ENVIRONMENTAL QUALITY STANDARDS

Compiled as a Supplement of the Assignment Report

Entitled

"ENVIRONMENTAL POLLUTION CONTROL PROGRAMME
SOCIALIST REPUBLIC OF THE UNION OF BURMA
1 December 1980 - 31 January 1981"

by

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Preface

The environmental quality standards contained in this document were compiled by Professor Chamras Chayabongse, consultant, as a supplement to his assignment report entitled "Environmental Pollution Control Programme: Socialist Republic of the Union of Burma". These standards were obtained from various sources including those available at the UNEP Regional Office, Bangkok, the Office of the National Environment Board of the Government of Thailand, etc. The compilation is still incomplete due to the assignment time limit. It would be very desirable and very much appreciated if additional information would be forwarded to UNEP Regional Office, Bangkok for further compilation.

Sources of information are indicated wherever available. For well recognized international standards, such as those of the World Health Organization, sources are not indicated.

Bangkok, Thailand
March 1981

UNITED NATIONS ENVIRONMENT PROGRAMME
Regional Office for Asia and the Pacific

Part 1

WATER STANDARDS

A. Standards for Waste Effluents

1. PHILIPPINES

Section 70 Effluent Water Quality Requirements

(a) Minimum Treatment - Except when the Commission finds it unnecessary, all liquid wastes discharged into inland rivers, lakes and reservoirs, will receive a minimum of primary treatment for inorganic wastes, except for toxic substances, and secondary treatment for organic wastes. Liquid wastes discharged into estuarine waters will receive secondary treatment, unless otherwise specified by the Commission. Liquid wastes discharged into marine outfalls will receive a minimum of primary treatment, unless otherwise specified by the Commission.

The following table shows the expected performance of each treatment process:

	Primary	Primary plus Secondary
Floating Solids Removal	95-100%	95-100%
Suspended Solids Removal	50-65%	80-95%
Settleable Solids Removal	90-95%	90-95%
BOD Removal	25-40%	80-95%

For pond systems, the expected performance for suspended solids and BOD removal shall be determined by the Commission on a case-to-case basis, taking into account the algae and the effluent requirements for the receiving body of water.

(b) Additional Treatment - Based on the Water Quality Criteria as defined in this Chapter, the Commission shall set specific effluent water quality standards according to local conditions. Advanced wastewater treatment and other suitable control measures may be required by the Commission whenever conditions warrant.

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For toxic substances and trace elements, the Commission shall require treatment and/or disposal on a case-to-case basis. In case of oil containing wastes, grease traps and oil-water separators must be provided.

Section 71 Prohibition - Disposal of wastewater by injection into ground water aquifers is prohibited, except in special cases as approved by the Commission. Dumping of oil and other harmful substances into the sea is likewise prohibited, except in cases as provided for in Sec. 9 of P.D. 979.

Source: Official Gazette, Republic of the Philippines.
Volume 74, No. 23, 5 June 1978, page 4476

2. MALAYSIA

Effluent Standards for Palm Oil Mills

Parameters	Standard A 1.7.78	Standard B 1.7.79	Standard C 1.7.80	Standard D 1.7.81
Biochemical Oxygen Demand (BOD), 3-day, 30°C; mg/l	5,000	2,000	1,000	500
Chemical Oxygen Demand (COD); mg/l	10,000	4,000	2,000	1,000
Total Solids; mg/l	4,000	2,500	2,000	1,500
Suspended Solids; mg/l	1,200	800	600	400
Oil & Grease; mg/l	150	100	75	50
Ammoniacal-Nitrogen; mg/l	25	15	15	10
Organic-Nitrogen; mg/l	200	100	75	50
pH	5.0-9.0	5.0-9.0	5.0-9.0	5.0-9.0
Temperature, °C	45	45	45	45

Source: Division of Environment, Malaysia, September 1979.

3. THAILAND

Allowable Waste Effluent Standards

Ministry of Industry, Thailand

B.O.D. (5 days at 20°C)	max	20 ppm or more but not exceeding 60 ppm, depending on geography of the waste discharging point
Suspended solids	max	30 ppm or as shown in the attached table
Dissolved solids	max	2,000 ppm
pH value	between 5 and 9	
Permanganate value	max	60 ppm
Sulphide (as H_2S)	max	1 ppm
Cyanide (as HCN)	max	0.2 ppm
Oil and grease	max	5 ppm
Tar	none	
Formaldehyde	max	1 ppm
Phenols and cresols	max	1 ppm
Free chlorine	max	1 ppm
Zinc	max	5 ppm
Chromium	max	0.5 ppm
Arsenic	max	0.25 ppm
Copper	max	1.0 ppm
Mercury	max	0.005 ppm
Cadmium	max	0.03 ppm
Barium	max	1.0 ppm
Selenium	max	0.02 ppm
Lead	max	0.2 ppm
Nickel	max	0.2 ppm
Insecticides	none	
Radioactive materials	none	
Temperature	max	40°C
Colour and Odour	Not objectionable when mixed in receiving water	

Standards for Suspended Solids in Waste Effluent

Discharging to Inland Streams of Various Dilution Ratios

Ratio Flow Rate of Stream : Flow Rate of Waste Water	Max. Allowable Suspended Solids, ppm.
8 - 150	30
151 - 300	60
301 - 500	150

Ministry of Industry Notication (1978). Additional standards have been set for zinc industry as follows.

a) Zinc concentration shall not exceed 3 mg/l

b) Chromium, lead or nickel concentrations shall not exceed 0.2 mg/l

c) Arsenic concentration shall not exceed 0.25 mg/l

d) Copper or barium concentrations shall not exceed 1 mg/l

e) Mercury concentration shall not exceed 0.0002 mg/l

f) Cadmium concentration shall not exceed 0.1 mg/l

g) Selenium or silver concentrations shall not exceed 0.02 mg/l

h) Oil and grease shall not exceed 5 mg/l

Source: Ministry of Industry, Thailand, September 1980. Bangkok, Thailand.

4. SINGAPORE

Item of Analysis		*Public Works Dept.'s Requirements	** Ministry of Health's Requirements
		Allowable limits for the discharge of trade effluents into sewers	Allowable limits for the discharge of trade effluents into water courses
1. Total suspended solids	mg/l	400	50
2. Total dissolved solids	mg/l	1,000 - 3,000 (Max.)	1,000
3. Barium, selenium, tin	mg/l	10	-
4. Iron (Fe)	mg/l	50	5
5. Arsenic	mg/l	5	0.5
6. Beryllium	mg/l	5	0.5
7. Boron	mg/l	5	0.5
8. Cadmium	mg/l	10	0.1
9. Chromium (trivalent or hexavalent)	mg/l	10	0.1
10. Copper	mg/l	5	0.1
11. Lead	mg/l	5	0.1
12. Mercury	mg/l	10	0.1
13. Nickel	mg/l	10	0.1
14. Silver	mg/l	5	0.1
15. Zinc	mg/l	10	0.1

Notes: * L.G.I.O. Regulations, 1970 (Disposal of Trade Effluents)

** The Environmental Public Health Regulations, 1971 (Prohibition on Discharge of Trade Effluents into Water Courses)

5. IRAN

Maximum Allowable Concentration of Wastewater Effluents Discharged into a Receiving Body of Water

CONSTITUENTS	VALUE
1. Aluminum (total)	5.0 mg/l
2. Arsenic (total)	0.1 mg/l
3. Barium (total)	2.0 mg/l
4. Beryllium (total)	0.1 mg/l
5. BOD_5 at 20°C	20.0 mg/l; instantaneous maximum not to exceed 40 mg/l
6. Boron (total)	2.0 mg/l
7. Cadmium (total)	1.0 mg/l
8. Calcium (total)	75.0 mg/l
9. COD	50.0 mg/l; instantaneous maximum not to exceed 100 mg/l
10. Chloride	Not to exceed 250 mg/l if discharged into fresh water. In other places of brackish nature the chloride content should not be increased more than 10% above normal background concentration
11. Chlorine (free residual)	1.0 mg/l
12. Chromium (hexavalent)	1.0 mg/l
13. Chromium (trivalent)	1.0 mg/l
14. Cobalt (total)	1.0 mg/l
15. Coliform, total (MPN or MF)	Zero
16. Coliform, Fecal	Zero
17. Colour	16.0 Std. colour units
18. Copper (total)	1.0 mg/l
19. Cyanide	0.02 mg/l
20. Detergents	1.5 mg/l as ABS equivalent
21. Dissolved oxygen	2.0 mg/l minimum at all times
22. Fluoride	2.5 mg/l
23. Formaldehyde	1.0 mg/l
24. Iron (total)	3.0 mg/l
25. Lead (total)	1.0 mg/l
26. Lithium (total)	2.5 mg/l
27. Magnesium (total)	100.0 mg/l
28. Manganese (total)	1.0 mg/l
29. Mercury (total)	Zero mg/l
30. Molybdenum (total)	0.01 mg/l
31. Nickel (total)	1.0 mg/l
32. Nitrogens, Ammonia as N	2.5 mg/l
33. Nitrogens, Nitrate as N	50.0 mg/l
34. Nitrogens, Nitrite as N	10.0 mg/l
35. Oil and Grease	10.0 mg/l

5. IRAN (Continued)

CONSTITUENTS	VALUE
36. pH	6.5 - 8.5 pH units
37. Phenol	1.0 mg/l
38. Phosphorus	1.0 mg/l
39. Radioactive Materials	Absent
40. Selenium (total)	1.0 mg/l
41. Silver	1.0 mg/l
42. Solids, Total Suspended	30.0 mg/l; Instantaneous maximum not to exceed 50 mg/l
43. Solids, Total Settleable	Zero
44. Solids, Total Dissolved	Shall not cause an increase of more than 10% above normal background concentration
45. Sulphate	300 mg/l
46. Sulphide	1.0 mg/l
47. Temperature	Shall not increase or decrease temperature of receiving water more than 3°C
48. Turbidity	50 JTU units
49. Zinc	2.0 mg/l

Source: Department of Environment, the Islamic Republic of Iran, 1980

6. JAPAN

Effluent Standards (June 21, 1971)

(1) Substances related to the Protection of Human Health

Toxic Substances	Permissible limits
Cadmium and its compounds	0.1 mg/l
Cyanide compounds	1 mg/l
Organic phosphorus compounds (parathion, methyl parathion, methyl demeton and EPN only)	1 mg/l
Lead and its compounds	1 mg/l
Hexavalent chrome compounds	0.5 mg/l
Arsenic and its compounds	0.5 mg/l
Total mercury	0.0005 mg/l
Alkyl mercury compounds	Not detectable
PCB	0.003 mg/l

Notes: 1. Prefectures may, by decree, set more stringent standards.

2. By the term "not detectable" is meant that the substance is below the level detectable by the method designated by the Director General of the Environment Agency.

6. JAPAN (Continued)

(2) Item related to the Protection of the Living Environment

Item	Permissible Limits
pH	5.8 ~ 8.6 for effluent discharged into public water bodies other than coastal waters
	5.0 ~ 9.0 for effluent discharged into coastal waters
BOD, COD	160 mg/l (daily average 120 mg/l)
SS	200 mg/l (daily average 150 mg/l)
N-hexane extracts	5 mg/l (mineral oil)
	30 mg/l (animal and vegetable fats)
Phenols	5 mg/l
Copper	3 mg/l
Zinc	5 mg/l
Dissolved iron	10 mg/l
Dissolved manganese	10 mg/l
Chrome	2 mg/l
Fluorine	15 mg/l
Number of coliform groups (per cc)	3,000 (daily average)

Notes: 1. Prefectures may, by decree, set more stringent standards.

2. The discharge standards in this table are applied to the effluents from industrial plants and other places of business whose volume of effluents per day is not less than 50 m^3.

3. The discharge standards for BOD are applied to public waters other than coastal waters and lakes, while the discharge standards for COD are applied only to effluents discharged into coastal waters and takes.

Source: Quality of the Environment in Japan, 1979.
Environment Agency.

7. REPUBLIC OF CHINA

Effluent Standards

Item	Level
BOD	40-150 mg/l
Suspended Solids	400 "
Cyanides	0.1 "
Lead	1.0 "
Chromium (hexavalent)	0.5 "
Phenolic Substances	0.01"
Chlorides	300 "
pH	5-9 "
Coliforms	1 MPN/100 l

Source: M.P. Pescod: Investigation of Rational Effluents and Stream Standards for Tropical Countries, 1974.

8. BELGIUM

(Royal Decree of 3 August 1976, published 29 September 1976)

Article 7: General quality limits for all industrial effluents discharged into normal surface waters

1. The effluent must be disinfected according to the procedure issued by the Ministry of Public Health if pathogenic germs are present.

2. pH: between 6.5 and 9. (If the natural pH of the surface water of ground water falls outside this range, the latter values may be adopted.)

3. BOD_5 20°C: max. 30 mg/l if discharged in navigable waterways and non-navigable waterways of Classes 1 & 2.
   max. 15 mg/l if discharged in other surface waters.

4. Temperature: max. 30°C.

5a. Settleable solids (after 2 hours) : max. 0.5 mg/l

b. Suspended solids : max. 60 mg/l

c. Hydrocarbons (CCL_4 extraction) : max. 5 mg/l

d. Petroleum ether extractable matter : max. 10 mg/l

e. Anionic-, kationic-, and non-ionic surface tension active matter : max. 3 mg/l

Article 8: General quality limits for the discharge of cooling water into normal surface waters

1. The effluent must be disinfected according to the procedure issued by the Ministry of Public Health if pathogenic germs are present.

2. pH: between 6.5 and 8.5 (If the natural pH of the surface water or ground water falls outside this range, the latter values may be adopted.)

3. Dissolved oxygen: min. 4 mg/l

4. Temperature: max. 30°C.

5. COD: difference between intake and effluent: max. 30 mg/l

/Quality

8. BELGIUM (continued)

Quality limits for oil refinery effluents discharged in normal surface waters

The oil refineries are divided according to their refining processes into the following classes:

Class A : Refineries with one or more of the following processes:

- crude reception and storage
- topping
- reforming
- sweetening
- hydrodesulphurization and sulphur recovery
- storage of intermediate and of finished products with possibility of blending

Class B : Refineries of Class A with one or more of the following processes:

- catalytic cracking
- hydro cracking
- isomerisation
- production of bitumen

Class C : Refineries of Classes A & B with one or more of the following processes:

- steam cracking
- production of base lube oils
- partial oxidation
- extraction processes

Class D :
- lube and grease plants
- reception and storage of crude oils and/or finished petroleum products

In derogation of the general quality limits for individual effluents (see Art. 7 of the Royal Decree of 3 August 1976, published 29 September 1976), the following effluent quality standards must be met:

	Class			
	A	B	C	D
BOD_5^{20} (mg/l)	35	35	50	70
Hydrocarbons (CCL_4 extr.) (mg/l)	20	20	20	30
Petroleum ether extractable matter (mg/l)	25	25	25	35

/In

8. BELGIUM (continued)

In addition to the afore-mentioned general quality limits:

		Class			
		A	B	C	D
C.O.D.	(mg/l)	200	250	300	350
Total Cr *)	(mg/l)	0.5	0.5	0.5	0.5
Cr^{6+} *)	(mg/l)	0.05	0.05	0.05	0.05
Total Pb *)	(mg/l)	0.05	0.05	0.05	0.05
Total N	(mg/l)	10	30	40	20
Total phenols	(mg/l)	0.5	1	1	1

*) on filtered sample

If the discharged waste waters are mainly composed of contaminated surface and/or ground water, the quality standards may be added to the concentrations already present in those waters before intake.

The above-mentioned derogations are valid for 5 years (up to 1981.09.29).

Article 18: General quality limits for all industrial effluents discharged into public sewers

1. pH: between 6 and 9.5
2. Temperature: max. 45°C
3. Suspended solids: diameter of particles less than 1 cm
   : max. concentration: 1 g/l
4. Petroleum ether extractable matter: 0.5 g/l
5. No products which can form explosive air/gas mixtures.

Source: CONCAWE Report No. 2/77 "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe." Compiled by CONCAWE Secretariate, The Hague, Netherlands. June 1977.

Note: CONCAWE: The oil companies' international study group for Conservation of Clean Air and Water - Europe.

9. DENMARK

GUIDELINES FOR EFFLUENT QUALITIES OF WASTE WATER

(DANISH ENVIRONMENTAL CONSERVATION ACT)

Receiving Water / Parameter	a Lakes and streams to lakes and narrow fjords	b Streams to open bays, sounds and the open sea	c Narrow fjords	d Open bays, sounds and the sea	Remarks
pH	6.5-8.5	6.5-8.5	6-9	-	d) To be fixed individually
Temperature	30°C	30°C	30°C	35°C	
BOD_5	20 mg/l	20 mg/l	100 mg/l	400 mg/l	d) Higher limit values may be acceptable, to be discussed
COD (Chemical Oxygen demand)	-	-	-	-	Limit values to be fixed individually
N: $(NH_3 + NH_4^+)$	2 mg/l	-	-	-	Higher values may be accept-ed during winter period
Total N	-	-	-	-	To be fixed after investi-gation of the receiving water system
Total P	1 mg/l	-	1 mg/l	-	
Sediment (after 2 h.)	0.5 ml/l	0.5 ml/l	1 ml/l	1 ml/l	
Floating matter	Should not be visible				
Dispersed material (total)	30 mg/l	30 mg/l	80 mg/l	-	

Receiving Water / Parameter	a Lakes and streams to lakes and narrow fjords	b Streams to open bays, sounds and the open sea	c Narrow fjords	d Open bays, sounds and the sea	Remarks
Hg	-	-	-	-	Specially restricted
Cd	-	-	-	-	-
(Cr^{III} + Cr^{VI})	0.2 mg/l	0.2 mg/l	0.2 mg/l	0.2 mg/l	All emissions of metals should be reduced as low as possible Limit values should be followed by a maximum total for grams/day
Cu	0.1 mg/l	0.1 mg/l	0.2 mg/l	0.5 mg/l	
Zn	0.5 mg/l	0.5 mg/l	1 mg/l	1 mg/l	
Pb	0.1 mg/l	0.1 mg/l	0.5 mg/l	0.5 mg/l	
Ni	0.2 mg/l	0.2 mg/l	0.5 mg/l	0.5 mg/l	
Ag	0.05 mg/l	0.05 mg/l	0.05 mg/l	0.1 mg/l	
As	0.5 mg/l	0.5 mg/l	0.5 mg/l	1 mg/l	
CN	0.1 mg/l	0.1 mg/l	0.1 mg/l	0.2 mg/l	d) To be fixed individually, maximum limit 2.0 mg/l
H_2S	2 mg/l	2 mg/l	5 mg/l	-	
Free Cl_2	0.3 mg/l	0.3 mg/l	0.5 mg/l	-	Amount of free Chlorine in effluent to fresh water systems should be reduced as low as possible
Halogenated phenols	-	-	-	-	Subject to special permission

Receiving Water / Parameter	a Lakes and streams to lakes and narrow fjords	b Streams to open bays, sounds and the open sea	c Narrow fjords	d Open bays, sounds and the sea	Remarks
Phenols	0.2 mg/l	0.2 mg/l	0.2 mg/l	-	d to be fixed individually, max. limit 1 mg/l
Stable oil emulsions of mineral oil	5 mg/l	5 mg/l	5 mg/l	10 mg/l	visible oil should be avoided
Anionic detergents 80% degradable	2 mg/l	2 mg/l	5 mg/l	10 mg/l	
Other synthetic detergents	-	-	-	-	to be fixed individually
Halogenated hydrocarbons	-	-	-	-	to be kept at min. as specially restricted
Organic solvents	-	-	-	-	to be fixed individually

Source: CONCAWE Report No. 2/77 "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe." Compiled by CONCAWE Secretariate, The Hague, Netherlands. June 1977.

10. FRANCE

Regulations of Effluents of New Refineries

Maximum volume of discharged water per ton of crude-oil processed (excluding rain and ballast water)

Refinery type	Volume of effluents: m^3
a) Skimming plant with distillation, reforming and desulphurization	0.4
b) Same as a) plus cat. cracking	0.8
c) Same as b) plus steamcracking and/or lube oil manufacture	1.2

Specifications for treated effluents on daily representative basis

Items		AFNOR* Methods	Ref. type (a)	Ref. type (b) & (c)
Temperature	^{o}C		30	30
pH			5.5 to 8.5	5.5 to 8.5
BOD_5	mg/l	T. 90103	30	40
COD	mg/l	T. 90101 (K. bichromate)	120	150
Suspended matter	mg/l		30	30
Hydrocarbons	ppm	T. 90202 (hexane extraction)	5	5
Hydrocarbons	ppm	T. 90203 (infrared)	20	20
Phenols	mg/l	T. 90204 (4 amino-antipyrine)	0.5	1
Lead	mg/l		0.1	0.1
$Chromium^{+6}$ (hexa)	mg/l		0.05	0.05

* AFNOR: Association Francaise de Normalisation

Source: CONCAWE Report No. 2/77 "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe." Compiled by CONCAWE Secretariate, The Hague, Netherlands. June 1977.

11. ITALY

Water Pollution Law No. 319, dated 10 May 1976

The law aims at controlling the pollution of surface waters and at the same time implementing a long range programme of water conservation. Rules are also provided by the Bill for financial assistance to build new waste water treating units and for taxation of polluting discharges during the interim period. Dilution of effluents with fresh water is forbidden.

Three tables of quality specifications for industrial or urban effluents are annexed to this law:

Table A: These limits are required of all existing industries discharging effluents into surface waters within 9 years and of new installations from the start up of their operations.

Table B: These limits are required of municipalities only within 3 years.

