

HAZARDOUS WASTES

Rubbish or Unused Materials with Contaminants are defined as follows:

1) The concentrations of hazardous inorganic and organic compounds in terms of milligram of substance per one kilogram of rubbish or unused material (mg/kg; wet weight), which are equal to or more than Total Threshold Limit Concentration value (TTLC) as follows:

Item	Chemicals	Quantity	Item	Chemicals	Quantity
1	Antimony and/or antimony compounds	500 mg/kg	20	Zinc and/or zinc compounds	5,000 mg/kg
2	Arsenic and/or arsenic compounds	500 mg/kg	21	Aldrin	1.4 mg/kg
3	Asbestos	1.0%	22	Chlordane	2.5 mg/kg
4	Barium and/or barium compounds (excluding barite and barium sulfate)	10,000 mg/kg	23	DDT, DDE, DDD	1.0 mg/kg
5	Beryllium and/or beryllium compounds	75 mg/kg	24	2,4-Dichlorophenoxyacetic acid	100 mg/kg
6	Cadmium and/or cadmium compounds	100 mg/kg	25	Dieldrin	8.0 mg/kg
7	Chromium (VI) compounds	500 mg/kg	26	Dioxin (2,3,7,8,-TCDD)	0.01 mg/kg
8	Chromium and/or chromium (III) compounds	2,500 mg/kg	27	Endrin	0.2 mg/kg
9	Cobalt and/or cobalt compounds	8,000 mg/kg	28	Heptachlor	4.7 mg/kg
10	Copper and/or copper compounds	2,500 mg/kg	29	Kepone	21 mg/kg
11	Fluoride salts	18,000 mg/kg	30	Lead compounds, organic	13 mg/kg
12	Lead and/or lead compounds	1,000 mg/kg	31	Lindane	4.0 mg/kg
13	Mercury and/or mercury compounds	20 mg/kg	32	Methoxychlor	100 mg/kg
14	Molybdenum and/or molybdenum compounds; excluding molybdenum disulfide	3,500 mg/kg	33	Mirex	21 mg/kg
15	Nickel and/or nickel compounds	2,000 mg/kg	34	Pentachlorophenol	17 mg/kg
16	Selenium and/or selenium compounds	100 mg/kg	35	Polychlorinated biphenyls (PCBs)	50 mg/kg
17	Silver and/or silver compounds	500 mg/kg	36	Toxaphene	5 mg/kg
18	Thallium and/or thallium compounds	700 mg/kg	37	Trichloroethylene	2,040 mg/kg
19	Vanadium and/or vanadium compounds	2,400 mg/kg	38	Silvex; 2,4,5,- Trichlorophenoxypropionic acid	10 mg/kg

- Remarks :**
- (1) Values specified for inorganic substances are the concentrations of elements, not compounds.
 - (2) In case of Asbestos and metal elements, the specified values are applied to fine powder only. Asbestos include chrysotile, amosite, crocidolite, tremolite, anthophyllite and actinolite.

2) Rubbish or Unused materials are extracted by Waste Extraction Test method (WET). Extracted water contains hazardous inorganic and organic components in milligram of substance per litre of extracted water (mg/l) that are equal to or more than Soluble Threshold Limit Concentration value as follows:

