of the Department of Pollution Control, dated June 14, B.E.2553 (2010), which was published in the Royal Government Gazette Vol.127 Special Part 84D dated July 9, B.E.2553 (2010).

**(B) Carbon Disulfide in Ambient Air**

Pollutant	24-hr average value ( $\mu\text{g}/\text{m}^3$ )	Measurement Method
Carbon Disulfide (CS <sub>2</sub> )	180	U.S.EPA Compendium Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette

**Remark :** The monitoring results of 24-hour average concentration of carbon disulfide in the ambient air is calculated at the reference conditions of 1 atm or 760 mm.Hg and 25°C.

**Source :** Notification of the National Environment Board, B.E.2555 (2012), dated March 29, B.E.2555 (2012), which was published in the Royal Government Gazette Vol.129 Special Part 92D dated June 11, B.E.2555 (2012).

**(C) Volatile Organic Compounds (VOCs) in Ambient Air**

No.	Pollutant	1-yr average value ( $\mu\text{g}/\text{m}^3$ )	Measurement Methods
1.	Benzene	1.7	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
2.	Vinyl Chloride	10	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
3.	1, 2 - Dichloroethane	0.4	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
4.	Trichloroethylene	23	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
5.	Dichloromethane	22	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
6.	1, 2 - Dichloropropane	4	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
7.	Tetrachloroethylene	200	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
8.	Chloroform	0.43	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.
9.	1, 3 - Butadiene	0.33	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or other methods approved by PCD and published in the Royal Government Gazette.

- Remarks :**
- (1) The monitoring results of VOCs in the ambient air in 1-year period is calculated from the arithmetic mean of 24-hour continuously monitored value of each month (at least once a month).
  - (2) In case the collected sample(s) are unable to be analysed, the new sampling shall be taken and analysed within 30 days from the previous sampling date.
  - (3) The monitoring results of 1 year average value of VOCs in the ambient air are reported as concentration at the reference conditions of 1 atm or 760 mmHg and 25°C.

**Source :** Notification of the National Environment Board, No.30, B.E.2550 (2007), issued under the Enhancement and Conservation of National Environment Quality Act B.E.2535 (1992), dated September 14, B.E.2550 (2007), which was published in the Royal Government Gazette Vol.124, Special Part 143D dated September 28, B.E.2550 (2007).

**(D) Surveillance Values of Volatile Organic Compounds (VOCs) in Ambient Air**

No.	Pollutant	24-hr average value ( $\mu\text{g}/\text{m}^3$ )	Measurement Methods
1.	Acetaldehyde	860	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
2.	Acrolein	0.55	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
3.	Acrylonitrile	10	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
4.	Benzene	7.6	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA. Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
5.	Benzyl Chloride	12	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
6.	1, 3 - Butadiene	5.3	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S.EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
7.	Bromomethane	190	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
8.	Carbon Tetrachloride	150	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
9.	Chloroform	57	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
10.	1, 2 - Dibromoethane	370	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S.EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
11.	1, 4 - Dichlorobenzene	1,100	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.

**(D) Surveillance Values of Volatile Organic Compounds (VOCs) in Ambient Air (Cont'd)**

No.	Pollutant	24-hr average value ( $\mu\text{g}/\text{m}^3$ )	Measurement Methods
12.	1, 2 - Dichloroethane	48	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
13.	Dichloromethane	210	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
14.	1, 2 - Dichloropropane	82	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
15.	1, 4 - Dioxane	860	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
16.	Tetrachloroethylene	400	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
17.	1, 1, 2, 2, Tetrachloroethane	83	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
18.	Trichloroethylene	130	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.
19.	Vinyl Chloride	20	U.S. EPA Method TO-14A or U.S. EPA Method TO-15 or U.S. EPA Method TO-11A or other methods approved by PCD and published in the Royal Government Gazette.

- Remarks :** (1) The monitoring results of surveillance for VOCs in the ambient air in 24-hour period is calculated from each VOCs in the ambient air are reported of 24-hour continuously monitored value.
- (2) The monitoring results of surveillance for 24 hour-VOCs in ambient air are reported as concentration at the reference conditions of 1 atm or 760 mm.Hg and 25°C.

**Source :** Notification of the Pollution Control Department, dated December 18, B.E.2551 (2008), which was published in the Royal Government Gazette Vol.126, Special Part 13D dated January 27, B.E.2552 (2009).

## LEAK EMISSION STANDARD

Phase \ Equipment	Concentration of Total Volatile Organic Compounds (ppmv)			
	- Compressor - Open-Ended Lines - Sampling Connections - Pressure Relief Devices for gases	- Pressure Relief Devices for liquid - Valve (gas/liquid) - Connectors or Flanges	Pumps for liquid	Agitator or Mixers
Phase 1	500	10,000	10,000	10,000
Phase 2	500	500	5,000	10,000