Table C: These limits are required of all existing industries within 3 years and for a further period of 6 years.

No.	Parameters	Table a	Table b	Table c	Remarks
1	pH	5.5-9.5	6.5-8.5	5.5-9.5	For Tables a and c: 6.5.8.5 in receiving water
2	Temperature ^{o}C	see remarks	30	see remarks	For Tables a and c: Δt of receiving water $< 3^{o}C$; $30^{o}C$ max for discharge into lakes and $35^{o}C$ into the sea
3	Colour	Not visible if diluted 1:20	Not visible if diluted 1:20	Not visible if diluted 1:40	Through a layer of 10 cm
4	Odour	-	-	-	
5	Floating Matter (larger than 1 cm ϕ)	absent	absent	absent	
6	Settleable ml/l Sediment mg/l	0.5	0.5	2	Measured in Imhoff Cone after 2 hours
7	Suspended Solids total mg/l	80	80	80-200	Table C: less than 40% of the value upstream of waste water treatment plant
8	BOD_5 - mg/l	40	80	40-200	Table C: less than 70% of the value upstream of waste water treatment plant
9	COD - mg/l	160	-	160-500	

11. ITALY (continued)

No.	Parameters	Table a	Table b	Table c	Remarks
10	Total Toxic Metals - mg/l	3	3	3	
11	Aluminum - mg/l	1	-	2	
12	Arsenic - mg/l	0.5	-	0.5	
13	Barium - mg/l	20	-	-	
14	Boron - mg/l	2	-	4	
15	Cadmium - mg/l	0.02	*	0.02	
16	Chromium^{+3} - mg/l	2	*	4	
17	Chromium^{+6} - mg/l	0.2	*	0.02	
18	Iron - mg/l	2	*	4	
19	Manganese - mg/l	2	*	4	
20	Mercury - mg/l	0.005	*	0.005	
21	Nickel - mg/l	2	*	4	
22	Lead - mg/l	0.2	*	0.3	
23	Copper - mg/l	0.1	*	0.4	
24	Selenium - mg/l	0.03	*	0.03	
25	Tin - mg/l	10	*	-	
26	Zinc - mg/l	0.5	*	1	
27	Cyanides - mg/l	0.5	*	1	
28	Chlorine - mg/l	0.2	*	0.3	
29	Sulphides - mg/l	1	*	2	
30	Sulphites - mg/l	1	*	2	
31	Sulphates - mg/l	1.000	*	1.000	Not applying to discharges into the sea
32	Chlorides - mg/l	1.200	*	1.200	
33	Fluorides - mg/l	6	*	12	
34	Phosphorus - mg/l	10	*	10	For Tables a and c: 0.5 max for discharges into lakes
35	Total Ammonia - mg/l of NH_4^+	15	-	30	For discharges into the lakes total Nitrogen must be less than 10 mg/l
36	Nitrogen as N in NO_2^- - mg/l	0.6	-	0.6	
37	Nitrogen as N in NO_3^- - mg/l	20	-	30	
38	Oils + Greases - (animal + vegetable) - mg/l	20	*	40	
39	Mineral Oils - mg/l	5	*	10	
40	Phenols - total mg/l	0.5	*	1	

11. ITALY (continued)

No.	Parameters	Table a	Table b	Table c	Remarks
41	Aldehydes - mg/l	1	*	2	
42	Aromatic Solvents - mg/l	0.2	*	0.4	
43	Nitrogenated Solvents - mg/l	0.1	*	0.2	
44	Clorinated Solvents - mg/l	1	*	2	
45	Surfactants - mg/l	2	*	4	
46	Pesticides - Clorinated mg/l	0.05	*	0.05	
47	Pesticides - Phosphorates mg/l	0.1	*	0.1	
48	Toxicity	see remarks	*	see remarks	After 50/50 dilution, the sample must support the life of at least 50% of the Salmo gairdnerii Rich. for 24 hr.
49	Coliform (total MPN/100 ml)	20.000	*	20.000	Yhese limits are applied only if requested by the local authorities
50	Coliform Fecal (MPN/100 ml)	12.000	*	12.000	
51	Streptococii Fecal (MPN/100 ml)	2.000	*	2.000	
					General notes The analysis must be carried out on an average sample composed of spotsamples taken at an interval of less than 3 hours. For the tests the methods published by IRSA (National Institute of the Water Research) must be applied.

* When not restricted by local authorities the limits are the same as in Table a

Source: CONCAWE Report No. 2/77 "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe." Compiled by CONCAWE Secretariate, The Hague, Netherlands. June 1977.

12. SWITZERLAND

Waste Water Discharge Regulations (8 December 1975)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
	These values are applicable for water flows equalled or exceeded during 347 days per year.	The limit values must be met at all times during dry periods. Under certain conditions derogations are permitted.	The limit values are applicable to artisanal and industrial waste water and must be met always. In justified cases derogations can be permitted.
Temperature	Max. $\Delta t = 3^{\circ}C$ Max. temp.= $25^{\circ}C$	Max. $30^{\circ}C$	Max. $60^{\circ}C$ In sewer max. $40^{\circ}C$
Transparance Method Snellen	No turbidity	30 cm	No limit
Colour	No colouration	May not cause colouration of receiving water	Dyes may be discharged if they are eliminated in the municipal treatment plant
Odour and taste	No odour and taste	May not cause alteration of odour and taste of receiving water	Odour may not cause nuisance
Toxicity	No toxicity	No toxicity towards fish after 24 hours for undiluted to 5 x diluted effluent, depending on dilution ratio in receiving water	Effluent may not affect negatively the efficiency of the biological waste water treatment plant
Salts	Water quality may not be deteriorated	Quality of the receiving water may not be deteriorated	The sewer system and treatment plant, as well as the efficiency may not be detericrated

12. SWITZERLAND (continued)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
Total insoluble matter	No sludge formation	4 out of 5 composite samples must be lower than 20 mg/l (24 hr average)	To be set case by case
Settleable solids	No sludge formation	Max. 0.3 mg/l after 2 hr setting time	To be set case by case
pH	Natural pH	6.5-8.5 Up to 9.0 may be permitted if river flow is high enough	6.5-9.0 6.5-9.5 if prevailing conditions permit
Oxygen	Min. 6 mg O_2/l	In receiving water min. 6 mg O_2/l	No lower limit
Surface tension	> 65 dyn/cm at 20°C	In receiving water: > 65 dyn/cm at 20°C	To be set case by case
Al	0.1 mg Al/l	10 mg Al/l	20 mg Al/l in influent to municipal treatment plant
As	0.01 mg As/l	0.1 mg As/l	0.1 mg As/l
Ba	0.5 mg Ba/l	5 mg Ba/l (dissolved)	To be set case by case
Pb	0.05 mg Pb/l	0.5 mg Pb/l	0.5 mg Pb/l
B	1 mg B/l	To be set case by case	To be set case by case
Cd	0.005 mg Cd/l	0.1 mg Cd/l	0.1 mg Cd/l
Cr^{+3}	0.05 mg Cr^{+3}/l	2 mg Cr^{+3}/l	2 mg Cr^{+3}/l

12. SWITZERLAND (continued)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
Cr^{+6}	0.01 mg Cr^{+6}/l	0.1 mg Cr^{+6}/l	0.5 mg Cr^{+6}/l
Fe	1 mg Fe/l	2 mg Fe/l (4 out of 5 composite samples, average time 24 hr)	20 mg Fe/l in influent to municipal treatment plant
Co	0.05 mg Co/l	0.5 mg Co/l	0.5 mg Co/l
Cu	0.01 mg Cu/l	0.5 mg Cu/l	1 mg Cu/l
Ni	0.05 mg Ni/l	2 mg Ni/g	2 mg Ni/l
Hg	0.001 mg Hg/l	0.01 mg Hg/l	0.01 Hg/l
Ag	0.01 mg Ag/l	0.1 mg Ag/l	0.1 mg Ag/l
Zn	0.2 mg Zn/l	2 mg Zn/l	2 mg Zn/l
Sn	0.5 mg Sn/l	2 mg Sn/l (except when organotin fungicides are present)	2 mg Sn/l (except when organotin fungicides are present)
Active Cl	No toxicity	0.05 mg Cl_2/l	3 mg Cl_2/l
Active Br	No toxicity	0.1 mg Br_2/l	3 mg Br_2/l
NH_3/NH_4^+	0.5 mg N/l (NH_3 + NH_4^+) Higher values may be set if not used for drinkwater supply	To be set case by case	To be set case by case
ClO_2	No toxicity	0.02 mg ClO_2/l	3 mg ClO_2/l

12. SWITZERLAND (continued)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
Cl^-	100 mg Cl^-/l	To be set case by case	To be set case by case
CN^-	0.01 mg CN^-/l	0.1 mg CN^-/l	0.5 mg CN^-/l
F^-	1 mg F^-/l	10 mg F^-/l	10 mg F^-/l
NO_3^-	25 mg NO_3^-/l Higher values may be set if water not used for supply of drinkwater	To be set case by case	To be set case by case
NO_2^-	No toxicity	1 mg NO_2^-/l	10 mg NO_2^-/l
Total P	- As low as possible in lake basins - Limiting proliferation of algea and weeds outside lake basins	- In lake basins: max. 1 mg P/l (4 out of 5-24 hr composite samples) min. P elimination: 85% - Outside lake basins: see column 1	As low as possible
SO_4^{--}	100 mg SO_4^{--}/l	As low as possible	300 mg SO_4^{--}/l
S^{--}	No toxicity	0.1 mg S^{--}/l	1 mg S^{--}/l
SO_3^{--}	No toxicity	1 mg SO_3^{--}/l	10 mg SO_3^{--}/l
Dissolved organic carbon	2 mg C/l	10 to 15 mg/l	To be set case by case

12. SWITZERLAND (continued)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
Total organic carbon (TOC)	No specified	17 to 22 mg C/l Higher values may be specified if intake water has high TOC content	To be set case by case
COD	Not specified	To be set case by case	To be set case by case
$KMnO_4$ Value	Not specified	To be set case by case	To be set case by case
BOD_5	4 mg O_2/l	20 mg O_2/l (4 out of 5 24 hr composite samples)	To be set case by case
Aromatic amines (as dichloro-aniline)	0.005 mg/l	To be set case by case	To be set case by case
Oil and fatty acids	Not specified	20 mg/l	Oil separator required
Total hydrocarbons	0.05 mg/l	10 mg/l	20 mg/l
Chlorinated solvents	0.005 mg/l (as Cl)	0.1 mg/l (as Cl)	0.1 mg/l (as Cl)
Non-volatile lipophilic chlorinated compounds	0.005 mg Cl/l	To be set case by case	To be set case by case

12. SWITZERLAND (continued)

Parameters	Water quality objectives of surface waters	Quality standards for effluents discharged into surface waters	Quality standards for effluents discharged in public sewers
Total organochloro-pesticides	0.0005 mg Cl/l	To be set case by case	To be set case by case
Phenols:			
- volatile	0.005 mg/l	0.05 mg/l (up to 0.2 mg/l may be admitted as an exception)	5 mg/l
- non-volatile	0.005 mg/l	0.05 mg/l	1 mg/l

13. WEST GERMANY

Waste Water Treatment Standards for Oil Refineries
Guidelines for Effluent Water Quality *

After mechanical treatment

a)	Settleable solids	:	0.3 ml/l
b)	Suspended solids	:	nil
c)	Extractable matter (diethylether)	:	20 mg/l

After chemical treatment

a)	Settleable solids	:	0.3 ml/l
b)	Suspended solids	:	nil
c)	pH	:	6.0 to 9.0
d)	Extractable matter (diethylether)	:	10 mg/l

After biological treatment

a)	Settleable solids	:	0.3 ml/l
b)	Suspended solids	:	nil
c)	Oil sheen	:	no
d)	BOD_5	:	30 mg/l
e)	Extractable matter (diethylether)	:	5 mg/l
f)	Sulphides	:	not detectable
g)	Phenols (volatile)	:	0.5 mg/l

* Established by LAWA (Länder-Arbeitsgemeinschaft Wasser)

Source: CONCAWE Report No. 2/77 "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe." Compiled by CONCAWE Secretariate, The Hague, Netherlands. June 1977.

14. EUROPE AND U.S.A.

Concentrations and Limit Values for Waste-Waters in Europe and U.S.A.

mg/l	Belgium 1	Denmark 2	Germany 3	United Kingdom 4	France 5	Italy 6	Nether-lands 7	USA 8
BOD_5	36-70	20	20	20-400	30-40	40	-	15
COD	200-350	see[2]	100	8-25	120-150	160	250	80-115
TOC	-	-	-	-	-	-	-	33
Oil, hydrocarbon	20-30	5	2	20-50	5/20[5]	5	20-30	5
Phenol	0.5-1	0.2	0.2	1-3	0.5-1	0.5	2-5	0.1
Mercaptan	-	-	n.n.	-	-	-	-	-
Hydrogen sulphide	-	2	n.n.-0.5	1-5	-	1	2-5	0.1
Total nitrogen	10-40	-	-	-	-	-	-	-
Ammonium	-	2	-	4-15	-	15	-	(80%)[3]
Nitrite	-	-	-	-	-	0.6	-	-
Nitrate	-	-	-	-	-	20	-	-
Cyanide	-	0.1	0.1[3]	-	-	0.5	-	-
Phosphorus	-	+	-	-	-	10	-	-
Lead	0.05	0.1	-	-	0.1	0.2	0.010	-
Cadmium	-	-	-	-	-	0.02	-	-
Chromium	0.05-0.5[1]	0.2	-	-	0.05[5]	0.2/2	-	0.02/0.25
Iron	-	-	3[3]	-	-	2	-	-
Copper	-	0.1	-	-	-	0.1	-	-
Nickel	-	0.2	-	-	-	2	-	-
Mercury	-	see[2]	-	-	-	0.005	-	-
Zinc	-	0.5	-	-	-	0.5	-	-

Numbers as superscripts refer to footnotes

14. EUROPE AND U.S.A. (continued)

Footnotes The situation in 1974 was as follows:

1 Belgium

Specific regulations for refineries with differentiation according to complexity (4 types). Hydrocarbons by carbon tetrachloride extraction; phenol as total phenol; lead as total lead. For chromium: separate determination for total chromium (limit 0.5 mg/l) and hexavalent chromium (limit 0.05 mg/l).

2 Denmark

Specific regulations for waste-waters in relation to the type of receiving water (e.g. fresh water, estuary, bay, sea) with division into 4 groups; only fresh water and estuary taken into account here. For COD, determination in relation to local conditions; oils and hydrocarbons are only determined as emulsions; chromium as total chromium; special regulations for mercury.

3 Germany

Specific recommendations for waste-waters from mineral oil processing (standard values), so-called minimum requirements with the character of regulations in preparation; at present, regulations vary in the Federal States. Phenols as steam-volatile phenols; mercaptan, cyanide and iron are employed as parameters and restricted in some Federal States.

4 United Kingdom

The figures relate to the situation on 1 January 1974; these are exclusively regional regulations set by the Water Authorities for individual refineries; application of particular parameters varies considerably according to nature, extent and quality.

5 France

Specific regulations for new refineries with differentiation for complexity (2 or 3 types according to quantity of waste-water). France moreover limits the output-related quantities of waste-water. Two different limits for hydrocarbons in relation to the method of analysis. Chromium refers to hexavalent compounds.

6 Italy

Specific regulations for industrial waste-waters, which are applied to new plants and, within a period of 9 years (from 1976) to existing plants.

Phenols as total phenol; ammonium as total ammonium (NH_4), nitrite as NO_2-N; nitrate as NO_3-N; in the case of chromium, separate determination for total chromium and hexavalent chromium.

14. EUROPE AND U.S.A. (continued)

Footnotes (continued)

7 Netherlands

According to the situation in 1974, with refineries mainly located on the coast or at ports, no nationally-uniform limits available.

Requirements generally only for oil content: COD only set at 1 out of 7 refineries, as also for lead; hydrogen sulphide as S^{--}.

8 USA

Specific regulations of the EPA for refinery waste-waters taking into account size and complexity (size and process factor); further differentiation according to BPCTCA and BATEA; BPCTCA values (best practicable control technology currently available) assigned and converted to concentration. 1974 and 1975: Load values set in the EPA guidelines. For COD, differentiation according to complexity; chromium: separate determination for total and hexavalent chromium. Ammonium must be 80% removed with respect to raw water.

BATEA: Best Available Technology Economically Achievable.

Source: CONCAWE Report No. 5/79. The Environmental Impact of Refinery Effluents. CONCAWE, The Hague, Netherlands. August 1979.

15. U.S.S.R.

Sanitary rules for the discharge of effluents into watercourse (as laid down in NSP 101-51)

	Type of watercourse		
Effluent characteristic	Parts of watercourses used for centralized water supply, and within the boundaries of the second sanitary protection zone for sources of water, or adjacent to State fisheries reserves	Parts of watercourses used for individual domestic water supplies and for water supplies to the food industries or including stretches in which fish of industrial importance spawn on a large scale	Parts of watercourses within inhabited localities, not used for drinking purposes, but for large-scale bathing, or of architectural and decorative value, and also used for organized fishing or which lie on the route used by fish on their way to spawning grounds
Suspended substances	After the discharge of effluents into watercourses followed by mixing, an increase in the content of suspended substances is permitted of: 0.25 mg/l	0.75 mg/l	1.50 mg/l
Note. For watercourses containing more than 30 mg/l of natural suspended substances at the low-water period, and also where effluents are discharged at intervals during high-water periods, and in those cases where the required degree of clarification of the effluents, in accordance with the standards in force, cannot be attained with the treatment methods available, the conditions to be satisfied shall be laid down by the All-union State Sanitary Inspectorate.			
Odours and tastes	After dilution of the effluents in the watercourse, the water of the latter must not develop, whether directly or after subsequent chlorination, any specific odours or tastes as a result of the discharge of effluents into it.		
Dissolved oxygen	The effluents, after mixing with the water of the watercourse, must not reduce the content of dissolved oxygen of the latter to less than 4 mg/l (based on the average daily content of oxygen in the summer, but for watercourses used for fisheries purposes, on the daily minimum during this period).		
Biochemical oxygen demand	After mixing of the effluents with the water of the watercourse, the 5-day biochemical oxygen demand (at 20°) must not exceed: 2 mg/l	4 mg/l	-
pH-value	Effluents must not cause the pH-value of the water of the watercourse to fall below 6.5 or to rise above 8.5.		

15. U.S.S.R. (continued)

	Type of watercourse
Colour	A mixture of the effluent with distilled water, in proportions corresponding to those calculated for the degree of dilution in the watercourse, must not have a marked colouration in a column of height: 20 cm 10 cm 5 cm
Pathogens	Effluents in which the pathogens of human or animal diseases may be present (effluents from slaughterhouses, tanneries, wool-washing plants, biological manufacturing plants, etc.): Discharge prohibited — Before discharge into watercourses, and after prior mechanical clarification, must be rendered harmless (disinfection).
Poisonous substances	Effluents must not contain poisonous substances, whether in solution or suspension, which may, after dilution in the watercourse, have a harmful effect, directly or indirectly, on man, animals or fish. Maximum permissible concentrations of poisonous substances in industrial effluents, discharged into watercourses, shall be laid down by the All-union State Sanitary Inspectorate.
Floating impurities	Effluents must not contain oil, fats, petroleum products or other floating substances in such quantities as are capable of causing the large-scale formation in watercourses of dense floating films.

Source: Control of Water Pollution. World Health Organization. Geneva, 1967.

B. Standards for Water Sources

1. WORLD HEALTH ORGANIZATION

Standards of Quality for Water Sources.

(1) Physical Quality

The limiting value for colour should be set at 300 units, on the basis that a value of less than 300 units indicates an acceptable quality for treatment and anything over 300 units indicates that special treatment may be needed to provide water meeting the drinking-water standards (max. allowable 50 units platinum - cobalt scale).

With regard to turbidity, no specific figure are given, since the problem of turbidity and the treatment needed is one that has to be decided for each individual case and cannot be subject to a general limit.

(2) Chemical Quality

2.1 Compounds affecting the potability of water

Substance	Maximum allowable limit
Total dissolved solids	1,500 mg/l
Iron	50 mg/l
Manganese (assuming that the ammonia content is less than 0.5 mg/l)	5 mg/l
Copper 1/	1.5 mg/l
Zinc 1/	1.5 mg/l
Magnesium plus sodium sulfate	1,000 mg/l
Alkyl benzyl sulfonates (ABS: surfactants) 2/	0.5 mg/l

2.2 Components hazardous to health

Substance	Maximum allowable limit
Nitrate as NO_3^-	45 mg/l
Fluoride	1.5 mg/l

.../2.3

1/ These are limiting values for raw water quality and for that reason are lower than the allowable limits for drinking water, where the presence of these metallic substances would probably be the result of the aggressive action of the water on service pipe metals.

2/ This value has been established on the basis of the maximum sensitivity of the presently accepted analytical procedures.

2.3 Toxic substances

Substance	Maximum allowable limit
Phenolic substances	0.002 mg/l
Arsenic	0.05 mg/l
Cadmium	0.01 mg/l
Chromium	0.05 mg/l
Cyanide	0.2 mg/l
Lead	0.05 mg/l
Selenium	0.01 mg/l
Radionuclides (gross beta activity)	1,000 uuc/l

2.4 Chemical indicators of pollution

Indicator	Maximum limit of pollution
Chemical oxygen demand (COD)	10 mg/l
Biochemical oxygen demand (BOD)	6 mg/l
Total nitrogen exclusive of NO_3^-	1 mg/l
NH_3	0.5 mg/l
Carbon chloroform extract (CCE: organic pollutants) 1/	0.5 mg/l
Grease	1 mg/l

(3) Bacteriological Standards

Classification	MPN/100 ml coliform bacteria 2/
I. Bacterial quality applicable to disinfection treatment only	0-50
II. Bacterial quality requiring coventional methods of treatment (coagulation, filtration, disinfection)	50-5000
III. Heavy pollution requiring extensive types of treatment	5000-50000
IV. Very heavy pollution, unacceptable unless special treatments designed for such water are used; source to be used only when unavoidable	greater than 50000

..../(4)

1/ Any amount greater than 0.2 indicates the necessity for further analytical determinations of the causative materials.