Item	Chemicals	Quantity	Item	Chemicals	Quantity
1	Arsenic and/or arsenic compounds	5 mg/l	19	Aldrin	0.14 mg/l
2	Barium and/or barium compounds (excluding barite and barium sulfate)	100 mg/l	20	Chlordane	0.25 mg/l
3	Beryllium and/or beryllium compounds	0.75 mg/l	21	DDT, DDE, DDD	0.1 mg/l
4	Cadmium and/or cadmium compounds	1.0 mg/l	22	2, 4-Dichlorophenoxyacetic acid	10 mg/l
5	Chromium (VI) compounds	5 mg/l	23	Dieldrin	0.8 mg/l
6	Chromium and/or chromium (III) compounds	5 mg/l	24	Dioxin (2,3,7,8,-TCDD)	0.001 mg/l
7	Cobalt and/or cobalt compounds	80 mg/l	25	Endrin	0.02 mg/l
8	Copper and/or copper compounds	25 mg/l	26	Heptachlor	0.47 mg/l
9	Fluoride salts	180 mg/l	27	Kepone	2.1 mg/l
10	Lead and or lead compounds	5 mg/l	28	Lindane	0.4 mg/l
11	Mercury and/or mercury compounds	0.2 mg/l	29	Methoxychlor	10 mg/l
12	Molybdenum and/or molybdenum compounds; excluding molybdenum disulfide	350 mg/l	30	Mirex	2.1 mg/l
13	Nickel and/or nickel compounds	20 mg/l	31	Pentachlorophenol	1.7 mg/l
14	Selenium and/or selenium compounds	1 mg/l	32	Polychlorinated biphenyls (PCBs)	5 mg/l
15	Silver and/or silver compounds	5 mg/l	33	Toxaphene	0.5 mg/l
16	Thallium and/or thallium compounds	7 mg/l	34	Trichloroethylene	204 mg/l
17	Vanadium and/or vanadium compounds	24 mg/l	35	Silvex; 2,4,5,- Trichlorophenoxypropionic acid	1 mg/l
18	Zinc and/or zinc compounds	250 mg/l			

- Remarks :**
- (1) Values specified for inorganic substances are the concentrations of elements, not compounds.
 - (2) Rubbish or Unused materials means unused substances or all wastes generated from the operation of a factory, including wastes from raw materials, wastes generated from production process, exhausted products and effluent containing hazardous components.

- (3) Hazardous wastes means rubbish or unused materials containing hazardous components or being contaminated with hazardous substances, or having hazardous characteristics.
- (4) Management of rubbish or non-used materials means treatment, deactivation, disposal, distribution, exchange or recycling in various forms, including storage for such purposes.
- (5) Generator of rubbish or non-used materials means the owner or possessor generate rubbish or non-used materials.
- (6) Collector and transporter mean person who possess rubbish and non-used materials.
- (7) Disposer of rubbish or unused materials means the owner or possessor who have rubbish or unused materials in possession according to Notification of Ministry of Industry on “Manifest Document System of Hazardous Wastes” B.E.2547 (2004) and Factory concerning with segregation or landfill of rubbish or unused materials (or factory type No.105).
- (8) Manifest means manifest document 20 according to Notification of Ministry of Industry on “Manifest Document of Hazardous wastes” B.E.2547 (2004).
- (9) Eletronic informing means reporting the information according to the Notification of Ministry of Industry on “Criterion and Informing Rubbish or Unused Materials from Factory via Internet” B.E.2547 (2004).

Source : Notification of Ministry of Industry, B.E.2548 (2005), published in the Royal Government Gazette, Vol. 123, Special Part 11D, dated January 25, B.E.2549 (2006).

SOIL QUALITY STANDARD

1) Soil Quality Standards for Habitat and Agriculture

Parameter	Unit	Standard	Analytical Methods
1. Volatile Organic Compounds			
1) Benzene	mg/kg	6.5	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or other methods approved by PCD
2) Carbon Tetrachloride	mg/kg	2.5	
3) 1,2 -Dichloroethane	mg/kg	3.5	
4) 1,1-Dichloroethylene	mg/kg	0.5	
5) cis-1,2-Dichloroethylene	mg/kg	43	
6) trans-1,2 -Dichloroethylene	mg/kg	63	
7) Dichloromethane	mg/kg	89	
8) Ethylbenzene	mg/kg	230	
9) Styrene	mg/kg	1,700	
10) Tetrachloroethylene	mg/kg	57	
11) Toluene	mg/kg	520	
12) Trichloroethylene	mg/kg	28	
13) 1,1,1-Trichloroethane	mg/kg	630	
14) 1,1,2-Trichloroethane	mg/kg	8.4	
15) Total Xylenes	mg/kg	210	
2. Heavy metals			
1) Arsenic	mg/kg	3.9	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma- Mass Spectrometry or Atomic Absorption, Furnace Technique or Atomic Absorption, Gaseous Hydride or Atomic Absorption Borohydride Reduction or other methods approved by Pollution Control Department
2) Cadmium and compounds	mg/kg	37	

1) Soil Quality Standards for Habitat and Agriculture (Cont'd)