- Remarks :**
- (1) “Factory” means the factories No.42, No.44, No.49 and No.89 prescribed in the Ministerial Regulation (B.E 2535) under the Factory Act B.E. 2535, in which volatile organic compounds are used in the production process of 36 tons per year or more capacity.
  - (2) “Volatile Organic Compounds” means the compounds containing organic carbon as the main element with vapor pressure of more than 0.1 mmHg at 20 °C and pressure of 760 mmHg, except methane (CH<sub>4</sub>), carbon monoxide (CO), carbon monoxide (CO<sub>2</sub>), metal carbide or carbonate, ammonium carbonate ((NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>).
  - (3) “Leakage” means the emission of volatile organic compounds from any equipment in a factory exceeds the controlled leakage value.
  - (4) “Equipment to be leak detected” means that pumps, compressors, agitators or mixers, valves, open-ended lines, connectors or flanges, pressure relief devices and sampling connection.
  - (5) “Vacuum” means the pressure inside the device is less than atmospheric pressure by at least 5 kPa (37.50 mmHg).
  - (6) Phase 1 : Enforced for 2 years after being published in the Royal Government Gazette.  
Phase 2 : Enforced after 2 years of being published in the Royal Government Gazette.
  - (7) The specification and procedure of a portable VOCs leak detector is in accordance with U.S.EPA Method 21: Determination of Volatile Organic Compound Leaks or other method approved by DIW.
  - (8) Detector used is an infrared camera or other techniques that can illustrate the VOC images invisible by human eyes. The specification of camera must conform with the leak criteria of DIW, and procedure for the Alternative Work Practice to Detect Leak from Equipment of U.S.EPA
  - (9) Frequency of leak detection is once a year.

**Source :** Notification of the Ministry of Industry B.E.2555 (2012), issued under Factory Act B.E.2535 (1992) dated April 3, B.E.2555 (2012) which was published in the Royal Government Gazette, Vol.129, Special Part 88D dated June 1, B.E.2555 (2012).

# ODOR STANDARD

## A) Odor Concentration from Industrial Zone and Outside Industrial Zone

Location	Odor concentration measured at the fence or within the factory area	Odor concentration measured at the stack
Industrial Zone	30	1,000
Outside Industrial Zone	15	300

- Remarks :**
- (1) “Odor” means the air contaminants which can be detected by human nose or analytical equipments.
  - (2) “Odor sample” means the air sample which is odorous at the odor source.
  - (3) “Odor concentration” means the value indicating the dilution ratio of odorous air samples with fresh air.
  - (4) “Industrial zone” means the area where the land use is defined as industrial land by city plant law; industrial estates by Industrial Estate Authority of Thailand regulation; or Industrial land by factory regulation.
  - (5) “Outside industrial zone” means the other areas besides industrial zone.
  - (6) “Odor testers” means those who smell the odor for measuring the odor concentration. The odor testers must be on the list of PCD or Department of Industrial Works, Ministry of Industry.
  - (7) The odor concentration shall be measured at the downwind distance of 1 meter from the fence or factory area.
  - (8) The analytical method of odor concentration at the stack shall follow the American Society for Testing and Materials (ASTM) or Japanese Industrial Standard (JIS) or other methods approved in the Royal Government Gazette. (Refer to Notification of the Ministry of Industry)
  - (9) Effective after 180 days a since January 11, B.E.2553 (2010). (Refer to Notification of the Ministry of Industry)
  - (10) It is not applicable to the emission sources for which the odor intensity standard has been specified in accordance with the Enhancement and Conservation of National Environmental Quality Act.
  - (11) The measurement method of odor concentration by means of sensory test shall be carried out by Odor testers comprising at least 6 odor tester who are on the list of Odor testers of the Pollution Control Department or the Department of Industrial Works or any agency approved by PCD.
  - (12) Odor testers who are to measure odor concentration shall be tested for perceiving odor before conducting every measurement and shall follow the procedure for odor testers. The test method and procedure for odor testers shall be designated by the Pollution Control Department.

- Sources :** Notification of the Ministry of Industry B.E.2548 (2005), issued under Factory Act B.E.2535 (1992) dated April 11, B.E.2548 (2005), and published in the Royal Government Gazette, Vol.122 Part 44A dated June 3, B.E.2548 (2005).
- : Notification of the Ministry of Natural Resources and Environment B.E.2553 (2010), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) dated November 13, B.E.2552 (2009), which was published in the Royal Government Gazette, Vol.127, Special Part 3D dated January 11, B.E.2553 (2010).
  - : Notification of Pollution Control Committee on “Measurement method of odor concentration by sensory test, and being on the odor tester list” of the Ministry of Natural Resources and Environment dated June 16, B.E.2554 (2011), which was published in the Royal Government Gazette, Vol.128, Special Part 89D dated August 11, B.E.2554 (2011).

### B) Odor Concentration from Livestock Farm

Location	Odor concentration standard (Odor unit : OU)
Livestock Farm	30

- Remarks :** (1) “Odor concentration” means the value indicating the dilution ratio of odorous air samples with fresh air.
- (2) “Livestock Farm” means corrals, animal cages, including animal traps or any other place for controlling animals, land boundary area of a single piece used for livestock forming livestock.
- (3) “Odor testers” means those who smell the odor for measuring the odor concentration. The odor testers must be on the list of Pollution Control Department (PCD), Ministry of Natural Resources and Environment or on the list of Department of Industrial Works, Ministry of Industry.
- (4) The odor concentration is measured by means of sensory test. Odor sampling and being on the list of odor testers of the Pollution Control Department (PCD), Ministry of Natural Resources and Environment is in accordance with the notification of the Pollution Control Committee published in the Government Gazette.
- (5) It is effective after July 15, B.E.2557 (2014)

- Source :** Notification of the Ministry of Natural Resources and Environment B.E.2556 (2013), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) dated March 13, B.E.2556 (2013), which was published in the Royal Government Gazette, Vol.130, Spacial Part 85D dated July 15, B.E.2556 (2013).
- : Notification of Pollution Control Committee B.E.2556 (2013), dated August 5, B.E.2556 (2013), which was published in the Royal government Gazette, Vol.130, Special Part 116D dated September 12, B.E.2556 (2013).