2/ When more than 40% of the number of coliform bacteria represented by the MPN Index are found to be of the faecal coliform group, the water source should be considered to fall into the next higher category with respect to the treatment required.

(4) Biological Standards

It is impossible at the present time to establish defenite biological parameters of the quality of water sources. Thus the same conclusions apply here as given above for drinking water.

(5) Radiological Standards

Water from sources to be used for the production of public water supplies should be examined routinely and at as great a frequency as possible for radioactive pollution. The amounts of radioactivity detected in a water source should be no greater than those which can be reduced by the selected methods of treatment to values which fall within the limits established for drinking water.

2. PHILIPPINES

Water Usage and Classification

The quality of Philippine waters shall be maintained in a safe and satisfactory condition according to their best usages. For this purpose all waters shall be classified according to the following beneficial usages:

(a) Fresh Surface Water

Classifications	Best Usage
Class AA	For source of public water supply. This class is intended primarily for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
Class A	For source of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
Class B	For primary contact recreation.
Class C	For the propagation and growth of fish and other aquatic resources.
Class D	For agriculture, irrigation, livestock watering and industrial cooling and processing.
Class E	For navigational use.

(b) Ground Water

Class GA	For source of domestic water supply.
Class GB	For source of irrigation and industrial water supply.

(c) Marine and Estuarine Water

Class SB	For primary contact recreation.
Class SC	For the propagation and growth of fish and other aquatic resources.
Class SD	For industrial cooling and processing.
Class SE	For navigation.

.../Water

Water Quality Criteria

(i) For Class 'AA' Waters

	Quality Parameter	Specification
1.	Total Solids	NSDW
2.	pH	NSDW
3.	Bacteria	Bacteria of the coliform group shall not exceed a monthly geometric average Most Probable Number (MPN) of 50 per 100 ml.
4.	Phenolic Substances	NSDW
5.	Radioactive Substances	
	Ra-226	NSDW
	Sr-90	NSDW
	Beta Emitter	NSDW
6.	Trace Elements	Not to exceed the following limits:
	Arsenic	0.05 mg/l
	Barium	NSDW
	Cadmium	NSDW
	Chromium	NSDW
	Copper	NSDW
	Cyanide	0.05 mg/l
	Fluoride	NSDW
	Iron	NSDW
	Lead	0.05 mg/l
	Manganese	NSDW
	Mercury	0.002 mg/l
	Selenium	0.05 mg/l
	Silver	0.05 mg/l
	Zinc	NSDW
7.	Organic Chemicals	Not to exceed the following limits:
	Synthotic Detergents (MBAS)	Nil
	Oil and Grease	Nil

.../8.

8.	Persistent Pesticides	Not to exceed the following limits:
	Aldrin	0.001 mg/l
	DDT	0.005 mg/l
	Dieldrin	0.001 mg/l
	Chlordane	0.003 mg/l
	Endrin	0.0002 mg/l
	Heptachlor	0.0001 mg/l
	Lindane	0.004 mg/l
	Toxaphane	0.005 mg/l
	Methoxychlor	0.1 mg/l
	2, 4-D	0.1 mg/l
	2, 4, 5-TP	0.01 mg/l
	PCB	Nil
9.	Other Chemicals	
	Calcium	NSDW
	Chloride	NSDW
	Magnesium	NSDW
	Nitrate	NSDW
	Sulfate	NSDW

(ii) For Clase 'A' Waters

	Quality parameter	Specifications
1.	Colour, units	75
2.	Temperature	$30^{o}C$
3.	Dissolved Oxygen	Not less than 5 mg/l.
4.	BOD ($20^{o}C$)	Not more than 10 mg/l.
5.	Total Solids	NSDW
6.	pH	Not less than 6.5 nor more than 8.5
7.	Bacteria	Bacteria of the coliform group shall not exceed a monthly average MPN of 5000 per 100 ml. nor exceed this number in more than 20 per cent of the samples examined during the month, nor exceed 20,000 in more than 5 per cent of the samples.

.../8.

8.	Phenolic Substances	NSDW
9.	Radioactive Substance	
	Ra-226	NSDW
	Sr-90	NSDW
	Beta Emitter	NSDW
10.	Trace Elements	Not to exceed the following limits:
	Arsenic	0.05 mg/l
	Barium	NSDW
	Cadmium	NSDW
	Chromium	NSDW
	Copper	NSDW
	Cyanide	0.05 mg/l
	Fluoride	NSDW
	Iron	NSDW
	Lead	0.05 mg/l
	Manganese	NSDW
	Mercury	0.002 mg/l
	Selenium	0.05 mg/l
	Silver	0.05 mg/l
	Zinc	NSDW
11.	Organic Chemicals	
	Synthetic Detergents (MABS)	0.05 mg/l
	Oil and Grease	2.0 mg/l
12.	Persistent Pesticides	
	Aldrin	0.001 mg/l
	DDT	0.05 mg/l
	Dieldrin	0.001 mg/l
	Chlordane	0.003 mg/l
	Endrin	0.0002 mg/l
	Heptachlor	0.0001 mg/l
	Lindane	0.004 mg/l
	Toxaphane	0.005 mg/l
	Methoxychlor	0.1 mg/l
	2, 4-D	0.1 mg/l
	2, 4, 5-TP	0.01 mg/l
	PCB	0.001 mg/l

.../13.

13.	Other Chemicals	
	Ammonia	0.01 mg/l
	Calcium	NSDW
	Chloride	NSDW
	Magnesium	NSDW
	Nitrate	NSDW
	Sulfate	NSDW
14.	Nutrients	Shall not be present in concentrations to cause deleterious or abnormal biotic growth.

(iii) For Class 'B' Waters

	Quality parameter	Specifications
1.	Colour, units	50
2.	Temperature	50°C
3.	Transparency	Secchi disk shall be visible at a minimum depth of 1 meter.
4.	Dissolved Oxygen	Not less than 5 mg/l.
5.	BOD_5 (20°C)	Not more than 15 mg/l.
6.	pH	Not less than 6.5 nor more than 8.5.
7.	Bacteria	Bacteria of the coliform group shall not exceed a monthly geometric average MPN of 1000 per 100 ml. and not to exceed this value in more than 20 per cent of samples examples examined during the month: or shall not exceed a geometric mean of 200 fecal caliform bacteria per 100 ml. based on at least 5 consecutive samples during a 30-day period.
8.	Phenolic Substances	0.002 mg/l
9.	Trace Elements	
	Arsenic	0.05 mg/l
	Cadmium	0.01 mg/l

.../Chromium

	Chromium	0.05	mg/l
	Cyanide	0.05	mg/l
	Lead	0.05	mg/l
	Mercury	0.002	mg/l
	Selenium	0.05	mg/l
	Silver	0.05	mg/l
10.	Organic Chemicals		
	Synthetic Detergents (MBAS)	0.5	mg/l
	Oil and Grease	2.0	mg/l
11.	Persistent Pesticides		
	Aldrin	0.001	mg/l
	DDT	0.05	mg/l
	Dieldrin	0.001	mg/l
	Chlordane	0.003	mg/l
	Endrin	0.0002	mg/l
	Heptachlor	0.0001	mg/l
	Lindane	0.004	mg/l
	Toxaphane	0.005	mg/l
	Methoxychlor	0.1	mg/l
	2, 4-D	0.1	mg/l
	2, 4, 5-TP	0.01	mg/l
	PCB	0.001	mg/l
12.	Nutrients	Shall not be present in concentrations to cause deleterious or abnormal biotic growth.	

(iv) For Class 'C' Waters

	Quality parameter	Specifications
1.	Colour, units	50
2.	Temparature	The maximum rise above natural temperature shall not exceed $3^{o}C$ outside the mixing zone as determined by the Commission.
3.	Dissolved Oxygen	Not less than 5 mg/l.

.../4.

4.	BOD_5 ($20^{\circ}C$)	Not more than 20 mg/l.
5.	pH	Not less than 6.5 nor more than 8.5. No change greater than 1.0 unit outside the estimated natural seasonal maximum and minimum.
6.	Total Dissolved Solids	1000 mg/l
7.	Total Solids	2000 mg
8.	Transparency	Secchi disk shall be visible at a minimum depth of 1 m.
9.	Bacteria	Bacteria of the coliform group shall not exceed a monthly geometric average MPN of 5000 per 100 ml., nor exceed this number in more than 20 per cent of samples examined during the month, nor exceed 20,000 in more than 5 per cent of the samples, except for commercial shellfishing in which the MPN of water does not exceed a geometric average MPN value of 100 per ml. nor exceed 400 in more than 5 per cent of the samples examined during the month.
10.	Phenolic Substances	0.02 mg/l
11.	Trace Elements	Not to exceed the following limits:
	Arsenic	0.05 mg/l
	Barium	0.05 mg/l
	Cadmium	0.01 mg/l
	Chromium	0.05 mg/l
	Copper	0.02 mg/l
	Cyanide	0.05 mg/l
	Lead	0.05 mg/l
	Mercury	0.0002 mg/l
	Selenium	0.05 mg/l
	Silver	0.05 mg/l
	Zinc	2.0 mg/l

.../12.

12.	Organic Chemicals		
	Synthetic Detergents (MABS)	0.05	mg/l
	Oil and Grease	5	mg/l
13.	Persistent Pesticides		
	Aldrin	0.01	ug/l
	DDT	0.02	ug/l
	Dieldrin	0.005	ug/l
	Chlordane	0.04	ug/l
	Endrin	0.002	ug/l
	Heptachlor	0.01	ug/l
	Lindane	o.02	ug/l
	Toxaphane	0.01	ug/l
	Methoxychlor	0.0005	ug/l
	2, 4-D	4.0	ug/l
14.	Nutrients	Shall not be present in amounts to cause deleterious or abnormal biotic growth.	

(v) For Class 'D' Waters

	Quality Parameter	Spectifications
1.	Temperature	The maximum rise above natural temperature shall not exceed 3°C outside the mixing zone as determined by the Commission.
2.	Dissolved Oxygen	Not less than 3 mg/l.
3.	Transparency	Secchi disk shall be visible at a maximum depth of 1 m.
4.	Total Dissolved Solids	Not more than 1000 mg/l.
5.	pH	Not less than 6.0 nor greater than 8.5.
6.	Trace Elements	Not to exceed the following limits:
	Aluminum	5.0 mg/l
	Arsenic	0.01 mg/l
	Beryllium	0.01 mg/l
	Boron	0.75 mg/l

.../Cadmium

Cadmium	0.01	mg/l
Chromium	0.10	mg/l
Cobalt	0.05	mg/l
Copper	0.20	mg/l
Fluoride	1.0	mg/l
Iron	5.0	mg/l
Lead	5.0	mg/l
Lithium	2.5	mg/l
	(Recommended maximum concentration for irrigating citrus is 0.075 mg/l)	
Manganese	0.20	mg/l
Molybdenum	0.01	mg/l
Nickel	0.2	mg/l
Selenium	0.02	mg/l
Vanadium	0.1	mg/l
Zinc	2.0	mg/l

7. Sodium Absorption Ratio (SAR) Not less than 8 nor more than 18.

8. Organic Chemicals
   Oil and Grease 5 mg/l

9. Nutrients Shall not be present in amounts to cause deleterious or abnormal biotic growth.

(vi) For Class 'E' Waters

Quality Parameter	Specifications
1. Dissolved Oxygen	Not less than 2 mg/l.
2. pH	Not less than 5 or more than 9.
3. Organic Chemicals Oil and Grease	Not to exceed 10 mg/l.

(b) Water Quality Criteria for ground water are the following:

(i) For Class 'GA' Waters — Same as for Class 'AA' for fresh surface water.

.../(ii)

(ii)	For Class 'GB' Waters	Same as for Class 'D' of fresh surface water, excluding temperature, dissolved oxygen, oil and grease and nutrients.

(e) Water Quality Criteria for marine and estuarine water are the following:

(i)	For Class 'SB' Waters	Same as for Class 'B' of fresh surface water.
(ii)	For Class 'SC' Waters	Same as for Class 'C' of fresh surface water.
(iii)	For Class 'SD' Waters	Same as for Class 'D' of fresh surface water, excluding total dissolved solids, sodium absorption ratio and trace elements.
(iv)	For Class 'SE' Waters	Same as for Class 'E' of fresh surface water.

TABLE I - NPCC WATER QUALITY CRETERIA (1978)

QUALITY PARAMETER	WATER CLASSIFICATION											
	FRESH SURFACE WATER						GROUND WATER		MARINE AND ESTUARINE WATER			
	Class AA	Class A	Class B	Class C	Class D	Class E	Class GA	Class GB	Class SB	Class SC	Class SD	Class SE
Colour, units		75	50	50				50	50			
Temporature ^{o}C	-	30	30	3(e)	3(e)	-	-	-	30	3(e)	3(e)	-
Transparency	-	-	(c)	(c)	(e)	-	-	-	(c)	(c)	-	-
Dissolved Oxygen	-	5	5	5	3.	2	-	-	5	5	3	2
5-day BOD at $20^{o}C$	-	10	15	20	-	-	-	-	15	20	-	-
Total Dissolved Solids			-	1000	1000			1000	1000	1000		
Total Solids	(a)	(a)	-	2000	2000	-	(a)	-	2000	2000	-	-
pH		6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5	5.0-9.0	(a)	6.0-8.5	6.5-8.5	6.5-8.5	6.0-8.5	5.0-9.0
Coliform, MPN/100m	50	5000	1000	5000	-	-	50	-	1000	5000	-	-
Phenolic Substances/ mg/l	(a)	(a)	0.002	0.02	-	-	(a)	-	0.002	0.02	-	-
Radioactive Substances												
Ra-226 uu^{C}/l	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Sr-90 uu^{C}/l	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Beta Emitter uu^{C}/l	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Trace Elements												
Aluminum	-	-	-	-	5	-	-	5	-	-	-	-
Arsenic	0.05	0.05	0.05	0.05	0.1	-	0.05	0.01	0.05	0.05	-	-
Barium	(a)	(a)	-	0.05	-	-	(a)	-	-	0.05	-	-
Beryllium	-	-	-	-	0.1	-	-	0.1	-	-	-	-
Boron	-	-	-	-	0.75	-	-	0.75	-	-	-	-
Cadmium	(a)	(a)	0.01	0.01	0.1	-	(a)	0.01	0.01	0.01	-	-
Chromium	(a)	(a)	0.05	0.05	0.10	-	(a)	0.10	0.05	0.05	-	-
Cobalt	-	-	-	-	0.05	-	-	0.05	-	-	-	-
Copper	(a)	(a)	-	0.02	0.20	-	(a)	0.20	-	0.02	-	-
Cyanide	0.05	0.05	0.05	0.05	-	-	0.05	-	0.05	0.05	-	-
Flouride	(a)	(a)	-	-	1	-	(a)	1	-	-	-	-

Iron	(a)	(a)	-	-	5	-	(a)	5	-	-	-	-
Lead	0.05	0.05	0.05	0.05	5	-	(a)	5	0.05	0.05	-	-
Lithium	-	-	-	-	2.5(d)	-	-	2.5(d)	-	-	-	-
Manganese	(a)	(a)	-	-	0.2	-	(a)	0.2	-	-	-	-
Mercury	0.002	0.002	0.002	0.002	-	-	0.002	-	0.002	0.002	-	-
Molybdenum	-	-	-	-	0.01	-	-	0.1	-	-	-	-
Nickel	-	-	-	-	0.2	-	-	0.2	-	-	-	-
Selenium	0.05	0.05	0.05	0.05	0.02	-	0.05	0.02	0.05	0.05	-	-
Silver	0.05	0.05	0.05	0.05	-	-	0.05	-	0.05	0.05	-	-
Venadium	-	-	-	-	0.1	-	-	0.1	-	-	-	-
Zinc	(a)	(a)	-	2	2	-	(a)	2	-	-	-	-
Sodium Absorption Ratio (SAR)	-	-	-	-	8-18	-	-	8-18	-	-	-	-
Organic Chemicals Synthetic Detergents (MBAS)	Nil	0.5	0.5	0.5	-	-	Nil	-	0.5	0.5	-	-
Oil & Grease	Nil	2	2	5	5	10	Nil	-	2	5	5	10
Persistant Pesticides												
Aldrin	0.001	0.001	0.001	0.01ug/l	-	-	0.001	-	0.001	0.01ug/l	-	-
DDT	0.05	0.05	0.05	0.02 "	-	-	0.05	-	0.05	0.02 "	-	-
Dieldrin	0.001	0.001	0.001	0.005"	-	-	0.001	-	0.001	0.005"	-	-
Chlordane	0.003	0.003	0.003	0.04 "	-	-	0.003	-	0.003	0.04 "	-	-
Endrin	0.0002	0.0002	0.0002	0.002"	-	-	0.0002	-	0.0002	0.002"	-	-
Heptachlor	0.0001	0.0001	0.0001	0.01 "	-	-	0.0001	-	0.0001	0.01 "	-	-
Lindane	0.004	0.004	0.004	0.02 "	-	-	0.004	-	0.004	0.02 "	-	-
Toxaphane	0.005	0.005	0.005	0.01 "	-	-	0.005	-	0.005	0.01 "	-	-
Methoxychlor	0.1	0.1	0.1	0.005"	-	-	0.1	-	0.1	0.005"	-	-
2, 4-D	0.1	0.1	0.1	4.0 "	-	-	0.01	-	0.01	2.0 "	-	-
2, 4, 5-TP	0.01	0.01	0.01	-	-	-	0.01	-	0.01	-	-	-
PCB	Nil	0.001	0.001	-	-	-	Nil	-	0.001	-	-	-

Other Chemicals												
Ammonia	-	0.01	-	-	-	-	-	-	-	-	-	-
Calcium	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Chloride	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Magnesium	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Nitrate	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Sulfate	(a)	(a)	-	-	-	-	(a)	-	-	-	-	-
Nutrient	-	(b)	(b)	(b)	(b)	-	-	-	(b)	(b)	(b)	-

REMARKS: 1. (a) National Standards for Drinking Water in the Philippines.
(b) Shall not be present in concentrations to cause deleterious or abnormal biotic growth.
(c) Secchi disk shall be visible at a minimum depth of 1 meter.
(d) Recommended maximum concentration for irrigating citrus is 0.075 mg/1.
(e) Rise in temperature.

2. All values are maximum permissible except for Dissolved Oxygen which is minimum permissible.

3. All units in mg/l except those indicated.

Source: Official Gazette, Republic of the Philippines
Vol. 24, No. 23, 5 June 1978

3. PEOPLE'S REPUBLIC OF CHINA

Source Selection

In selecting sources, both long term and short term, authorities should consider village developments and city planning. Current data on quality, hydrology, and hydrogeology must be taken into account. Sanitation and cleanliness around the water catchment area and the surroundings and the absence of endemic diseases are important criteria. The source should be sufficient in quantity and quality and be easy to protect. Groundwater should be used in preference to other supply sources. The water catchment site should be upstream from city or industrial development.

The quality of raw water for domestic supplies is determined by:

The number of *Escherichia coli* in the water, which should be fewer than 1000/litre on average if chlorination is the only disinfection available; the number of *E. coli* can be 10000/litre on average if both purification and disinfection processes are available;

The physical and chemical quality, which should conform to the standards (Table 1);

The toxicological levels, which should conform to the standards (Table 1);

In areas where goitre is endemic, the iodine concentration; and

The presence of harmful substances not included in the quality standards (Table 1).

If the source quality does not conform to the standards and if there is no alternative, the project should be approved by the department of health of the province, city, or autonomous region. Alternative treatment methods should be considered in association with the department so that the quality of the water can be improved.

Source Protection

The source for domestic water supply should be in a protected area. For piped supply systems, the protection measures and the size of the area should follow the requirements for:

.../*Surface*

Surface Water

Within a radius of 100 m of the catchment point, no boating, swimming, fishing, or other activities that could contaminate the water are permitted. The boundary should be clearly marked.

Within 1000 m upstream and 100 m downstream of the catchment point, no industrial or domestic wastewater should be discharged into the source; within the protected area, no solid waste material may be dumped, and no harmful chemicals may be stored; use of the protected area as a harbour for loading or unloading refuse, excreta, or toxic chemicals is not permitted; no industrial or domestic wastewater may be used for irrigation in the area; no residual or highly toxic chemical may be used on fields that drain into the protected area; and no grazing is permitted.

No residential areas, livestock, or husbandry areas; seepage latrines; seepage pits should be constructed or planned within 10 m of pumping stations, sedimentation tanks, or final water tanks at waterworks or private installations.

Good hygienic conditions and tree planting should be planned.

Groundwater

The size of the area protecting a catchment depends on hydrogeologic conditions, method and structure of the catchment, and sanitary conditions of the surrounding areas. Protection measures should be carried out as for surface water.

Within the effective areas of an individual well or a group of wells, no industrial or domestic wastewater should be used for irrigation and no residual or highly toxic chemicals should be used; no seepage latrines, seepage pits, or solid waste dumps may be constructed; no drainage of wastes should be allowed; and no disruption of deep soil strata should be permitted. If the water-bearing stratum is not exposed at the surface or is not recharged by adjacent surface water, the size of the protected area can be reduced somewhat. Protection limits for a water-catchment facility, the effective radius, and water-quality protection methods for groundwater should be studied and determined by the water-supply authority in conjunction with hydrogeologic and public health departments.