Parameter	Unit	Standard	Analytical Methods
3) Hexavalent Chromium	mg/kg	300	Coprecipitation or Colorimetric or Chelation/Extraction or other methods approved by Pollution Control Department
4) Lead	mg/kg	400	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by Pollution Control Department.
5) Manganese and Compounds	mg/kg	1,800	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by Pollution Control Department.
6) Mercury and compounds	mg/kg	23	Cold-Vapor Technique or other Methods approved by Pollution Control Department
7) Nickel, soluble salts	mg/kg	1,600	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by Pollution Control Department.
8) Selenium	mg/kg	390	Inductively Coupled Plasma-Atomic Emission Spectrometry or Atomic Absorption, Furnace Technique or Atomic Absorption, Gaseous Hydride or Atomic Absorption, Borohydride Reduction or other methods approved by Pollution Control Department.
3. Pesticides			
1) Atrazine	mg/kg	22	Gas Chromatography or other methods approved by Pollution Control Department.
2) Chlordane	mg/kg	16	Gas Chromatography/Mass Spectrometry (GC/MS) or other methods approved by Pollution Control Department.

1) Soil Quality Standards for Habitat and Agriculture (Cont'd)

Parameter	Unit	Standard	Analytical Methods
3) 2,4-D	mg/kg	690	Gas Chromatography or High Performance Liquid Chromatography/Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS) or other methods approved by Pollution Control Department.
4) DDT	mg/kg	17	Gas Chromatography or Gas Chromatography/Mass Spectrometry (GC/MS) or other methods approved by Pollution Control Department.
5) Dieldrin	mg/kg	0.3	
6) Heptachlor	mg/kg	1.1	
7) Heptachlor Epoxide	mg/kg	0.5	
8) Lindane	mg/kg	4.4	
9) Pentachlorophenol	mg/kg	30	
4. Other Chemicals			
1) Benzo (a) pyrene	mg/kg	0.6	Gas Chromatography/Mass Spectrometry (GC/MS), or Thermal Extraction/Gas Chromatography/Mass-Spectrometry (TE/GC/MS), or Gas Chromatography/Fouirer Transform Infrared (GC/FT-IR) Spectrometry, or other methods approved by Pollution Control Department.

1) Soil Quality Standards for Habitat and Agriculture (Cont'd)

Parameter	Unit	Standard	Analytical Methods
2) Cyanide and compounds	mg/kg	11	Total and Amenable Cyanide : Distillation, or Total Amenable Cyanide (Automated Colorimetric, with off-line Distillation), or Cyanide Extraction Procedure Solids and oils or other methods approved by Pollution Control Department.
3) PCBs	mg/kg	2.2	Gas Chromatography or other methods Approved methods by PCD.
4) Vinyl Chloride	mg/kg	1.5	Gas Chromatography or Gas Chromatography/Mass Spectrometry (GC/MS) or other methods approved by PCD.

- Remarks :** (1) Test Methods of Evaluating Solid Waste, Physical/Chemical Methods (SW-846) (United States Environmental Protection Agency)
(2) Soil Sampling and Preservation Methods must be as specified.

2) Soil Quality Standard for Other Purposes

Parameter	Unit	Standard	Analytical Methods
1. Volatile Organic Compounds			
1) Benzene	mg/kg	15	Gas Chromatography or Gas Chromatography/Mass Spectrometry (GC/MS) or other methods approved by PCD.
2) Carbon Tetrachloride	mg/kg	5.3	
3) 1,2 -Dichloroethane	mg/kg	7.6	
4) 1,1-Dichloroethylene	mg/kg	1.2	
5) cis-1,2-Dichloroethylene	mg/kg	150	
6) trans-1,2-Dichloroethylene	mg/kg	210	
7) Dichloromethane	mg/kg	210	
8) Ethylbenzene	mg/kg	230	
9) Styrene	mg/kg	1,700	
10) Tetrachloroethylene	mg/kg	190	
11) Toluene	mg/kg	520	

2) Soil Quality Standard for Other Purposes (Cont'd)