.../For

For the area around water-treatment works, the requirements for surface water sources should be met.

Private water supplies from groundwater should be protected from pollution due to seepage latrines, seepage pits, excreta pits, refuse heaps, and solid waste heaps, none of which should be within 20-30 m of the well. Adequate sanitation systems should be constructed.

Table 1. Water quality standards for domestic and potable water supplies.[a]

Parameter	Limit
Physical property	
Colour	Not more than 15° and not visually offensive
Turbidity	Not more than 5°
Tastes and odours	Not offensive
Visible solids	None
Chemical property	
pH	6.5-8.5
Hardness (CaO)	Not more than 250 mg/l
Iron	Not more than 0.3 mg/l
Manganese	Not more than 0.1 mg/l
Copper	Not more than 1.0 mg/l
Zinc	Not more than 1.0 mg/l
Volatile carbolic	Not more than 0.002 mg/l
Anionic detergent	Not more than 0.3 mg/l
Toxicological content	
Fluoride	Not more than 10 mg/l; recommended 0.5-1.0 mg/l
Cyanide	Not more than 0.05 mg/l
Arsenic	Not more than 0.04 mg/l
Selenium	Not more than 0.01 mg/l
Mercury	Not more than 0.001 mg/l
Cadmium	Not more than 0.01 mg/l
Chromium (hexacovalent)	Not more than 0.05 mg/l
Lead	Not more than 0.1 mg/l
Bacteriological content	
Total colony count	Not more than 100/ml
Coliform	Not more than 3/ml
Residual chlorine	After treatment, not less than 0.3 mg/l for the next 30 minutes. In piped supply systems, concentration at the end of the network should not be less than 0.05 mg/l.

Source: Ministry of Health, People's Republic of China, 1 December 1976.

[a]Quality of private (small) water systems should comply with the toxicological limits of these standards. If the qualities of other items cannot be adequately met, the responsible authority should start a mass campaign of sanitation to improve the public health environment, adequate measures should be adopted for water treatment, and the quality of the supply should be continually improved.

.../Editor's

Editor's note: These standards are drawn from a separate document (TJ20-76) approved by the Ministry of Health and the Basic Construction Committee and published by the Chinese Building Industry Press, Beijing. The document is translated and presented in Appendix 4. The degree to which they are enforced throughout China is not known. The Chinese Health Ministry's water quality standards reflect the difficulties in maintaining an effective surveillance system in rural areas and China's level of industrial development. China's pragmatic approach is illustrated in its standards for bacterial contamination. They are far less stringent than Canada's water quality criteria guidelines. China does not include pesticides, radionuclides, nitrilotriacetic acid, or trihalomethanes - a reflection of the complexity of anlaysis needed for these and the degree to which the Chinese see them as priorities.

Source: Rural Water Supply in China.
Document No. IDRC-TS25e.
International Development Research Centre
Ottawa, Canada. 1981

4. IRAN

Maximum allowable Concentration of Constituents in the Receiving Stream Intended for Different Uses (mg/l)

		WATER SUPPLY				AQUATIC LIFE
		DRINKING:	DOMESTIC:	INDUSTRY:	IRRIGATION	
1.	Aluminum	5.0	5.0	5.0	5.0	5.0
2.	Arsenic	0.05	0.1	0.2	0.1	0.05
3.	Barium	1.0	1.0	1.0	1.0	1.0
4.	Beryllium	0.1	0.1	0.1	0.1	0.1
5.	Boron	5.0	5.0	5.0	5.0	5.0
6.	Cadmium	0.01	0.01	0.01	0.01	0.01
7.	Chlorine, Free	0.20	0.2	1.0	0.2	0.1
8.	Chromium, +6	0.05	0.05	1.0	0.1	0.1
9.	Chromium, +3	1.0	1.0	1.0	1.0	1.0
10.	Cobalt	1.0	1.0	1.0	0.05	1.0
11.	Copper	0.05	1.0	1.0	0.2	0.1
12.	Cyanide	0.05	0.2	0.2	0.05	0.05
13.	Detergent	0.5	0.5	0.5	0.5	0.5
14.	Formaldehyde	1.0	1.0	1.0	1.0	1.0
15.	Iron	0.1	0.3	0.3	5.0	0.2
16.	Lead	0.1	0.1	0.1	1.0	0.1
17.	Lithium	1.0	1.0	2.5	2.5	1.0
18.	Mercury	0.0	0.0	0.0	0.0	0.0
19.	Molybdenum	0.01	0.01	0.01	0.01	0.01
20.	Nickel	0.2	0.2	0.2	0.2	0.2
21.	Phenol	0.001	1.0	1.0	1.0	1.0
22.	Selenium	0.01	0.01	0.01	0.02	0.05
23.	Silver	0.05	0.05	1.0	0.1	0.05
24.	Sulfate	200	200	300	500	500
25.	Sulfide	1.0	1.0	1.0	1.0	1.0
26.	Zinc	5.0	5.0	5.0	2.0	5.0

Source: Department of the Environment, the Islamic Republic of Iran, 1980

5. JAPAN

Environmental water quality standards
(Latest revision, 3 February 1975, Notification No. 3)

(1) Standards relating to human health

Item	Standard values 1/
Cadmium	0.01 ppm or less
Cyanide	Not detectable
Organic phosphorus 2/	Not detectable
Lead	0.1 ppm or less
Chromium (sexavalent)	0.05 ppm or less
Arsenic	0.05 ppm or less
Total mercury	0.0005 ppm or less
Alkyl mercury	Not detectable
PCB	Not detectable

Notes: 1/ Maximum values. But with regard to total mercury, standard value is based on the yearly average value.

2/ Organic phosphorus includes parathion, methyl parathion, methyl demeton and E.P.N.

..../(2)

(2) Standards Relating to Living Environment

(i) Rivers

Category	Item / Purpose of utilization	Standard values 1/				
		pH	Biochemical Oxygen demand (BOD)	Suspended Solids (SS)	Dissolved oxygen (DO)	Number of coliform groups
AA	Water supply, class 1; conservation of natural environment and uses listed in A-E	6.5-8.5	1 ppm or less	25 ppm or less	7.5 ppm or more	50 MPN/100 ml or less
A	Water supply, class 2; fishery, class 1; bathing and uses listed in B-E	6.5-8.5	2 ppm or less	25 ppm or less	7.5 ppm or more	1,000 MPN/100 ml or less
B	Water supply, class 3; fishery, class 2, and uses listed in C-E	6.5-8.5	3 ppm or less	25 ppm or less	5 ppm or more	5,000 MPN/100 ml or less
C	Fishery, class 3; industrial water, class 1, and uses listed in D-E	6.5-8.5	5 ppm or less	50 ppm or less	5 ppm or more	
D	Industrial water, class 2; agricultural water 2/, and uses listed in E	6.0-8.5	8 ppm or less	100 ppm or less	2 ppm or more	
E	Industrial water, class 3; conservation of environment	6.0-8.5	10 ppm or less	Floating matter such as garbage should not be observed	2 ppm or more	

Notes: 1. The standard value is based on the daily average value. (The same applies to the standard values of lakes and coastal waters.)

2. At the inlet or agricultural water, pH shall be between 6.0 and 7.5 and dissolved oxygen shall not be less than 5 ppm. (The same applies to the standard values of lakes.)

3. Conservation of natural environment: Conservation of scenic spots and other natural resources.

4. Water supply, class 1: Water treated by simple cleaning operation, such as filtration.
Water supply, class 2: Water treated by normal cleaning operation such as sedimentation and filtration.
Water supply, class 3: Water treated through a highly sophisticated cleaning operation including pretreatment.

5. Fishery, class 1: For aquatic life such as trout and bull trout inhabiting oligosaprobic water, and those of fishery class 2 and class 3.
Fishery, class 2: For aquatic life, such as fish of the salmon family and sweetfish inhabiting oligosaprobic water and those of fishery class 3.
Fishery, class 3: For aquatic life such as carp and silver carp inhabiting *B*-mesosaprobic water.

6. Industrial water, class 1: Water given normal cleaning treatment such as sedimentation.

..../Industrial

Industrial water, class 2: Water given sophisticated treatment by chemicals.
Industrial water, class 3: Water given special cleaning treatment.

7. Conservation of environment: Up to the limits at which no unpleasantness is caused to people in their daily life (including a walk by the riverside, etc.)

(ii) Lakes (natural lakes, reservoirs, marshes and artificial lakes with more than 10 million cublic metres of water)

Category	Item / Purpose of utilization	Standard values				
		pH	Chemical oxygen demand (COD)	Suspended solids (SS) 1/	Dissolved oxygen (DO)	Number of coliform groups
AA	Water supply, class 1; fishery, class 1; conservation of natural environment and uses listed in A-C	6.5-8.5	1 ppm or less	1 ppm or less	7.5 ppm or more	50 MPN/100 ml or less
A	Water supply, classes 2 and 3; fishery, class 2; bathing and uses listed in B-C	6.5-8.5	3 ppm or less	5 ppm or less	7.5 ppm or more	1,000 MPN/100 ml or less
B	Fishery, class 3; industrial water, class 1; agricultural water, and uses listed in C	6.5-8.5	5 ppm or less	15 ppm or less	5 ppm or more	-
C	Industrial water, class 2; conservation of environment	6.0-8.5	8 ppm or less	Floating matter as garbage shall not be observed	2 ppm or more	-

Notes: 1. With regard to fishery, classes 1, 2 and 3, the standard value for suspended solids shall not be applied for the time being.
2. See notes for Rivers

(iii) Coastal waters

Category	Item / Purpose of utilization	Standard values				
		pH	Chemical oxygen demand (COD)	Dissolved oxygen (DO)	Number of coliform groups 1/	N-hexane extracts
A	Fishery, class 1; bathing; conservation of natural environment and uses listed in B-C	7.8-8.3	2 ppm or less	7.5 ppm or more	1,000 MPN/100 ml or less	Not detectable
B	Fishery, class 2; industrial water and uses listed in C	7.8-8.3	3 ppm or less	5 ppm or more	-	Not detectable
C	Conservation of environment	7.0-8.3	8 ppm or less	2 ppm or more	-	-

Notes: 1. With regard to the water quality of fishery, class 1 for cultivation of oysters, the number of coliform groups shall be less than 70 MPN/100 ml.

2. Fishery, class 1: For aquatic life such as red sea-bream, yellow tail, seaweed and those of fishery.
Fishery, class 2: For aquatic life such as gray mullet, laver, etc.

3. Conservation of environment: Up to the limits at which no unpleasantness is caused to people in their daily life (including a walk by the shore, etc.)

Source: Quality of the Environment in Japan, 1979
Environment Agency.

6. BELGIUM

Classification of Surface Waters

Water sources are classified as follows:

Class I: Waters used for drinking water;

Class II: Waters used for the watering of animals and for fisheries purposes;

Class III: Waters used mainly for industrial purposes.

Initially, all of the water sources are classified in Class II, later the Ministry of Public Health may determine their classification.

Class I

Temperature may not exceed 25°C at the water intake of a water supply undertaking.

pH must be in the range 6.5-8.7.

Dissolved oxygen content must not be less than 70% of saturation at the water intake of a water supply undertaking.

Suspended solids in the receiving water may not be increased by more than 60 mg/l by all the effluents discharged into it.

The limit of toxicity is laid down in each individual case by the Ministry of Public Health and the Family.

BOD at the water intake of a water supply undertaking, the 48 hour 20°C, BOD may not exceed 4 mg/l.

Class II

Temperature must not exceed 23°C in "mixed" water courses.

pH must be in the range 6.5-8.7.

Dissolved oxygen content depends on the optimum quality for aquatic life.

Suspended solids may not be increased by more than 60 mg/l.

The concentration of toxic substances depends on their maximum permissible and minimum lethal dosage.

/Class III

6. BELGIUM (continued)

Class III

Temperature must not exceed 30°C.

pH must be in the range 6.5 to 8.7.

Dissolved oxygen content must not be less than 3 mg/l.

Suspended solids may not be increased by more than 100 mg/l.

Source: Control of Water Pollution. World Health Organization, 1967.

7. CZECHOSLOVAKIA

Maximum Permissible Concentration of Toxic Substances in the Water of Watercourses

Substance	Maximum permissible (mg/l)
Lead	0.1
Arsenic	0.05
Copper	0.1
Nickel	0.1
Selenium	0.05
Mercury	0.005
Cadmium	0.1
Zinc (divalent)	5.0
Chromium (hexavalent)	0.1
Chromium (trivalent)	0.5
Cyanides	0.1
Hydrogen sulphide	0.5
Carbon disulphide	1.0
Crude oil and its derivatives, and dissolved hydrocarbons	0.1
Free Chlorine	traces
Sulphides	0.5
DDT (technical) 1/	0.2
Chlorobenzene	0.1
Fluorides	1.0
Phenols 2/	-

1/ If the DDT is dissolved in carbon tetrachloride or kerosene, account must also be taken of the maximum permissible concentrations of these solvents.

2/ With public supplies of chlorinated water, an odour of chlorophenol must not be produced on chlorination.

7. CZECHOSLOVAKIA (continued)

Criteria for the Water Quality of Streams

Class	BOD_5 (mg/l)		Dissolved oxygen (mg/l)		pH value	Average no. of B. coli
	Average	Max.	Average	Max.		
I Excellent	< 1	2	> 9	6.5	6.5-8.5	< 1 000
II Good	1-2	3	> 7	6.0	6.5-8.5	< 10 000
III Permissible	2-3	5	> 5	4.0	6.0-9.0	< 50 000
IV Below Standard	3-5	7	> 4	3.0	5.0-9.5	< 200 000
V Unfit for use	> 5	-	< 4	-	-	> 200 000

Source: Control of Water Pollution
World Health Organization, 1967.

8. NEW ZEALAND

Classes of water and requirements for pollution prevention

I. Inland waters

Class	Characteristics	Requirements for pollution prevention
A	Water-supply waters in a controlled catchment area	• Entry of sewage, industrial wastes or other polluting discharges prohibited
B	Water-supply waters in an uncontrolled catchment area	• Water temperature must not be raised above 75°F, or if natural temperature exceeds 70°F, must not be raised by more than 5°F; • acidity or alkalinity must be kept within pH range 6.0 to 8.5; • water must not be unpalatable, or contain toxic substances to an extent rendering it unsafe for human or farm animal consumption, nor show any conspicuous change in its natural colour; • oxygen content must not be reduced to less than 6 ppm; • coliform bacteria content must not consistently exceed 5000 per 100 ml; • all discharges must be substantially free from suspended solids, grease and oil
C	Waters to which the public have ready access and used regularly for bathing	• As for Class B, except that water must not contain substances toxic or harmful to humans, nor contain such substances to such an extent as to be unsafe for consumption by farm animals, and the figure for the coliform bacteria content is 1000 per 100 ml
D	Inland waters in classified areas not included in any of the foregoing classes	• As for Class B, except that the reference to toxic substances rendering the water unsafe for human consumption is deleted, the minimum oxygen content is 5 ppm, and the reference to coliform bacteria is deleted

8. NEW ZEALAND (continued)

II. Coastal waters

Class	Characteristics	Requirements for pollution prevention
SA	Waters from which edible shellfish are regularly taken for human consumption	• No destruction of normal aquatic life by reason of a concentration of toxic substances, a change in the pH-value, or a rise in temperature; • no fouling of fishing grounds; coliform bacteria content must not consistently exceed 50 per 100 ml; • natural colour of water must not be conspicuously affected, water must not give off an offensive smell; • all discharges must be substantially free from suspended solids, grease and oil
SB	Waters to which the public have ready access and used regularly for bathing	As for Class SA, with the addition that substances toxic or harmful to humans are prohibited, and the maximum coliform bacteria content is 1000 per 100 ml
SC	Coastal waters to which the requirements listed apply	As for Class SA, with the addition that the water temperature must not be raised above 80°F and the pH value must be in the range 6 to 9, while the reference to coliform bacteria is deleted
SD	Coastal waters to which the requirements listed apply	As for Class SA, but the references to coliform bacteria and to the colour and smell of the water are deleted

Source: Control of Water Pollution, World Health Organization, Geneva, 1967.

9. U.S.A.

A. Classification of Fresh Surface Waters and Corresponding Quality Standards (North Carolina)

1. Class A-I Waters

a. Best Usage of Waters: Source of water supply for drinking, culinary, or food-processing purposes or any other usage requiring water of lower quality.

b. Conditions Related to Best Usage: This class is intended primarily for waters having watersheds which are uninhabited and otherwise protected as required by the State Board of Health and which require only approved disinfection, with additional treatment when necessary to remove naturally present impurities, in order to meet the "Public Health Service Drinking Water Standards" and will be considered safe for drinking, culinary, and food-processing purposes.

2. Quality Standards Applicable to Class A-I Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits; taste or odor-producing substances.	None attributable to sewage, industrial wastes or other wastes.
b. Sewage, industrial wastes, or other wastes.	None.
c. Toxic wastes; oils; deleterious substances; colored or other wastes.	None.
d. Organisms of coliform group.	Not to exceed 50/100 ml (either MPN or MF count) as a monthly average value.
e. Radioactive substances.	Gross beta activity (in the known absence of Strontium-90 and alpha emitters) not to exceed 1,000 pc/l (picocuries per liter) at any time.

3. Class A-II Waters

a. Best Usage of Waters: Source of water supply for drinking, culinary or food-processing purposes and any other best usage requiring waters of lower quality.

b. Conditions Related to Best Usage: The waters, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection with additional treatment if necessary to remove naturally present impurities, will meet the "Public Health Service Drinking Water Standards" and will be considered safe for drinking, culinary or food-processing purposes.

4. Quality Standards Applicable to Class A-II Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	Only such amounts attributable to sewage, industrial wastes or other wastes as will not, after reasonable opportunity for dilution and mixture of same with the receiving waters, make the waters unsafe or unsuitable as a source of water supply for drinking, culinary, or food-processing purposes, injurious to fish and wildlife, or impair the waters for any other best usage established for this class.
b. Sewage, industrial wastes, or other wastes.	None which are not effectively treated to the satisfaction of the Board and in accordance with the requirements of the State Board of Health.
c. Odor-producing substances contained in sewage, industrial wastes, or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes, as will not, after reasonable opportunity for dilution and mixture of same with receiving waters, cause taste and odor difficulties in water supplies which cannot be corrected by treatment as specified under "Conditions Related to Best Usage", impair the palatability of fish, or have a deleterious effect upon any best usage established for waters of this class.
d. Phenolic compounds.	Not greater than 0.001 mg/l (phenols).
e. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5 except that swamp waters may have a low of 4.3.
f. Total hardness.	Not greater than 100 parts per million as $CaCO_3$.
g. Dissolved oxygen.	Not less than 6.0 mg/l for natural trout waters; 5.0 mg/l for put-and-take trout waters; not less than a daily average of 5.0 mg/l with a minimum of not less than 4.0 mg/l for non-trout waters, except that swamp waters may have lower values if caused by natural conditions.

/h.

h. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters unsafe or unsuitable as a source of water supply for drinking, culinary, or food-processing purposes, injurious to fish and wildlife or adversely affect the palatability of same, or impair the waters for any other best usage established for this class.
i. Organisms of coliform group.	Not to exceed 5,000/100 ml as a monthly average value (either MPN or MF count); nor exceed this number in more than 20% of the samples examined during any one month; nor exceed 20,000/100 ml in more than 5% of such samples. Fecal Coliforms (MPN or MF count) not to exceed a log mean of 1,000/100 ml based on at least five consecutive samples examined during any 30-day period; nor exceed 2,000/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
j. Temperature.	Not to exceed 5°F above the natural water temperature, and in no case to exceed 84°F for mountain and upper piedmont waters and 90°F for lower piedmont and coastal plain waters. The temperature of natural trout waters shall not be significantly increased due to the discharge of heated liquids and shall not exceed 68°F; however, the temperature of put-and-take trout waters may be increased by as much as 3°F but the maximum may not exceed 70°F.
k. Radioactive substances.	Gross beta activity (in the known absence of Strontium-90 and alpha emitters) not to exceed 1,000 picocuries per liter.

5. Class B Waters

a. Best Usage of Waters: Bathing and any other best usage except as source of water supply for drinking, culinary or food-processing purposes.

b. Conditions Related to Best Usage: The waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor bathing places and will be considered safe and satisfactory for bathing purposes. Also, suitable for other uses requiring waters of lower quality.

6. Quality Standards Applicable to Class B Waters

Items	Specifications
a. Floating solids; settleable solids, sludge deposits.	Only such amounts attributable to sewage, industrial wastes or other wastes as will not, after reasonable opportunity for dilution and mixture of same with the receiving waters, make the waters unsafe or unsuitable for bathing, injurious to fish and wildlife, or impair the waters for any other best usage established for this class.
b. Sewage, industrial wastes, or other wastes.	None which are not effectively treated to the satisfaction of the Board. In determining the degree of treatment required for such waste when discharged into waters to be used for bathing, the Board will take into consideration the quantity and quality of the sewage and wastes involved and the proximity of such discharges to the waters in this class.
c. Phenolic compounds.	Not to exceed 0.001 mg/l (phenols).
d. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5, except that swamp waters may have a low of 4.3.
e. Dissolved oxygen.	Not less than 6.0 mg/l for natural trout waters; 5.0 mg/l for put-and-take trout waters; not less than a daily average of 5.0 mg/l with a minimum of not less than 4.0 mg/l for non-trout waters, except that swamp waters may have lower values if caused by natural conditions.

f. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters unsafe or unsuitable for bathing, injurious to fish and wildlife or adversely affect the palatability of same, or impair the waters for any other best usage established for this class.
g. Organisms of coliform group. (Applicable only during the months of May through September. During other months the coliform organism standard for Class "C" Waters shall apply.)	Fecal coliforms not to exceed a log mean of 200/100 ml (either MPN or MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
h. Temperature.	Not to exceed 5°F above the natural water temperature, and in no case to exceed 84°F for mountain and upper piedmont waters and 90°F for lower piedmont and coastal plain waters. The temperature of natural trout waters shall not be significantly increased due to the discharge of heated liquids and shall not exceed 68°F; however, the temperature of put-and-take trout waters may be increased by as much as 3°F but the maximum may not exceed 70°F.

7. Class C Waters

a. Best Usage of Waters: Fishing, boating, wading and any other usage except for bathing or as a source of water supply for drinking, culinary or food-processing purposes.

b. Conditions Related to Best Usage: The waters will be suitable for fish and wildlife propagation. Also, suitable for boating, wading, and other uses requiring waters of lower quality.

8. Quality Standards Applicable to Class C Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	Only such amounts attributable to sewage, industrial wastes or other wastes as will not, after reasonable opportunity for dilution and mixture of same with the receiving waters, make the waters unsafe or unsuitable for fish and wildlife, or impair the waters for any other best usage established for this class.

/b.

b. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5, except that swamp waters may have a low of 4.3.
c. Dissolved oxygen.	Not less than 6.0 mg/l for natural trout waters; 5.0 mg/l for put-and-take trout waters; not less than a daily average of 5.0 mg/l with a minimum of not less than 4.0 mg/l for non-trout waters, except that swamp waters may have lower values if caused by natural conditions.
d. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters injurious to fish and wildlife or adversely affect the palatability of same, or impair the waters for any other best usage established for this class.
e. Organisms of coliform group.	Fecal coliform not to exceed a log mean of 1,000/100 ml (MPN or MF count) based upon at least five consecutive samples examined during any 30-day period; nor exceed 2,000/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
f. Temperature.	Not to exceed 5°F above the natural water temperature, and in no case to exceed 84°F for mountain and upper piedmont waters and 90°F for lower piedmont and coastal plain waters. The temperature of natural trout waters shall not be significantly increased due to the discharge of heated liquids and shall not exceed 68°F; however, the temperature of put-and-take trout waters may be increased by as much as 3°F but the maximum may not exceed 70°F.

9. Class D Waters

a. Best Usage of Waters: Agriculture, industrial cooling and process water supply, fish survival, navigation, and any other usage, except fishing, bathing, or as a source of water supply for drinking, culinary or food-processing purposes.

/b.

b. Conditions Related to Best Usage: The waters without treatment and except for natural impurities which may be present therein will be suitable for agricultural uses and will permit fish survival. The waters will also be usable after special treatment by the user as may be needed under each particular circumstance for industrial purposes, including cooling and process waters.

10. Quality Standards Applicable to Class D Waters

Items	Specifications
a. Floating solids, settleable solids; sludge deposits.	Only such amounts attributable to sewage, industrial wastes or other wastes as will not, after reasonable opportunity for dilution and mixture of same with the receiving waters, render the waters unsuitable for agriculture, industrial cooling purposes and fish survival, or cause an offensive condition.
b. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5, except that swamp waters may have a low of 4.3.
c. Dissolved oxygen.	Not less than 3.0 mg/l.
d. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts attributable to sewage, industrial wastes or other wastes as will not render the waters unsuitable for agriculture, industrial cooling purposes, navigation, fish survival, or cause offensive conditions.
e. Organisms of coliform group. (Applicable only to waters designated by the Board for irrigation of fruits and vegetables.)	Fecal coliforms not to exceed a log mean of 1,000/100 ml (MPN or MF count) based upon at least five consecutive samples examined during any 30-day period; nor exceed 2,000/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
f. Temperature.	Not to exceed 5°F above the natural water temperature and in no case to exceed 84°F for mountain and upper piedmont waters and 90°F for lower piedmont and coastal plain waters.

/B.

B. Classification of Tidal Salt Waters and Water Quality Standards Applicable Thereto (North Carolina)

1. Class SA Waters

a. Best Usage of Waters: Shellfishing for market purposes and any other usage requiring waters of lower quality.

b. Conditions Related to Best Usage: Waters will meet the sanitary and bacteriological standards given in the 1965 revision of the "National Shellfish Sanitation Program Manual of Operations: Part 1, Sanitation of Shellfish Growing Areas", recommended by the Public Health Service and will be considered safe and suitable for shellfish culture.

2. Quality Standards Applicable to Class SA Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	None attributable to sewage, industrial wastes or other wastes.
b. Sewage, industrial wastes, or other wastes.	None which are not effectively treated to the satisfaction of the Board and in accordance with the requirements of the State Board of Health.
c. pH.	Range between 6.8 and 8.5.
d. Dissolved oxygen.	Not less than 5.0 mg/l, except that swamp waters may have a minimum of 4.0 mg/l.
e. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not make the waters unsafe or unsuitable for fish and shellfish or their propagation, impair the palatability of same, or impair the waters for any other best usage established for this class.
f. Organisms of coliform group.	Total coliform group not to exceed a median MPN of 70/100 ml, and not more than 10% of the samples shall exceed an MPN of 230/100 ml for a 5-tube decimal dilution test (or 330/100 ml where a 3-tube decimal dilution is used) in those areas most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

/g.

g. Temperature.	Shall not be increased above the natural water temperature by more than 1.5°F during the months of June, July, and August nor more than 4.0°F during other months and in no case to exceed 90°F, due to the discharge of heated liquids.

3. Class SB Waters

a. Best Usage of Waters: Bathing and any other usage except shellfishing for market purposes.

b. Conditions Related to Best Usage: The waters, under proper sanitary supervision by the controlling health authorities, will meet accepted sanitary standards of water quality for outdoor bathing places and will be considered safe and satisfactory for bathing purposes.

4. Quality Standards Applicable to Class SB Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	None attributable to sewage, industrial wastes or other wastes.
b. Sewage, industrial wastes, or other wastes.	None which are not effectively treated to the satisfaction of the Board. In determining the degree of treatment required for such waters when discharged into waters to be used for bathing, the Board will take into consideration the quantity and quality of the sewage and wastes involved and the proximity of such discharges to the waters in this class.
c. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5, except that swamp waters may have a low of 4.3.
d. Dissolved oxygen.	Not less than 5.0 mg/l, except that swamp waters may have a minimum of 4.0 mg/l.
e. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not make the waters unsafe or unsuitable for bathing, injurious to fish or shellfish, or adversely affect the palatability of same, or impair the waters for any other best usage established for this class.

/f.

f. Organisms of coliform group. (Applicable only during months of May through September. During other months the coliform organism standard for Class "SC" Waters shall apply.)	Fecal coliforms not to exceed a log mean of 200/100 ml (either MPN or MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
g. Temperature.	Shall not be increased above the natural water temperature by more than 1.5°F during the months of June, July and August nor more than 4.0°F during other months and in no case to exceed 90°F, due to the discharge of heated liquids.

5. Class SC Waters

a. Best Usage of Waters: Fishing, and any other usage except bathing or shellfishing for market purposes.

b. Conditions Related to Best Usage: The waters will be suitable for fishing and fish propagation. Also, suitable for other uses requiring waters of lower quality.

6. Quality Standards Applicable to Class SC Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	Only such amounts attributable to sewage, industrial waste or other wastes as will not, after reasonable opportunity for dilution and mixture of same with the receiving waters, make the waters unsafe or unsuitable for fish, shellfish and wildlife, or impair the waters for any other best usage established for this class.
b. pH.	Shall be normal for the waters in the area, which generally shall range between 6.0 and 8.5, except that swamp waters may have a minimum of 4.3.
c. Dissolved oxygen.	Not less than 5.0 mg/l, except that swamp waters may have a minimum of 4.0 mg/l.

/d.

d. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters injurious to fish and shellfish, adversely affect the palatability of same, or impair the waters for any other best usage established for this class.
e. Organisms of coliform group.	Fecal coliforms not to exceed a log mean of 1,000/100 ml (MPN or MF count) based upon at least five consecutive samples examined during any 30-day period; nor exceed 2,000/100 ml in more than 20% of the samples examined during such period. (Not applicable during or immediately following periods of rainfall.)
f. Temperature.	Shall not be increased above the natural water temperature by more than 1.5°F during the months of June, July, and August nor more than 4.0°F during other months, and in no case to exceed 90°F, due to the discharge of heated liquids.

7. Class SD Waters

a. Best Usage of Waters: Navigation and waste disposal.

b. Quality Standards Applicable to Class SD Waters

Items	Specifications
a. Floating solids; settleable solids; sludge deposits.	Only such amount attributable to sewage, industrial or other wastes as will not interfere with navigation, or cause an offensive condition.
b. pH.	Not less than 4.3 in waters used for navigation; otherwise, levels such as not to affect adversely the quality of waters to which these waters may be tributary.
c. Dissolved oxygen.	Sufficient to prevent the development of an offensive condition.

d. Toxic wastes; oils; deleterious substances; colored or other wastes.	Only such amounts, whether alone or in combination with other substances, and only such temperatures, as will not render the waters unsuitable for navigation or create an offensive condition.

Source: Rules, Regulations, Classifications and Water Quality Standards Applicable to the Surface Waters of North Carolina. Adopted by Board of Water and Air Resources. Raleigh, North Carolina, 1970.

C. Classification of Underground Waters and Corresponding Quality Standards (New York)

Class	Best usage	Characteristic	Specification
CA	Water supply for drinking, culinary or food processing purposes, and any other usages	Sewage or industrial wastes or ineffectively treated effluents; faecal matter, garbage, manure or other refuse	None within limiting distances of well, spring or infiltration gallery as specified in rules and regulations under the Public Health Law or in decisions of Water Power and Control Commission; otherwise, none within 200 ft of a well, spring or infiltration gallery used as source of public water supply, and none within 100 ft of well, spring or infiltration gallery used as source for any other drinking water supply, except as approved or required by local health authorities or State Department of Health; otherwise, none in such a way or in sufficient amounts to impair the waters for use as a source of water supply for drinking, culinary or food processing purposes
		Tastes or odour-producing substances	None attributable to sewage, industrial or other wastes in sufficient amounts to make the waters unsafe or unsuitable as a source of water supply for drinking, culinary or food processing purposes

Class	Best usage	Characteristic	Specification
		Toxic wastes, deleterious substances, other wastes or heated liquids	None alone or in combination with other substances in sufficient amounts or at such temperatures as to make the waters unsafe or unsuitable as a source of water supply for drinking, culinary or food processing purposes, or impair the waters for any other best usage specified
GB	Industrial or other water supply and any other usages, except those for Class GA	Toxic wastes, deleterious substances, other wastes or heated liquids	None alone or in combination with other substances in sufficient amounts or at such temperatures as to make the waters unsafe or unsuitable for any best usage specified

Source: Control of Water Pollution, World Health Organization, Geneva, 1967.

D. Established Classes for Fresh Surface Waters and the Standards of Quality and Purity Which Shall be Applied Thereto (South Carolina)

CLASS AA

Waters suitable for use for domestic and food processing purposes with treatment levels as specified by the Department of Health and Environmental Control, or waters which constitute an outstanding recreational or ecological resource. Suitable, where specified, in the document, Stream Classifications for the State of South Carolina, for trout fishing ("fishing" as defined in Section I of this document). Also suitable for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS AA WATERS

Items	Specifications
1. Sewage, treated waste, thermal discharges, toxic wastes, deleterious substances, colored or other wastes.	None.

Items	Specifications
2. Dissolved oxygen.	Class AA-TROUT waters shall be maintained at their natural condition or 6 mg/l with a daily average of 7 mg/l whichever is the greater. All other Class AA waters must have an average of 6 mg/l except where natural conditions can be shown to contribute to values below this, throughout the year.
3. Fecal coliform	Not to exceed 20/100 ml as a monthly arithmetic average.

CLASS A

Waters suitable for direct water contact use. Suitable also for uses requiring waters of lesser quality.

QUALITY STANDARDS FOR CLASS A WATERS

Items	Specifications
1. Toxic wastes, deleterious substances, colored or other wastes.	None in amounts exceeding limitations established and adopted by the Department of Health and Environmental Control to protect waters of this class. In establishing and adopting limits, the Department of Health and Environmental Control will be guided by Section 1412 Public Health Service Act, amended by the Safe Drinking Water Act (P.L. 93-523) and related regulations.
2. Dissolved oxygen.	Not less than 5 mg/l except that swamp waters may have an average of 4 mg/l.
3. Fecal coliform.	Not to exceed a geometric mean of 200/100 ml; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 ml.
4. pH.	Range between 6.0 and 8.0 except that swamp waters may range from pH 5.0 to pH 8.0.

/CLASS B

CLASS B

Waters suitable for domestic supply after conventional treatment in accordance with requirements of the South Carolina State Board of Health and Environmental Control. Suitable also for propagation of fish, industrial and agricultural uses and other uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS B WATERS

	Items	Specifications
1.	Toxic wastes, deleterious substances, colored or other wastes.	None in amounts exceeding limitations established and adopted by the Department of Health and Environmental Control to protect waters of this class. In establishing and adopting limits the Department of Health and Environmental Control will be guided by Section 1412 Public Health Service Act, amended by the Safe Drinking Water Act (P.L. 93-523) and related regulations.
2.	Dissolved oxygen.	Daily average not less than 5 mg/l with a low of 4 mg/l except that swamp waters may have an average of 4 mg/l.
3.	Fecal coliform.	Not to exceed a geometric mean of 1000/100 ml based on five consecutive samples during any 30 day period; nor to exceed 2000/100 ml in more than 20% of the samples examined during such period (not applicable during or following periods of rainfall).
4.	pH.	Range between 6.0 and 8.5 except that swamp waters may range from pH 5.0 to pH 8.5.

CLASSES AND STANDARDS FOR TIDAL SALT WATERS

CLASS SAA

Waters suitable for uses that require the absence of pollution (South Carolina Pollution Control Act Section 1(7) and/or waters which constitute an outstanding recreational or ecological resource. Suitable also for use requiring water of lesser quality.

/QUALITY

QUALITY STANDARDS FOR CLASS SAA WATERS

Items	Specifications
1. Garbage, cinders, ashes, oils, sludge, or other refuse.	None.
2. Sewage, treated wastes, thermal discharges, toxic wastes, deleterious substances, colored or other wastes.	None.
3. Dissolved oxygen.	Not less than 5 mg/l.
4. Organisms of coliform group.	Not to exceed a median coliform of 70/100 ml, nor shall more than 10% of the samples in a five (5) tube dilution test exceed a MPN of 230/100 ml; or current Department of Health and Environmental Control and U.S. Food and Drug Administration standards.
5. pH.	Not outside of naturally occurring values.

CLASS SA

Waters suitable for propagation, survival, and harvesting of shellfish for market purposes as designated by the Department of Health and Environmental Control. Suitable also for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS SA WATERS

Items	Specifications
1. Garbage, cinders, ashes, oils, sludge or other refuse.	None.
2. Sewage or waste effluents.	None which are not effectively treated and disinfected.
3. Toxic wastes, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

/4.

4.	Dissolved oxygen.	Not less than 5 mg/l.
5.	Organisms of coliform group.	Not to exceed a median coliform of 70/100 ml, nor shall more than 10% of the samples in a five (5) tube dilution test exceed a MPN of 230/100 ml; or current Department of Health and Environmental Control and U.S. Food and Drug Administration standards.
6.	pH.	Shall not vary more than 3/10 of a pH unit above or below that of effluent-free waters in the same geological area having a similar total salinity, alkalinity and temperature.

CLASS SB

Waters suitable for direct water contact and for survival and propagation of shellfishing except shellfishing for market purposes. Suitable also for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS SB WATERS

	Items	Specifications
1.	Garbage, cinders, ashes, oils, sludge or other refuse.	None.
2.	Sewage or waste effluents.	None which are not effectively disinfected.
3.	Toxic wastes, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition thereof; to make the waters unsafe or unsuitable for bathing or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
4.	Dissolved oxygen.	Not less than 5 mg/l.
5.	Fecal coliform.	Not to exceed a geometric mean of 200/100 ml; nor shall more than 10% of the samples in any 30 day period exceed 400/100 ml.

6.	pH.	Shall not vary more than one-half of a pH unit above or below that of effluent-free waters in the same geological area having a similar total salinity, alkalinity and temperature, but not lower than 6.75 or above 8.5.

CLASS SC

Waters suitable for crabbing, commercial fishing and for the survival and propagation of marine fauna and flora.

QUALITY STANDARDS FOR CLASS SC WATERS

	Items	Specifications
1.	Garbage, cinders, ashes, oils, sludge or other refuse.	None
2.	Toxic wastes, oils, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition of fish or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
3.	Dissolved oxygen.	Not less than 4 mg/l.
4.	Fecal coliform.	Not to exceed a geometric mean of 1000/100 ml based on five consecutive samples during any 30 day period; nor exceed 2000/100 ml in more than 20% of the samples examined during such period (not applicable during or immediately following periods of rainfall).
5.	pH.	Shall not vary more than one pH unit above or below that of effluent-free waters in the same geological area having a similar total salinity, alkalinity and temperature but not lower than 6.75 or above 8.5.

Source: Water Classification Standards System for the State of South Carolina. South Carolina Department of Health and Environmental Control. 1977.

10. U.S.S.R.

Table 1

General provisions governing the composition and characteristics of water of bodies of water at points of water used for drinking, and recreational and domestic purposes.

Criterion of composition and characteristics of water of a body of water	Type of water use	
	For centralized and decentralized domestic drinking water supplies and also for water supplies for the food industries	For bathing, sports and recreation of the population, and also bodies of water within the boundaries of inhabited areas
Suspended substances	Contents of suspended substances should not be increased by more than: 0.25 mg/l 0.75 mg/l For bodies of water containing more than 30 mg/l of natural suspended substances of the low-water period, an increase in the contents of suspended substances of not more than 5% shall be permissible. Discharge of suspensions with a settling velocity of more than 0.4 mm/sec, in the case of flowing bodies of water, and of more than 0.2 mm/sec, in the case of reservoirs, is prohibited.	
Floating impurities (or substances)	Floating films, patches of mineral oils and accumulations of other impurities must not be observed on the surface of the body of water.	
Odours and tastes	Water must not acquire odours or tastes of strength more than 2 points, developing:	

..../Immediately

	immediately or after subsequent chlorination: immediately Water must not impart strange odours and tastes to the flesh of fish.	
Colour	Colouration must not appear in a column of height: 20 cm: 10 cm	
Temperature	Summer temperature of water consequent on discharge of effluents should not increase by more than 3^{o} as compared with the maximum summer temperature of the body of water.	
pH-value	Must remain with the range 6.5-8.5.	
Dissolved solids	Must not exceed 1000 mg/l, based on the solid residue, of which 350 mg/l to consist of chlorides and 500 mg/l of sulphates.	To be fixed in accordance with the standards given above for 'tastes'.
Dissolved oxygen	Must not be less than 4 mg/l at any period of the year in a sample taken at any time up to midday.	

..../Criterion

Criterion of composition and characteristics of water of a body of water	Type of water use	
	For centralized and decentralized domestic drinking water supplies and also for water supplies of the food industries	For bathing, sport and recreation of the population, and also bodies of water within the boundaries of inhabited areas
Biochemical oxygen demand	Total oxygen demand of water at 20°C must not exceed: 3 mg/l	6 mg/l
Pathogens	Water must not contain pathogens. Effluents containing pathogens must undergo disinfection after preliminary treatment. Methods of disinfection and preliminary treatment (mechanical or biological) must be approved by the state sanitary inspection services in each individual case.	
Poisonous substances	Must not be present in concentrations capable, directly or indirectly, of having a harmful effect on the organisms or the health of the population.	

Table 2

Maximum permissible concentrations of harmful substances in the water of bodies of water used for sanitary and domestic water supplies

Substances	Limiting criterion of harmfulness	Maximum permissible concentration (mg/l)
Lead	Sanitary-toxicological	0.1
Arsenic		0.05
Mercury (in inorganic compounds)		0.05

..../Selenium

Selenium		0.01
Cyanides (simple)		0.1
Fluorine [1]		1.5
Tetraethyl lead		None [2]
Benzene		0.5
Hexachlorobenzene		0.05
Nitrochlorobenzene		0.05
Pyridine		0.2
Formaldehyde		0.5
Ursol (p-phenylene diamine)		0.1
Acrylonitrile		2.0
Hexogen		0.1
Copper	General sanitary	0.1
Zinc		1.0
Nickel		0.1
Cobalt		1.0
Cadmium		0.01
Free chlorine [3]		None [2]
Sulphides [4]		None [2]
Trinitrotoluene		0.5
Acetone		Within permissible limits calculated from the content of organic substances in the water of the body of water, the biochemical oxygen demand and the dissolved oxygen content.
Methanol		
Ethylene glycol		
Propylene glycol		
Triethylene glycol		
Formic acid		
Acetic acid		
Butyric acid		
Benzoic acid		
Lactic acid		

..../Caprolactam

Notes: 1. Whether in the form of fluorine or its compounds.
2. Within the limits of the most sensitive analytical methods.
3. Taking the chlorine demand into account.
4. Taking into account the oxygen solubility under winter conditions.