Parameter	Unit	Standard	Analytical Methods
12) Trichloroethylene	mg/kg	61	Gas Chromatography or Gas Chromatograph/ Mass Spectrometry (GC/MS) or other methods approved by PCD.
13) 1,1,1-Trichloroethane	mg/kg	1,400	
14) 1,1,2-Trichloroethane	mg/kg	19	
15) Total Xylenes	mg/kg	210	
2. Heavy metals			
1) Arsenic	mg/kg	27	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Furnace Technique or Atomic Absorption, Gaseous Hydride or Atomic Absorption, Borohydride Reduction or other methods approved by PCD.
2) Cadmium and compounds	mg/kg	810	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by PCD.
3) Hexavalent Chromium	mg/kg	640	Coprecipitation or Colorimetric or Chelation/Extraction or other methods approved by PCD
4) Lead	mg/kg	750	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by PCD.
5) Manganese and compounds	mg/kg	32,000	

2) Soil Quality Standard for Other Purposes (Cont'd)

Parameter	Unit	Standard	Analytical Methods
6) Mercury and compounds	mg/kg	610	Cold-Vapor Technique or other methods approved by PCD.
7) Nickel, soluble salts	mg/kg	41,000	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Technique or other methods approved by PCD.
8) Selenium	mg/kg	10,000	Inductively Coupled Plasma-Atomic Emission Spectrometry or Atomic Absorption, Furnace Technique or Atomic Absorption, Gaseous Hydride or Atomic Absorption, Borohydride Reduction or other methods approved by PCD.
3. Pesticides			
1) Atrazine	mg/kg	110	Gas Chromatography or other methods approved by PCD.
2) Chlordane	mg/kg	110	Gas Chromatography/Mass Spectrometry (GC/MS) or other methods approved by PCD.
3) 2,4-D	mg/kg	12,000	Gas Chromatography or High Performance Liquid Chromatography/Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS) or other methods approved by PCD.
4) DDT	mg/kg	120	Gas Chromatography or Gas Chromatography/
5) Dieldrin	mg/kg	1.5	Mass Spectrometry (GC/MS) or other
6) Haptachlor	mg/kg	5.5	methods approved by PCD.
7) Heptachlor Epoxide	mg/kg	2.7	
8) Lindane	mg/kg	29	

2) Soil Quality Standard for Other Purposes (Cont'd)

Parameter	Unit	Standard	Analytical Methods
9) Pentachlorophenol	mg/kg	110	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or Gas Chromatography/Fouirer Transform Infrared (GC/FT-IR) Spectrometry or other methods approved by PCD.
4. Others			
1) Benzo (a) pyrene	mg/kg	2.9	Gas Chromatography/Mass Spectrometry (GC/MS) or Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS) or Gas Chromatography/ Fouirer Transform Infrared (GC/FT-IR) Spectrometry or other methods approved by PCD.
2) Cyanide and compounds	mg/kg	35	Total and Amenable Cyanide : Distillation or Total Amenable Cyanide (Automated Colorimetric, with off-line Distillation) or Cyanide Extraction Procedure for Solids and oils or other methods approved by PCD.
3) PCBs	mg/kg	10	Gas Chromatography or other methods approved by PCD.
4) Vinyl Chloride	mg/kg	8.3	Purge and Trap Gas Chromatography or purge and Trap Gas Chromatography/Mass Spectrometry methods approved by PCD.

Remarks : (1) Test Methods of Evaluating Solid Waste, Physical/Chemical Methods (SW-846) (United States Environmental Protection Agency).

(2) Soil Sampling and Preservation Methods must be as specified.

3) *Preservation Method of Soil Samples*

Parameters	Container	Preservative	Holding Time
1. Volatile Organic Compounds	Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days
2. Heavy metals (except Hexavalent Chromium and Mercury and compounds)	Plastic/Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	180 Days
3. Hexavalent Chromium	Plastic/Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	30 Days before sample preparation 4 Days after sample preparation
4. Mercury and compounds	Plastic/Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	28 Days
5. Pesticides	Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days before sample preparation 40 Days after sample preparation
6. Benzo (a) pyrene	Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days before sample preparation 40 Days after sample preparation
7. Cyanide and compounds	Plastic/Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days before sample preparation
8. PCBs	Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days before sample preparation 40 Days after sample preparation
9. Vinyl Chloride	Glass	Fridge $4^{\circ} \pm 2^{\circ}\text{C}$	14 Days

Source : Notification of National Environment Board No.25, B.E.2547 (2004) issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) published in the Royal Government Gazette No.121 Special Part 119D dated October 20, B.E.2547.