Caprolactam		1.0
Dimethyl formamide		10.0
Isobutyl alcohol		1.0
Trivalent chromium	Organoleptic	0.5
Hexavalent chromium		0.1
Iron		0.5
Barium		4.0
Carbon disulphide		1.0
Carbon tetrachloride		5.0
Chlorobenzene		0.1
Dinitrobenzene		0.5
Dinitrochlorobenzene		0.5
Dichlorobenzene		0.03
Trichlorobenzene		0.03
Phenols, forming chlorophenol 1/		0.001
Xylene		0.05
Toluene		0.5
Turpentine		0.2
Dichlorethane		2.0
Trinitrophenol (picric acid)		0.5
Dinitronaphthalene		1.0
Tetranitromethane		0.5
Styrene		0.1
Butyl alcohol		1.0
Methylethyl ketone		1.0
Cyclohexanone		1.0
Chloroprene		0.1
Saponin		0.2
DDT		0.2
Thiophos		0,003
Metaphos		0.02
Mercaptophos		0.01
Carbophos		0.05
Nitroform		0.01
Petroleum:		
High sulphur content		0.1
Others		0.3
Kerosene		0.3
Benzine		0.1
Naphthenic acids		0.3

Note: 1/ For points of water consumption using the body of water as a source of water for domestic and drinking purposes.

Source: Control of Water Pollution, World Health Organization, 1967

11. BULGARIA

Indices and norms for determination of allowable concentration of pollution of category of water for water supply

Substances	Category I (Water Supply)
D.O.	more than 6 mg/l
Saturated Oxygen	more than 75%
Biological Necessity of Oxygen	less than 5 mg/l
H_2S	not admissible
Biological state	oligo to beta meso
Cl_2	less than 250 mg/l
SO_4	less than 250 mg/l
Total hardness-German degrees	less than 30
Ca^{++}	less than 200 mg/l
Mg^{++}	less than 50 mg/l
Solid residue dissolved substances at $105^{o}C$	less than 800 mg/l
NH_4	less than 0.05 mg/l
NO_3	less than 30 mg/l
pH	6.5-8.5
Total iron	less than 0.3 mg/l
Manganese	less than 0.1 mg/l
Phenols	less than 0.001 mg/l
Detergents	less than 0.5 mg/l
Flavour and taste	without flavour, without taste
Colour-degrees of the Rubljov scale	less than 15^{o}
Oils	invisible
Coli-titre	more than 1 cm^3
Pathogenic microbes	not admissible

Index and norms for the determination of allowable degree of pollution with toxic substances of category of water for water supply

Substances	Category I (Water Supply)
Cyanide ions	less than 0.01 mg/l
Lead	less than 0.1 mg/l
Arsenic	less than 0.05 mg/l
Mercury	not allowed
Copper	less than 0.1 mg/l
Zinc	less than 1 mg/l
Cadmium	less than 0.01 mg/l
Chromium (3^+)	less than 0.1 mg/l
Chromium (6^+)	less than 0.05 mg/l
Cobalt	less than 1 mg/l
Silver	less than 0.01 mg/l
Sulfide ions	not allowed
Vanadium	not allowed
Boron	not allowed
Fluorine	0.5-1.5 mg/l
Selenium	less than 0.01 mg/l
Barium	less than 1 mg/l
Benzine	less than 0.1 mg/l
Naptha and its derivatives	less than 0.3 mg/l
Uranium natural	less than 0.6 mg/l
Radium	less than 4×10^{12} curie/l
Organo-phosphorus Compound	not allowed
Carbophos Mercaptephos	"
Metaphos and Thiophos	"

Source: "Aspects of Pollutants of Inter-Regional Significance" by Dr. Pencho Kazasov, Ministry of Health and Welfare, Sofia, Bulgaria. November 1975.

Part 2

AIR QUALITY STANDARDS

1. PHILIPPINES

Section 58 Maximum Permissible Emission Standards for Visible Emissions and Particulate Matter

(a) For fuel-burning equipment and industrial plant:-

(1) The concentration of air impurities emitted from existing sources at the point of emission determined in accordance with the provision of these Rules and Regulations shall be such that, when compared in the appropriate manner with the Ringelmann Chart or an equivalent method approved by the Commission, impurities shall not appear to be darker than Shade 2 on the Chart.

(2) The concentration of air impurities emitted from new sources under the above Regulation shall be such that impurities shall not appeal to be darker than Shade 1 on that Chart.

Exceptions to Regulations 58 (a) (1) and (2) shall apply to the following circumstances:-

(i) When in the opinion of the Commission, it is not reasonably practicable to achieve these standards and a permission has been granted in writing for a conditional variation of these Rules and Regulations.

(ii) The concentration of air impurities hereinbefore prescribed may be exceeded for a total period not in excess of 20 minutes in any period of 24 hours if the emission of air impurities in excess of such standard of concentration is solely due to the lighting up of any boiler or incinerator from cold, provided that at no time should the concentration of air impurities be such that when compared in the appropriate manner with the Ringelmann Chart, such air impurities would appear to be darker than Shade 3 on that Chart and that all practicable means are employed to prevent or minimize the emission of air impurities.

/(iii)

(iii) The standard of concentration of air impurities hereinbefore prescribed may be exceeded for a period not in excess of 10 minutes in any period of eight hours in the case of boilers burning up to one tonne of fuel per hour of 20 minutes in any period of eight hours in the case of boilers burning more than one tonne but less than five tonnes of fuel per hour or 30 minutes in any period of eight hours in the case of boilers burning more than five tonnes of fuel per hour if the emission of air impurities in excess of such standard of concentration is solely due to the soot blowing of a boiler, provided that at no time should the concentration of air impurities be such that when compared in the appropriate manner with the Ringelmann Chart such air impurities would appear to be darker than Shade 3 on said Chart and all practicable means are employed to prevent or minimize the emission of air impurities.

(iv) For kilns used for firing bricks, tiles, pipes, pottery or refractories, Regulation 58 (b) shall apply.

(b) Boilers or incinerators emitting solid particles.

For existing boilers and incinerators, concentration of solid particles at the point of emission adjusted to a basis of 12% carbon dioxides, shall be such that the total mass of such solid particles does not exceed 500 mg/scm.

For new boilers or incinerators (new sources) the maximum permissible emission limit under the above Regulation shall be 300 mg/scm.

(c) Any trade, industry, process, industrial plant or fuel-burning equipment emitting solid particles, except those referred to in paragraph (b) of these Regulations, the concentration of solid particles at the point of emission of existing sources shall not exceed 500 mg/scm.

For new sources the maximum permissible emission limit for particulate matter shall be 300 mg/scm.

/Section 59

Section 59 Maximum Permissible Emission Standards for Specific Air Pollutants from Stationary Sources -

For any trade, industry, process, fuel-burning equipment or industrial plant emitting air pollutants, the concentration at the point of emission shall not exceed the limits set in Table 1.

TABLE 1.—*Maximum Permissible Emission Standards for Specific Air Pollutants from Stationary Sources* *

Pollutant	Standard Applicable to Source	Maximum Permissible Emission Standard
Antimony and its compounds	any source	10 milligrams/scm as antimony
Ammonia	any source	400 milligrams/scm
Arsenic and its compounds	any source	10 mg/scm as arsenic
Cadmium and its compounds	any source	10 mg/scm as cadmium
Total of antimony, arsenic, cadium, lead, mercury and their compounds	any industrial source	10 milligrams/scm (Addition of each metal or compound expressed as the metal in each case)
Carbon Disulfide	any source	100 milligrams/scm
Carbon Monoxide	any industrial source	500 milligrams/scm
Copper and its compounds	any source	100 milligrams/scm
Chlorine (and chlorine Gas)	any source	60 milligrams/scm
Formaldehyde	any source	600 milligrams/scm
Hydrofluoric Acid & Fluorine compounds	aluminum reduction any other industrial source	20 milligrams/scm as hydrofluoric acid 50 milligrams/scm as hydrofluoric acid
Hydrogen Chloride & Chlorine compound	any source	200 milligrams/scm as Chlorine
Hydrogen Sulfide Gas	any source	15 milligrams/scm
Lead and its compounds	any source	10 milligrams/scm
Mercury & its compounds	any source	5 milligrams/scm as mercury
Nickel and its compounds	any source, except nickel carbonyl for which it should be	20 milligrams/ scm as nickel 3.5 milligrams/scm as nickel
Nitric acid or Oxides of Nitrogen	any source	2 grams/scm as NO_2
Phenol	any source	400 milligrams/scm
Phosphorus Pentoxide	any source	200 milligrams/scm
Sulfuric Acid, Sulfur Dioxide & Sulfur Trioxide	any trade, industry or process excluding sulfuric acid manufacture	1500 mg/scm as sulfur dioxide
Sulfuric Acid, Sulfur Dioxide and Sulfur Trioxide	any trade, industry or process manufacturing sulfuric acid	2 grams/scm as sulfur dioxide
Total Oxides	any fuel-burning plant	250 milligrams/scm as Sulfur Dioxide, or where limit cannot be met, control to be by stack height
Zinc and its compounds	any source	100 milligrams/scm

* NOTE: If the emission standard cannot be met due to economic and technical limitations, then the ambient air quality standard should prevail.

Section 62 National Ambient Air Quality Standards

For the purpose of protecting public health and welfare and reduce damage to property as well as providing an air quality management control strategy for emission limitation from mobile and stationary sources, location of commercial, industrial and residential facilities, and to assist in the promotion and use of an improved transportation systems, the following maximum limiting levels, not to be exceeded more than once a year are hereby established:

Table 2

National Ambient Air Quality Standards

POLLUTANT Total	CONCENTRATION Micrograms/scm.	PPM	EXPOSURE TIME Hours
Suspended Particulate	150		24
matter	250		1
Sulfur Dioxide	369	0.14	24
	850	0.80	1
Photochemical Oxidants	120	0.06	1
Nitrogen Dioxide	190	0.10	1
	milligrams/scm	PPM	
Carbon Monoxide	10	9	8
	33	80	1

The methods for measurement of four of the pollutants are World Health Organization (WHO) selected methods: sulfur dioxide by acidimetric; photochemical oxidants by potassium iodide; nitrogen dioxide by diazotizing-coupling; and carbonmonoxide by nondispersive infrared absorption. Total suspended particulate matter is measured by light scattering. The comparability of these methods with others may be judged by using WHO-specified comparison methods.

/The

The maximum air quality standards of other specific pollutants are set at values given in Table 3.

Table 3

Pollutants and Their Maximum Permissible Ambient Concentration
(Standards applicable to a 30-minute sample)

Pollutant	Miligrams Per Cu. M. S.T.P.	Parts Per Million By Volume
Ammonia	0.2	0.28
Antimony	0.02	-
Arsenic	0.02	-
Asbestos	2 x 10" particulates/scm (Over 5 micrometers in size)	
Cadmium	0.01	-
Carbon Disulfide	0.03	0.01
Copper Fumes	0.01	-
Chlorine	0.3	0.1
Formaldehyde	0.035	0.029
Hydrochloric Acid	0.2	0.14
Hydrogen Sulfide	0.03	0.02
Lead	0.02	-
Nitrogen Dioxide	0.3	0.16
Nitric Acid	0.4	0.15
Oxidants (as O_2)	0.2	0.1
Phenol	0.1	0.026
Soot, Carbon Black	0.02	-
Sulfuric Acid	0.3	-

For any plant, a discharge of pollutants that results in airborne concentrations in excess of the amounts shown in Table 3 when measured at ground level or habitable elevation; whichever is more restrictive, shall not be permitted.

/Section 66

Section 66 Air Quality Indices

(a) The following shall describe the three (3) levels of air quality for particulates, carbon monoxile and sulfur dioxide anywhere in the Philippines:

(1) Suspended Particulates:

Good-0 to 100 micrograms/scm
Fair-101 to 250 micrograms/scm
Poor-251 to 350 micrograms/scm
Serious or alert conditions -
greater than 350 micrograms/scm
Alert 1-350 micrograms/scm
(White) expected to hold or increase for 12 hours or more.
Alert 2-550 micrograms/scm,
(blue) expected to hold or increase for 12 hours or more.
Alert 3-750 micrograms/scm,
(red) (emergency) expected to hold or increase for 12 hours or more.

(2) Carbon Monoxide:

Good-0 to 10 ppm (0 to 12.5 milligrams/scm)
Fair-11 to 20 ppm (12.6 to 25.0 milligrams/scm)
Poor-21 to 30 ppm (25.1 to 37.5 milligrams/scm)
Serious or alert conditions -
greater than 30 ppm
Alert 1-30 ppm, expected to hold or increase for
(White) about two hours or more but not to exceed four hours; otherwise, next alert is issued.
Alert 2-60 ppm, expected to hold or increase for about two hours or more but not to exceed four hours; otherwise next alert is issued.
Alert 3-80 ppm (emergency), expected to hold or increase for about two hours or more.

/(3)

(3) **Sulphur Dioxide:**

Good-0 to 0.1 ppm (0 to 285 micrograms/scm)

Fair-0.11 to 0.3 ppm (286 to 850 micrograms/scm)

Poor-0.31 to 0.5 ppm (851 to 1430 micrograms/scm)

Serious or alert conditions-greater than 0.5 ppm

Alert 1-0.5 ppm, expected
(White) to hold or increase for 12 hours or more

Alert 2-0.8 ppm, expected
(blue) to hold or increase for 12 hours or more.

Alert 3-(emergency) 1.0 ppm,
(red) expected to hold or increase for 12 hours or more.

Source: Official Gazette, Republic of the Philippines
Vol. 74, No. 23, 5 June 1978

2. THAILAND

1. AIR QUALITY STANDARDS

1.1 Ambient Air Quality Standards

Office of the National Environment Board is responsible for setting ambient air quality standards. The standards displayed in Table 1 have been submitted to the National Environment Board for review.

There are currently no approved ambient air quality standards in Thailand.

1.2 Emission Standards for Automobiles

1.2.1 Road Traffic Police Notification (1971) With the engine at idle and properly accelerated, the characteristic of black smoke determined by BOSCH Smokemeter shall not exceed 40 per cent. In 1972 another kind of instrument, Cosmocord, was accepted for measuring black smoke.

1.2.2 Office of the National Environment Board Notification (1979) Maximum allowable levels of black smoke and carbon monoxide concentration emitted from automobiles have been designated as follows:

a) The level of black smoke emitted from deisel engine determined by smokemeter with BOSCH System shall not exceed 40 per cent and the value obtained from Hartridge System shall not exceed 52 per cent;

b) The level of carbon monoxide in the exhausted gas discharged from gasoline engine determined by Nondispersive Infrared Detection shall not exceed 6 per cent.

/1.3

1.3 Emission Standards for Motor Launch

1.3.1 Harbour Department Notification (No. 38/1972) The smoke discharged from internal combustion engine, while the launch is stationary and the engine accelerated at 2/3 of maximum engine speed, determined by smokemeter with Hartridge system, shall not exceed 40 per cent.

1.4 Emission Standards for Industry

1.4.1 Ministry of Industry Notification (Document No. 4, Article 77, 1971) A factory which emits smoke from furnance or other machines must use smoke stack of adequate height, and the black smoke released at the top of the stack shall not exceed 40 per cent of Ringelmann Standard except for short periods of time when the furnance operation is started or the ash removing equipment is out of order.

1.5 Labour Standards

1.5.1 Ministry of Interior Notification (1977) Department of Labour set occupational safety standards concerned with the chemical substances in the working environment as follows:

a) Throughout normal working period within the place of operation where an employee works, the average, concentration of chemical substances in the atmosphere shall not exceed that specified in Table 2.

b) The employer shall not permit an employee to work, throughout his normal working period, in a place where the concentration of chemical substances in the atmosphere exceeds those specified in Table 3.

/c)

c) The employer shall not permit an employee to work in a place where the concentration of chemical substances exceeds those specified in Table 4.

d) The employer shall not permit an employee to work in a place where the average quantity of mineral dust in the atmosphere, throughout the normal working period, exceeds those specified in Table 5.

Table 1

Ambient Air Quality Standards

Pollutants \ Average values	1 hour	8 hours	24 hours	1 year	Method of measurement
	mg/m^3	mg/m^3	mg/m^3	mg/m^3	
Carbon monoxide	50	20	-	-	Non-dispersive infrared detection
Nitrogen dioxide	0.32	-	-	-	Gas phase chemiluminescence
Sulphur dioxide	-	-	0.30	0.10*	Pararosaniline
Total suspended particulates	-	-	0.33	0.10*	Gravimetric
Photochemical oxidant (Ozone)	0.20	-	-	-	Chemiluminescence
Lead	-	-	0.01	-	Wet ashing

Note: * refers to geometric mean value.

Table 2

Labour Standards

NO.	Substances	Amount of chemicals	
		p.p.m.	mg/m^3
1.	Aldrin	-	0.25
2.	Azinphos-methyl	-	0.2
3.	Chlordane	-	0.5
4.	D D T	-	1
5.	D D V P	-	1
6.	Dichlorvos	-	1
7.	Dieldrin	-	0.25
8.	Dimethyl 1,2-dibromo 2, 2 dichloroethyl phosphate (Dibrom)	-	3
9.	Endrin	-	0.1
10.	Guthion	-	0.2
11.	Lead arsenate	-	0.15
12.	Lindane	-	0.5
13.	Malathion	-	15
14.	Methoxychlor	-	15
15.	Nicotine	-	0.5
16.	Systox	-	0.1
17.	Thallium (soluble compounds) as Tl	-	0.1
18.	Thiram	-	5
19.	Toxaphene	-	0.5
20.	Parathion	-	0.11
21.	Phosdrin	-	0.1
22.	Pyrethrum	-	5
23.	Warfarin	-	0.1
24.	Carbaryl (Sevin (R))	-	5
25.	2, 4 - D	-	10
26.	Paraquat	-	0.5

/27.

Table 2 (Cont'd)

NO.	Substances	Amount of chemicals	
		p.p.m.	mg/m^3
27.	2,4,5 T	-	10
28.	Acetic acid	10	25
29.	Ammonia	50	35
30.	Arsenic and compounds (as As)	-	0.5
31.	Arsine	0.05	0.2
32.	Biphenyl	0.2	1
33.	Bisphenol A	0.5	2.8
34.	Carbon dioxide	5,000	9,000
35.	Carbon monoxide	50	55
36.	Chlorine	1	3
37.	Chlorine dioxide	0.1	0.3
38.	Chromium and Chromium compounds	-	1
39.	Copper fume	-	0.1
40.	Dust or mist of copper	-	1
41.	Cotton dust (raw)	-	1
42.	Cyanide as CN	-	5
43.	Ethyl alcohol (Ethanol)	1,000	1,900
44.	Fluoride (as F)	-	2.5
45.	Fluorine	0.1	0.2
46.	Hydrogen cyanide	10	11
47.	Iron oxide fume	-	10
48.	Methyl alcohol (Methanol)	200	260
49.	Nickel carbonyl	0.001	0.007
50.	Nickel, metal and soluble compounds, as Ni	-	1
51.	Nitric acid	2	5

/52.

Table 2 (Cont'd)

NO.	Substances	Amount of chemicals	
		p.p.m.	mg/m^3
52.	Nitric oxide	25	30
53.	Nitrogen dioxide	5	9
54.	Nitroglycerin	0.2	2
55.	Sodium hydroxide	-	2
56.	Sulphur dioxide	5	13
57.	Sulphuric acid	-	1
58.	Tetraethyl lead (as Pb)	-	0.075
59.	Tetramethyl lead (as Pb)	-	0.07
60.	Tin and Inorganic compounds of Tin	-	2
61.	Tin and Organic compounds of Tin	-	0.1
62.	Phenol	5	19
63.	Phosgene (Carbonyl chloride)	0.1	0.4
64.	Phosphine	0.3	0.4
65.	Phosphoric acid	-	1
66.	Phosphorus (yellow)	-	0.1
67.	Phosphorus pentachloride	-	1
68.	Phosphorus pentasulfide	-	1
69.	Phosphorus trichloride	0.5	3
70.	Xylene (Xylol)	100	435
71.	Zinc chloride fume	-	1
72.	Zinc oxide fume	-	5

Source: Ministry of Interior Notification (1977)
Department of Labour

/Table 3

Table 3

Labour Standards

NO.	Substances	Amount of chemicals	
		p.p.m.	mg/m^3
1.	Allyl glycidyl ether (AGE)	10	45
2.	Boron trifluoride	1	3
3.	Butylamine	5	15
4.	Tert - Butyl chromate (as CrO_3)	-	0.1
5.	Chlorine trifluoride	0.1	0.4
6.	Chloracetaldehyde	1	3
7.	Chloroform (trichloromethane)	50	240
8.	0 - Dichlorobenzene	50	300
9.	Dichloroethyl ether	15	90
10.	1, 1 - Dichloro - 1 - nitroethane	10	60
11.	Diglycidyl ether (DGE)	0.5	2.8
12.	Ethyl mercaptan	10	25
13.	Ethylene glycol dinitrate and/or Nitroglycerin	0.2	1
14.	Hydrogen chloride	5	7
15.	Iodine	0.1	1
16.	Manganese	-	5
17.	Methyl bromide	20	80
18.	Methyl mercaptan	10	20
19.	Methyl styrene	100	480
20.	Methylene bisphenyl isocyanate (MDI)	0.02	0.2
21.	Monomethyl hydrazine	0.2	0.35
22.	Terphenyls	1	9
23.	Toluene - 2, 4 - Diisocyanate	0.02	0.14
24.	Vinyl chloride	1	2.8

Source: Ministry of Interior Notification (1977)
Department of Labour.

/Table 4

Table 4

Labour Standards

No.	Material	Average concentration during normal work period	Concentration for a specified time		Acceptable concentration
			Concentration	Maximum Duration	
1.	Benzene	10 p.p.m	50 p.p.m	10 minutes	25 p.p.m
2.	Beryllium and Beryllium compounds	2 ug/M^3	25 ug/M^3	30 minutes	5 ug/M^3
3.	Cadmium fume	0.1 mg/M^3	-	-	3 mg/M^3
4.	Cadmium dust	0.2 mg/M^3	-	-	0.6 mg/M^3
5.	Carbon disulfide	20 p.p.m	100 p.p.m	30 minutes	30 p.p.m
6.	Carbon tetrachloride	10 p.p.m	200 p.p.m	5 minutes in any 4 hours	25 p.p.m
7.	Ethylene dibromide	20 p.p.m	50 p.p.m	5 minutes	30 p.p.m
8.	Ethylene dichloride	50 p.p.m	200 p.p.m	5 minutes in any 3 hours	100 p.p.m
9.	Formaldehyde	3 p.p.m	10 p.p.m	30 minutes	5 p.p.m
10.	Fluoride as dust	2.5 mg/M^3	-	-	-
11.	Lead and its inorganic compounds	0.2 mg/M^3	-	-	-
12.	Methyl chloride	100 p.p.m	300 p.p.m	5 minutes in any 3 hours	200 p.p.m
13.	Methylene chloride	500 p.p.m	2000 p.p.m	5 minutes in any 2 hours	1000 p.p.m
14.	Organo (alkyl) mercury	0.01 mg/M^3	-	-	0.04 mg/M^3
15.	Styrene	100 p.p.m	600 p.p.m	5 minutes in any 3 hours	200 p.p.m
16.	Trichloroethylene	100 p.p.m	300 p.p.m	5 minutes in any 2 hours	200 p.p.m
17.	Tetrachloroethylene	100 p.p.m	300 p.p.m	5 minutes in any 3 hours	200 p.p.m
18.	Toluene	200 p.p.m	500 p.p.m	10 minutes	300 p.p.m
19.	Hydrogen sulfide	-	50 p.p.m	10 minutes	20 p.p.m
20.	Mercury	-	-	-	0.05 mg/M^3
21.	Chromic acid and chromates	-	-	-	0.1 mg/M^3

Source: Ministry of Interior Notification (1977)
Department of Labour.

Table 5

Labour Standards

No.	Substances	Average amount of dusts throughout normal working time	
		Mppof	mg/M^3
1.	Silica:		
	Crystalline:		
	Quartz (Respirable dust)	$\frac{250}{\% SiO_2+5}$	$\frac{10\ mg/M^3}{\% SiO_2+2}$
	Quartz (Total dust)	-	$\frac{30\ mg/M^3}{\% SiO_2+2}$
	Cristobalite	$\frac{1}{2}\left[\frac{250}{\% SiO_2+5}\right]$	$\frac{1}{2}\left[\frac{10\ mg/M^3}{\% SiO_2+2}\right]$
	Tridymite	$\frac{1}{2}\left[\frac{250}{\% SiO_2+5}\right]$	$\frac{1}{2}\left[\frac{10\ mg/M^3}{\% SiO_2+2}\right]$
2.	Amorphous, including natural diatomacrous earth	20	$\frac{80\ mg/M^3}{\% SiO_2}$
3.	Silicates (less than 1% crystalline silica):		
	Asbestos	5*	-
	Tremolite	5*	-
	Talc (Asbestos form)	5*	-
	Talc (Non-asbestos form)	20	-
	Mica	20	-
	Soapstone	20	-
	Portland cement	50	-
	Graphite	15	-
	Coal dust (respirable fraction less than 5% SiO_2)	-	$2.4\ mg/M^3$
	Coa dust (for more than 5% SiO_2)	-	$\frac{10\ mg/M^3}{\% SiO_2+2}$
4.	Inert or Nuisance dust:		
	Respirable dust	15	$5\ mg/M^3$
	Total dust	50	$15\ mg/M^3$

* means fibres/1 cc. of air

Source: Ministry of Interior Notification (1977)
Department of Labour

3. JAPAN

1. Ambient Air Quality Standards

Sulphur Dioxide, Nitrogen Dioxide, Carbon Monoxide, Suspended Particulate Matter, Photochemical Oxidants

Sub-stance	Sulphur dioxide	Carbon Monoxide	Suspended particulate[1] matter	Nitrogen dioxide[3]	Photochemical[2] oxidants
Environ-mental condi-tions	Daily average of hourly values shall not exceed 0.04 ppm, and hourly values shall not exceed 0.1 ppm.	Daily average of hourly values shall not exceed 10 ppm, and average of hourly values in eight consecutive hours shall not exceed 20 ppm.	Daily average of hourly values shall not exceed 0.10 mg/m^3, and hourly values shall not exceed 0.20 mg/m^3.	Daily average of hourly values shall be within the range between 0.04 ppm and 0.06 ppm or below.	Hourly values shall not exceed 0.06 ppm.
Meas-uring methods	Conductome-tric method	Nondispersive infrared analizer method	Weight concentration measuring methods based on filtration collection, or light scattering method yielding values having a linear relation with the values of the above method	Colorimetry employing Saltzman reagent (with Saltzman's coefficient being 0.84)	Absorptiometry using neutral potassium iodide solution, or coulometry

Notes:
1. Suspended particulates matter shall mean airborn particles of 10 microns or less in diameter.
2. Photochemical oxidants are oxidizing substances such as ozone and paroxiacetyl nitrate produced by photochemical reactions (only those capable of isolating iodine from neutral potassium iodide, excluding nitrogen dioxide).
3. a) In an area where the daily average of hourly values exceeds 0.06 ppm, efforts should be made to achieve the level of 0.06 ppm by 1985.
   b) In an area where the daily average of hourly values is within the range between 0.04 ppm and 0.06 ppm, efforts should be made so that the ambient concentration be maintained around the present level within the range or not significantly exceed the present level.
   c) Not only emission control measures against individual sources but also other various countermeasures should be implemented in an integrated, effective and appropriate manner in order to maintain or achieve the ambient air quality standard.

2. Emission Standards

(1) Sulphur Oxides (Latest revision, Sept. 28, 1976)

(i) Sulphur oxides emission standard

The emission standard for sulphur oxides which applies at a given sulphur oxides emitting facility may be calculated by inserting a value (K), specified under Cabinet Order for the region that the facility is in, into the following equation:

$$q = K \times 10^{-3} \times He^2$$

Here, q is the hourly volume of sulphur oxides emitted (in units of Nm^3) and He, effective height of stack, is the sum of actual height of stack and smoke ascent height. The size of K, which varies according to the region, inversely determines the degree of regulation, for the effect of a reduction in K is a much stiffer control standard. The standard for sulphur oxide has hence been labelled the "K-value regulation."

The general emission standard for sulphur oxides (the K value) was strengthened on September 28, 1976, and as a result all of Japan is now controlled under sixteen K ranks ranging from 3.00 to 17.5.

(ii) Regulation on fuel

The regulation on fuel quality under the Article 15 of the Air Pollution Control Law was revised in September 1976. Asahikawa was added to the previous list of 14 areas (Tokyo, Osaka, etc.)

The regulation standards were upgraded to a sulphur content ranging from 0.5 to 1.2 per cent.

/Regulation

Regulation on sulphur oxides emission (K value)

a) General standards

	Area	K value
1	6 areas: Central Tokyo, Yokohama•Kawasaki, Nagoya, Yokkaichi, Osaka•Sakai, Kobe•Amagasaki	3.0
2	21 areas: Chiba, Fuji, Kyoto, Himeji, Mizushima, Kitakyushu and others	3.5
3	1 area: Sapporo	4.0
4	4 areas: Hitachi, Kashima and others	4.5
5	3 areas: Toyama, Kure, Tohyo	5.0
6	9 areas: Annaka, Niigata, Okayama, Shimonoseki and others	6.0
7	3 areas: Tomakomai, Hachioji, Kasaoka	6.42
8	6 areas: Sendai, Fukui, Hiroshima and others	7.0
9	8 areas: Asahikawa, Utsunomiya, Mihara, Tokushima and others	8.0
10	8 areas: Akita, Kanazawa, Ohtsu, Fukuoka, Nagasaki and others	8.76
11	6 areas: Takasaki, Urawa, Narita, Naha and others	9.0
12	4 areas: Shizuoka, Sasebo and others	10.0
13	15 areas: Hakodate, Gifu, Takamatsu, Minamata and others	11.5
14	6 areas: Mishima, Kurume and others	13.0
15	20 areas: Aomori, Morioka, Yamagata, Nagano, Kagoshima and others	14.5
16	Other areas	17.5

b) Special standards

6 areas:	Central Tokyo, Osaka Sakai, Yokohama•Kawasaki, Kobe•Amagasaki, Yokkaichi, Nagoya	1.17
8 areas:	Chiba, Fuji, Himeji, Mizushima, Kitakyushu and others	1.75
14 areas:	Kashima, Toyama, Kyoto, Fukuyama, Ohmuta, Ohita and others	2.34

Note: Special standards are applied to newly constructed facilities only.

/(2) Soot

(2) Soot and Dust (Latest amendment, June 22, 1971)

(Unit: g/Nm^3)

Name of facility	Ordinary emission standard			Special emission standard	
	large scale	small scale		large scale	small scale
Boilers (using liquid fuels or gas)	0.10	0.20	0.30	0.05	0.20
Boilers (using lower-grade coal)	0.80			0.40	
Boilers (of other types using coal, etc.)	0.40			0.20	
Gas generating furnace, catalytic regeneration tower	0.60			0.40	
Roasting furnace, sintering furnace, calcining furnace converter (combustion type), openhearth furnace	0.30	0.40		0.20	
Blast furnace	0.10			0.05	
Heating furnace, converter (excepting the combustion type), petroleum pipe stills, sulphur-collecting combustion furnace.	0.20			0.10	
Lime stone calcining furnace (underground furnace), aggregate drying furnace	0.80			0.40	
Lime stone calcining furnace (others), electric furnace (for steel making)	0.60			0.30	
Electric furnace	0.40			0.20	
Blast furnace (of types not covered by any of the above items), metal melting furnace, metal-heating furnace, calcining and melting furnace (excepting lime stone calcining furnace), reactors, direct fire furnace, drying furnace (other than aggregate drying furnace), electric furnace (of types not covered by any of the above items)	0.20	0.40		0.10	0.20
Glass melting furnace (crucible furnace)	0.50			0.50	
Waste incinerator (continuous furnace)	0.20	0.70		0.10	0.20
Waste incinerator (others)	0.70			0.40	

Notes:
1. Prefectures may, by decree, set more stringent standards.
2. The gas emission rate of 40,000 Nm^3/h is the criterion used for scale classification. However, heavy oil boilers alone are classified into three scales with the criteria of 200,000 Nm^3/h and 40,000 Nm^3/h for ordinary emission standards.
3. For further details, refer to Table 2 attached to the Enforcement Ordinances of the Air Pollution Control Law.
4. Nm^3 signifies cubic metre of air at 20°C temperature, and 760 mm. pressure.

/(3) Harmful

(3) Harmful Substances (June 22, 1971)

Name of substance	Name of facility	Standard value
Cadmium and its compound	Baking furnace and smelting furnace for manufacturing glass using cadmium sulfide or cadmium carbonate as raw material	1.0 mg/Nm^3
	Calcination furnace, sintering furnace, smelting furnace, converter and drying furnace for refining copper, lead or cadmium	
	Drying facility for manufacturing cadmium pigment, or cadmium carbonate	
Chlorine	Chlorine quick cooling facility for manufacturing chlorinated ethylene	30 mg/Nm^3
	Dissolving tank for manufacturing ferric chloride	
	Reaction furnace for manufacturing activated carbon using zinc chloride	
	Reaction facility and absorbing facility for manufacturing chemical products	
Hydrogen chloride	Same as above	80 mg/Nm^3
	Waste incinerator	700 mg/Nm^3
Fluorine, hydrogen fluoride, and silicon fluoride	Electrolytic furnace for smelting aluminium (Harmful substances are emitted from discharge outlet)	3.0 mg/Nm^3
	Electrolytic furnace for smelting aluminium (Harmful substances are emitted from top)	1.0 mg/Nm^3
	Baking furnace and smelting furnace for manufacturing glass using fluorite or sodium silico-fluorate as raw material	1.0 mg/Nm^3
	Reaction facility, concentrating facility and smelting furnace for manufacturing phosphoric acid	
	Condensing facility, absorbing facility and distilling facility for manufacturing phosphoric acid	
	Reaction facility, drying facility and baking furnace for manufacturing sodium tripoli-phosphate	
	Reaction furnace for manufacturing super-phosphate of lime	15 mg/Nm^3
	Baking furnace and open-hearth furnace for manufacturing phosphoric acid fertilizer	20 mg/Nm^3
Lead and its compound	Calcination furnace, drying furnace, smelting furnace, and drying furnace for refining copper, lead, or zinc	10 mg/Nm^3
	Sintering furnace and blast furnace for refining copper, lead or zinc	30 mg/Nm^3
	Smelting furnace etc. for secondary refining of lead, for manufacturing lead pipe, sheet, wire, lead storage battery or lead pigment	10 mg/Nm^3
	Baking furnace and smelting furnace for manufacturing glass using lead oxides as raw materials	20 mg/Nm^3

Note: Prefectures may, by decree, set more stringent standards.

/(4) Nitrogen

(4) Nitrogen Oxides (as of August 2, 1979) (Abstract)

Type of facility		Unit: 1,000 Nm³/h	Date of installing / On (%)	Standard value (ppm)				
				before Aug. 9, '73	after Aug. 10, '73 before Sept. 9, '75	after Sept. 10, '75 before June 17, '77	after June 18, '77 before Aug. 9, '79	after Aug. 10, '79
Boiler	Gas firing	500 and above	5	130		100	60	
		100 ~ 500					100	
		40 ~ 100		130				100
		10 ~ 40		150		130		
		5 ~ 10		150				
		less than 5						
	Solid material firing	100 and above	6	till Apr. 30, '80: 600 from May 1, '80: 480	480		400	
		40 ~ 100		till Aug. 9, '82: 600 from Aug. 10, '82: 480				
		10 ~ 40		till Aug. 9, '82: 600, from Aug. 10, '82: 480		480		
		5 ~ 10		from May 1, '80: 480				
		less than 5		from Aug. 10, '84: 480				
	Liquid firing	500 and above	4	till Apr. 30, '80: 230 from May 1, '80: 180	180	150	130	
		100 ~ 500		till Apr. 30, '80: 230 from May 1, '80: 190		150		
		40 ~ 100		190				
		10 ~ 40		from May 1, '80: 230				
		5 ~ 10		(~Sept. 9, '77) from Oct. 1, '80: 250 (~Sept. 9, '77) from Aug. 10, '84: 230			(Sept. 10, '77~): 180	
		less than 5						
Sintering furnace		100 and above	15	from May 1, '80: 260			220	
		10 ~ 100		from May 1, '80: 270				
		less than 10		from Aug. 10, '82: 300				220
Calcination furnace			10	from Aug. 10, '82: 200				200
Roasting furnace			14	from Aug. 10, '82: 250				220
Blast furnace			15	from Aug. 10, '82: 120				100
Metal smelting furnace			12	from Aug. 10, '82: 200				180
Metal heating furnace (Radiant type)		100 and above	11	till Apr. 30, '80: 220 from May 1, '80 200	200	100		
		40 ~ 100		200		150		
		10 ~ 40						
		5 ~ 10		from May 1, '80: 200			150	
		less than 5		from Aug. 10, '82: 200			180	
Metal heating furnace (Others)		100 and above	11	till Apr. 30, '80: 220 from May 1, '80: 160	till Apr. 30, '80: 200 from May 1, '80: 160	100		
		40 ~ 100		till Apr. 30, '80: 220 from May 1, '80: 170	till Apr. 30, '80: 200 from May 1, '80: 150	150	130	
		10 ~ 40		till Aug. 9, '82: 200, from Aug. 10, '82: 170				
		5 ~ 10		from May 1, '80: 170			150	
		less than 5		from Aug. 10, '82: 200			180	
Petroleum heating furnace		100 and above	6	till Apr. 30, '80: 210 from May 1, '80: 170	170	100		
		40 ~ 100		180	150		130	
		10 ~ 40						
		5 ~ 10		from May 1, '80: 180			150	
		up to 5		from Aug. 10, '82: 200			180	
Cement calcination furnace		100 and above	10	from Apr. 1, '81 480		250		
		less than 100		from Apr. 1, '81: 480			350	
Glass melting furnace			15	from Aug. 10, '82: 500				450
Drying furnace			16	from Aug. 10, '82: 250				230
Waste incinerator		40 and above	12	from Aug. 10, '82: 300			250	
		less than 40		from Aug. 10, '82: 300				250
Nitric acid production facility			Os	200				
Coke oven		100 and above	7	from May 1, '80: 350		200	170	
		less than 100		from May 1, '80: 350				

Notes:
1. Reference to Unit, the symbol "~" means "and above/less than": e.g. a ~ b means a and above/less than b
2. The NOx emission concentration shall be converted through the following equation. (Except in the case of nitric acid production facilities.)

$$C = \frac{21 - On}{21 - Os} Cs$$

C: NOx emission concentration
On: Oxygen concentration in flue gas (set values in the above table)
Os: Actual oxygen concentration in flue gas
Cs: Actual nitrogen oxides emission concentration

Source: Quality of the Environment in Japan 1979. Environment Agency.

2. Permissible Limits of Motor Vehicle Exhaust Gas

					Application date: New model vehicle	Application date: Existing model vehicle	Standards (maximum permissible limits)
Gasoline- or LPG-fueled vehicles	Carbon monoxide (CO)	New vehicle	Control by driving cycle	4-mode	September 1, 1966	September 1, 1967	3.0% for gasoline-fueled ordinary motor vehicle and small-size motor vehicle
					September 1, 1969	January 1, 1970 April 1, 1970**	2.5% for gasoline-fueled ordinary motor vehicle and small-size motor vehicle **for truck and bus
					January 1, 1971	January 1, 1971	1.5% for LPG-fueled ordinary motor vehicle and small-size motor vehicle 3.0% for light motor vehicle
				10-mode	April 1, 1973	December 1, 1973	26.0g/km for gasoline-fueled passenger car, 18.0g/km for LPG-fueled passenger car (all vehicles except heavy-duty vehicle)
				Gasoline 6-mode			1.6% for gasoline-fueled vehicle, 1.1% for LPG-fueled vehicle (heavy-duty vehicle)
				10-mode	April 1, 1975	December 1, 1975	2.7g/km for passenger car, 17.0g/km for truck and bus (all vehicles except heavy-duty vehicle)
				11-mode		(April 1, 1976)	85.0g/test for passenger car, 130.0g/test for light-duty vehicle (all vehicles except heavy-duty vehicle)
			Idling		August 1, 1970	August 1, 1970	4.5%
		Vehicle in use	Idling		August 1, 1970	August 1, 1970	5.5%
					October 1, 1972	October 1, 1972	4.5%
	Hydrocarbon (HC)	New vehicle	Blow-by gas control		September 1, 1970	January 1, 1971	Installation of blow-by gas recirculation device
			Fuel evaporative gas control		July 1, 1972	April 1, 1973	Installation of fuel evaporative emission control device (2.0g/test)
			Control by driving cycle	10-mode	April 1, 1973	December 1, 1973	3.8g/km for gasoline-fueled vehicle, 3.2g/km for LPG-fueled vehicle (all vehicles except heavy-duty vehicle), 22.5g/km for light motor vehicle with two-stroke engine
				Gasoline 6-mode			520 ppm for gasoline-fueled vehicle, 440 ppm for LPG-fueled vehicle (heavy-duty vehicle)
				10-mode	April 1, 1975	December 1, 1975 (April 1, 1976)	0.39g/km for passenger car, 2.7g/km for truck and bus, 15.0g/km for truck of light motor vehicle with two-stroke engine (all vehicles except heavy-duty vehicle)
				11-mode			9.5g/test for passenger car, 17.0g/test for truck and bus, 70.0g/test for truck of light motor vehicle with two-stroke engine (all vehicles except heavy-duty vehicle)
		Vehicle in use	Device installation		May 1, 1973	May 1, 1973	Installation of HC/NOx reduction device and adjustment of spark timing
			Idling		January 1, 1975	January 1, 1975	1,200 ppm for passenger car and bus with four-stroke engine, 7,800 ppm for passenger car and bus with two-stroke engine, 3,300 ppm for passenger car and bus with special structure engine
					June 1, 1975	June 1, 1975	1,200 ppm for truck with four-stroke engine, 7,800 ppm for truck with two-stroke engine, 3,300 ppm for truck with special structure engine

	Nitrogen oxides (NOx)	New vehicle	Control by driving cycle	10-mode	April 1, 1973	December 1, 1973	3.0g/km (all vehicles except heavy-duty vehicle) 0.5g/km for light motor vehicle with two-stroke engine
				Gasoline 6-mode			2,200 ppm for heavy-duty vehicle
				10-mode	April 1, 1975	December 1, 1975 (April 1, 1976)	1.6g/km for passenger car, 2.3g/km for truck and bus, 0.5g/km for light motor vehicle with two-stroke engine (all vehicles except heavy-duty vehicle)
				11-mode			11.0g/test for passenger car, 20.0g/test for truck and bus, 4.0g/test for light motor vehicle with two-stroke engine (all vehicles except heavy-duty vehicle)
				10-mode	April 1, 1976	March 1, 1977 (March 31, 1978)	0.84g/km for passenger car with EIW of 1 ton or less, 1.2g/km for passenger car with EIW of more than 1 ton and passenger car of light motor vehicle with four-stroke engine, 0.5g/km for light motor vehicle with two-stroke engine
				11-mode			8.0g/test for passenger car with EIW of 1 ton or less, 9.0g/test for passenger car with EIW of more than 1 ton and passenger car of light motor vehicle with four-stroke engine, 40g/test for light motor vehicle with two-stroke engine
				Gasoline 6-mode	August 1, 1977	April 1, 1978	1,850 ppm for heavy-duty vehicle
				10-mode	April 1, 1978 (April 1, 1981)	March 1, 1979 (April 1, 1981)	0.48g/km for passenger car
				11-mode			6.0g/test for passenger car
				10-mode	January 1, 1979 (April 1, 1981)	December 1, 1979 (April 1, 1981)	1.4g/km for truck and bus (light-duty vehicle) 1.6g/km for truck and bus (medium-duty vehicle and light motor vehicle)
				11-mode			10g/test for truck and bus (light-duty vehicle) 11g/test for truck and bus (medium-duty vehicle and light motor vehicle)
				Gasoline 6-mode			1,390 ppm for truck and bus (heavy-duty vehicle)
				10-mode	January 1, 1981 (April 1, 1983)	December 1, 1981 (April 1, 1983)	0.84g/km for truck and bus (light-duty vehicle)
				11-mode			8.0g/test for truck and bus (light-duty vehicle)
				10-mode	December 1, 1981 (April 1, 1984)	November 1, 1982 (April 1, 1984)	1.26g/km for truck and bus (medium-duty vehicle)
				11-mode			9.5g/test for truck and bus (medium-duty vehicle)
		Vehicle in use	Device installation		May 1, 1973	May 1, 1973	Installation of HC/NOx reduction device and adjustment of spark timing
Diesel-powered vehicles	CO,HC,NOx	New vehicle	Control by driving cycle	Diesel 6-mode	September 1, 1974	April 1, 1975	CO 980 ppm, HC 670 ppm, NOx 590 ppm (1,000 ppm for direct injection type)
	NOx				August 1, 1977	April 1, 1978	500 ppm (850 ppm for direct injection type)
					April 1, 1979 (April 1, 1981)	March 1, 1980 (April 1, 1981)	450 ppm (700 ppm for direct injection type)
	Particulates (Diesel smoke)		Full-load test		July 1, 1972	July 1, 1972	Rate of contamination 50%
		Vehicle in use	No-load acceleration test		January 1, 1975	January 1, 1975	Rate of contamination 50%

Notes: 1. Light-duty vehicle – an ordinary car or small-sized car weighing less than 1,700 kg.
2. Medium-duty vehicle – an ordinary car or small-sized car weighing 1,700 up to 2,500 kg.
3. Heavy-duty vehicle – an ordinary car or small-sized car, excluding passenger car, weighing more than 2,500 kg.
4. "All vehicles except heavy-duty vehicle" – all vehicles except truck and bus weighing more than 2,500 kg.
5. Application date in the parentheses is also applied to the imported cars.

Source: Quality of the Environment in Japan, 1979.

Part 3

NOISE STANDARDS

1. THAILAND

1. Noise Level Standards for Industry

Ministry of Industry Notification (Document No. 4, 1971). It is necessary for licence to provide effective ear plugs to persons in a factory which has noise level exceeding 80 dB.

2. Noise Level Standards for Automobiles

Road Traffic Police Notification (1971). Noise level produced by machines and any part of automobiles during normal operation shall not exceed 95 dB when the measurement is made at 7.5 metres from the vehicle using either Bruel and Klaer of Denmark or G.R. (General Radio Co. of USA) sound level metre. In 1972, the additional sound level metre, Cosmocord of England, was accepted for measurement of noise level from automobiles.

3. Noise Level Standard for Launches

Habour Department Notification (No. 38/1972). Maximum allowable noise levels produced by launches is designated at 90 dB when the measurement is made at 7.5 metres around a stationary launch with the engine accelerated at 2/3 of maximum engine speed by using international standard instruments and measuring techniques.

4. Labour Standards

Ministry of Interior Notification (1976). The Department of Labour set the following requirements to be met by an employer to ensure safe working conditions for employees

a) Employees shall not be continuously exposed to noise levels greater than 91 dB (A) for more than 7 hours per day.

/b)

b) If the working day is more than 7 hours but less than 8 hours, employees shall not be continuously exposed to noise level exceeding 90 dB (A).

c) For more than 8 hours workday, employees shall not be continuously exposed to noise levels exceeding 80 dB (A).

d) Employees shall not be permitted to work under conditions in which the noise level exceeds 140 dB (A).

2. PHILIPPINES

Section 78 Ambient Noise Quality Standards

(a) Classification of General Areas:

For purposes of establishing ambient noise quality standards, areas within any city, region or center of urban living shall be classified by the Commission as follows:

Class AA - a section or contiguous area which requires quietness, such as areas within 100 metres from school sites, nursery schools, hospitals, and special homes for the aged.

Class A - A section or contiguous area which is primarily used for residential purposes.

Class B - A section or contiguous area which is primarily a commercial area.

Class C - A section primarily reserved as a light industrial area.

Class D - A section which is primarily reserved as a heavy industrial area.

(b) The maximum alloable noise levels in general areas shall be those as indicated in Table 1.

Table 1

Environmental Quality Standards for Noise in General Areas

Category of Area	Daytime	Morning and Evening	Night time
AA	50 db	45 db	40 db
A	55 db	50 db	45 db
B	65 db	60 db	55 db
C	70 db	65 db	60 db
D	75 db	70 db	65 db

/(1)

(1) The standards are applied to the arithmetic median of at least seven readings at the point of maximum noise level.

(2) The division of the 24-hr. period shall be as follows:

Morning	5.00 A.M. to 9.00 A.M.
Daytime	9.00 A.M. to 6.00 P.M.
Evening	6.00 P.M. to 10.00 P.M.
Night time	10.00 P.M. to 5.00 A.M.

Section 79 Measurement of Noise Level

(a) Noise level shall be measured by a standard sound level metre that meets the specifications of the American National Standards Institute (ANSI) S1.4-1971, or other specifications accepted by the Commission. The weighting network with "A" characteristics shall be used for measurement.

(b) The method of measurement of noise shall be as follows:

(1) The figure indicated by a sound level meter where its indicator shows no fluctuations or only small fluctuations.

(2) Where the indicator of a sound level meter records periodic or intermittent fluctuations with the highest peaks almost regular, the average of the highest peaks for respective fluctuations is recorded.

(3) Where the indicator of a sound level meter records irregular and big fluctuations, the figure on the higher end of the 90 per cent range of the levels is recorded.

(c) For point of fixed sources of pollution, the noise level shall be measured at the boundary line of the factory site or establishment, or at 30 metres from the boundary of a construction site.

Source: Official Gazette, Republic of the Philippines Vol. 74, No. 23, 5 June 1978.

/3. JAPAN

3. JAPAN

1. NOISE (25 May 1971, Cabinet Decision)

(i) Standard values

(a) General area

(in dB(A))

Category of areas	Division of hours		
	Daytime	Morning & evening	Night time
	Not more than	Not more than	Not more than
AA	45	40	35
A	50	45	40
B	60	55	50

Note: Standard values vary depending on the area type. Therefore, classification of areas is left to the discretion of prefectural governors.

AA - Areas which require particular quiet. For instance, areas where medical facilities are concentrated.
A - Primarily residential areas.
B - Areas where a substantial number of residences are located among shops and factories.

(b) Roadside areas

(in dB(A))

Categories of areas	Division of hours		
	Daytime	Morning & evening	Night time
	Not more than	Not more than	Not more than
Type A areas bordering on a two-lane road	55	50	45
Type A areas bordering on a more than two-lane road	60	55	50
Type B areas bordering on a not more than two-lane road	65	60	55
Type B areas bordering on a more than two-lane road	65	65	60

(ii) Target dates

These standards must be achieved immediately in general areas and within five years in areas adjacent to roads. However, in areas near main roads with heavy traffic a lead period longer than five years is allowed for the achievement of the standards, but must be achieved at

/an

an earliest possible date.

(iii) Exemptions

These environmental standards are not applicable to aircraft noise, railway noise, and noise resulting from construction works.

(3) Environmental Quality Standards for Aircraft Noise (Dec. 27, 1973)

(i) Environmental quality standards

a. The values of the environmental quality standards are established for each category for area shown in Table 1. Prefectural governors shall designate the category of area.

Table 1.

Category of area	Standard value (in WECPNL)
I	70 or less
II	75 or less

Note: Area category I stands for the area for exclusively residential use and area category II for the other area where normal living conditions should be preserved.

b. The environmental quality standards values referred in paragraph a. above are measured and evaluated by the following method:

(i) Peak levels in dB(A) of aircraft noise which is higher than background noise level by 10 dB(A) or more, and the number of such aircraft, should be recorded for, in principle, seven consecutive days.

(ii) Measurements should be carried out outdoors, at points selected as representing the points of aircraft noise in the area concerned.

(iii) Timing of measurements should be chosen as representing the duration of aircraft noise at the point of measurements, taking into consideration the flight conditions and meteorological conditions including wind directions.

(iv) The aircraft noise shall be evaluated as follows. The WECPNL values for each day will be calculated from peak levels of aircraft noise and numbers recorded under subparagraph (i) using the following equation. The energy mean of daily WECPNL values thus calculated is the noise level in question.

$$WECPNL = dB(A) + 10 \log_{10} N - 27$$

Note: dB(A) stands for energy mean of all peak levels of any one day and N stands for value calculated by the following equation: $N = N_2 + 3N_3 + 10(N_1 + N_4)$, where N, is the number of aircraft between 0:00 a.m. and 7:00 p.m., N_1 the number between 7:00 a.m. and 7:00 p.m., N_2 the number between 7:00 p.m. and 10:00 p.m., and N_3 the number between 10:00 p.m. and 12:00 p.m., and N_4 the number between 10:00 p.m. and 12:00 p.m.

(v) The instrument of measurement to be used in any one of the following: the sound level meter provided for in Japanese Industrial Standard C-1502, precision sound level meter under International Electric Standards Conference Pub/179, or any other equivalent instrument.

In these cases, A-wighted calibration and slow dynamic response should be used.

c. The environmental quality standards provided for in paragraph a. shall not apply to areas around airports where there are 10 or less daily landings and take-offs and around those in remote islands.

(ii) Target dates

a. In areas around public airports and others, the environmental quality standards shall be attained and maintained before the target dates specified for each category of airports shown in Table 2. In these cases, in the areas where target dates are more than five years away, the improvement goals in Table 2 shall be attained as an interim measure in order to facilitate the attainment of the environmental quality standards step by step.

b. In areas around airports used by the Self Defense Forces, etc., efforts shall be made to attain and maintain the environmental quality standards before same target dates as those for the category of public airports under similar conditions in Table 2, considering the average number of landings and take-offs, type of aircraft and concentration of houses.

c. In areas where it is deemed difficult to attain the environmental quality standards before the target dates in spite of the comprehensive measures to be taken to control aircraft noise, such measures should be taken as sound-proofing of the houses of people wishing to remain in the area, with a view to obtaining the indoor conditions effectively equivalent to ones where the environmental quality standards are being met, and maximum endeavours shall be made to attain the environmental quality standards as soon as possible.

Table 2.

Airport categories		Target dates	Improvement goals
Airport to be built in future		Immediately	
Third class and equivalent airports		Immediately	
Second class airports except Fukuoka Airport	A	Within five years	
	B	Within ten years	Within five years to attain less than 85 WECPNL (or 65 WECPNL or less indoors in areas exceeding
New Tokyo International Airport			
First class airports (excepting New Tokyo International Airport) and Fukuoka Airport		As soon as possible within ten years or more	1. Within five years to attain less than 85 WECPNL (or 65 WECPNL or less indoors in areas exceeding 85 WECPNL) 2. Within ten years to attain less than 75 WECPNL (or 60 WECPNL or less indoors in areas exceeding 75 WECPNL)

Notes: 1. Airports were categorized as of effective date of these standards.
2. Airports of category B of second class are those where there are regular commercial landings and take-offs of aircrafts equipped with turbo-jet engines, and category A means the others.
3. The dates indicated in Table 2 are to be counted from the date of establishment of the environmental quality standards.

(4) Environmental Quality Standards for Shinkansen Superexpress Railway Noise (July 20, 1975)

(i) Environmental quality standards

a. The values of the environmental quality standards are established for each category of area shown in Table 1. Prefectual governors shall designate the category of area.

Table 1.

Category of area	Standard value (in dB(A))
I	70 or less
II	75 or less

Note: Area category I stands for the area for mainly residential use and area category II for other areas, including commercial and industrial areas, where normal living conditions should be preserved.

b. The environmental quality standards values referred in paragraph a. above are measured and evaluated by the following method:

(i) Measurements should be carried out by recording the peak noise level of each of Shinkansen trains passing in both directions, regarding, in principle, 20 successive trains.

(ii) Measurements should be carried out outdoors and in principle at the height of 1.2 meters above the ground. Those measurement points should be selected, which are seen to represent the Shinkansen railway noise levels in the area concerned, as well as those points where the noise is posing a problem.

(iii) Measurements are to be avoided when special weather conditions prevail and when train speeds are slower than normal.

(iv) The Shinkansen railway noise should be evaluated by the energy mean value of the higher half of the measured peak noise levels.

(v) Instruments that meet the requirements listed in Article 88 of the Measuring Law (Statute No. 207 of 1951) should be used for the measurements, with A-weighted calibration and slow dynamic response.

c. The environmental quality standards provided for in paragraph a. shall apply to Shinkansen railway noise from 6 a.m. to 12 midnight.

(ii) Target dates

a. Efforts shall be made in co-operation with related administrations and prefectural governments to attain and maintain the environmental quality standards before the target dates specified for each classification of zones along the railway line as shown in Table 2.

In areas where it is deemed difficult to attain the environmental quality standards before the target dates in spite of the comprehensive measures to be taken to control the Shinkansen railway noise, such measures should be taken as sound-proofing of houses, with a view to obtaining the indoor conditions effectively equivalent to ones where the environmental quality standards are being fulfilled.

When endeavours fail to satisfy the standards within target dates, such efforts are to be continued to attain them as soon as possible.

TABLE 2

Classification of zone along the railway			Target dates for achievement		
			Existing lines	Lines under construction	Future lines
A	Zones exceeding 80 dB (A)		Within 3 years	On start of service	On start of service
B	Zones ranging between 75 and 80 dB (A)	a	Within 7 years	Within 3 years after inauguration	
		b	Within 10 years		
C	Zones rainging between 70 and 75 dB (A)		Within 10 years	Within 5 years after inauguration	

Notes: 1. The subdivision a. under the B classification stands for zones within the region in which there is a succession of category I area, and subdivision b. stands for zones except subdivision a.

2. The existing line signifies the superexpress railway connecting Tokyo and Hakata (Fukuoka Pref.), and the lines under construction refer to those which will, when completed, run between Tokyo and Morioka (Iwate Pref.), between Omiya (Saitama Pref.) and Niigata (Niigata Pref.) and between Tokyo and Narita (Chiba Pref.) respectively.

3. The dates indicated in Table 2 are to be counted from the date of establishment of the environmental quality standards.

Source: Quality of the Environment in Japan, 1979
Environment Agency.

2. Maximum Permissible Limits of Automobile Noise

(Unit: phon)

Types of vehicle		Constant running noise & exhaust noise	Accelerating running noise		Effective date of accelerating running noise 1979 reg.
			Current reg.	1975 reg.	
Ordinary, small-sized and light-duty cars (excluding those exclusively used for carrying passengers with a riding capacity of 10 persons or less, and two-wheeled motor vehicles)	Those vehicles of which total weight exceeds 3.5 tons and maximum power exceeds 200 HP	80	89	86	New model vehicles January 1, 1979 (April 1, 1979) Existing model vehicles December 1, 1979 (March 1, 1980)
	Those vehicles of which total weight exceeds 3.5 tons with maximum power under 200 HP	78	87		
	Those vehicles of which total weight under 3.5 tons	74	83		
Ordinary, small-sized and light-duty cars exclusively used for carrying passengers with a riding capacity of 10 persons or less (excluding two-wheeled motor vehicles)		70	82	81	New model vehicles January 1, 1979 (April 1, 1979) Existing model vehicles Sept. 1, 1979 (March 1, 1980)
Motorcycles (those of which displacement exceeds 125 cc)		74	83	78	New model vehicles April 1, 1979 Existing model vehicles March 1, 1980
Motor-driven cycles (those of which displacement less than 125 cc)		70	79	75	

Notes: 1. The effective dates in parentheses apply to light oil-fueled vehicles.
2. Imported vehicles will be regulated from April 1, 1981.

Source: Quality of the Environment in Japan, 1979
Environment Agency.

Request standard for road traffic vibration
(Enforcement Regulation of Vibration Regulation Law promulgated on November 10, 1976)

Area \ Time	Daytime	Night-time
I	65 dB	60 dB
II	70 dB	65 dB

Notes: The Areas I and II are areas which have been designated by the prefectural governors concerned.

Classification of areas is as follows:

1) Area I
Areas are those which require particular quietness in order to preserve a better living environment, and those which need quietness preserved to enable their use as residential areas.

2) Area II
Areas are those which are being used for commercial and industrial use, as well as residential purposes, in which excessive vibration needs to be prevented and those which mainly serve industrial purposes in which there is need of measures to prevent living environment from deteriorating.

Source: Quality of the Environment in Japan, 1979.
Environment Agency, Japan.

4. CANADA

Table 131-1
Indoor Sound Level Limits

Type of Space	Equivalent Sound Level (L_{eq}), dBA
Bedrooms, sleeping quarters, hospitals, etc. (Time period 23:00-07:00 hours)	40
Living rooms, hotels, motels, etc. (Time period 07:00-23:00 hours)	45
Individual or semi-private offices, small conference rooms, reading rooms, classrooms, etc. (Time period 07:00-23:00 hours)	45
General offices, reception areas, retail shops and stores, etc. (Time period 07:00-23:00 hours)	50

Table 131-2
Sound Level Limits for Outdoor
Recreational Areas (07:00-23:00 hours)

Sound Descriptor for the Entire Period	Sound Level Limit, dBA
L_{50}	52
L_{eq}	55

Table 131-3
Sound Level Limits for Outdoor
Areas (23:00-07:00 hours)

Sound Descriptor for the Entire Period	Sound Level Limit, dBA
L_{50}	47
L_{eq}	50

Source: "Model Municipal Noise Control by Law." Revised May 1976. Ministry of Environment. Ontario, Canada.

5. UNITED KINGDOM

Table 9.3

United Kingdom: Noise Standards in Force (1970)
(Source: OECD, 1970)

Class of Vehicle	1970 Limits (dBA)
Motorcycles	
Not more than 50 cc	77
More than 50 cc but not more than 125 cc	82
More than 125 cc but not more than 500 cc	86
More than 500 cc	86
Passenger cars	84
Light goods vehicle not less than 3.5 tons gross weight	85
Motor tractor not more than 1.5 tons	89
Heavy vehicles	
Of not more than 200 h.p.	89
Of more than 200 h.p.	92

Source: "The Impact of Noise Pollution" by George Bugliarello, et al. Pergamon Press, New York. 1976.

6. U.S.A.

In the United States, Federal regulation of noise in work places is part of the general Occupational Safety and Health Act (OSHA) of 1970, the aim of which is "to assure so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources" (U.S. Public Law, 1970).

The Act adopts noise regulations from the Walsh-Healey Act of 1967 (which was limited to industries with government contracts exceeding $10,000 a year), and extends these to cover all employees in businesses affecting interstate commerce. The Act further authorizes the Secretary of Labor to promulgate as occupational safety and health standards any national consensus standards which he finds relevant. The latter term refers to pre-existing rules or standards which have won general (government, industry, and union) acceptance in other contexts.

Although its jurisdiction is nationwide, the Act includes provisions for having the states take over enforcement activities as long as their standards and procedures are at least as effective as the Federal law.

In general the laws provide standards regarding: toxic materials as harmful physical agents; prescription of labels warning of hazards; provision of suitable protective equipment; and monitoring employee exposure to hazards, as well as frequency and medical examinations. Inspectors are allowed to make investigations, which may be on the behalf of an employee or his union, and to issue citations for violations. The Occupational Safety and Health Review Commission, a new quasi-judicial body, has been established to review appeals and set civil and criminal penalties for violations.

The section of the Occupational Safety and Health Standards that deals with noise (Section 1910.95), (U.S. Federal Register, 1972), is divided into two parts. The first deals with the maximum permitted exposure levels (Table 19.3).

/Table 19.3

Table 19.3

Permissible Noise Exposures Under U.S. Occupational Safety and Health Act of 1970 (Source: U.S. Federal Register, 1972)

Duration Per Day, Hours	Sound Level dBA Slow*
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

When the daily noise exposure is composed of two or more periods of noise exposure at different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the fractions: $C_1/T_1+C_2/T_2+\ldots C_i/T_i+\ldots C_n/T_n$ (where C_i indicates the total time of exposure at a specified noise level, T_i the total time of exposure permitted at that level, and n is the number of periods considered) exceeds unity, then, the mixed exposure should be considered to exceed the limit value.

* The "slow" response is a setting of the sound level meter which causes it to average out high level noises of brief duration such as hammering, rather than responding to the individual impact noise.

Source: "The Impact of Noise Pollution" by George Bugliarello, et al. Pergamon Press, New York. 1976.

Table 9.4

Chicago Ordinance for Noise Emission from Vehicles
(Adapted from Chicago, 1971)

Date of Construction	Maximum Limit in dBA (at 50 ft)
Motorcycles	
Before January 1, 1970	92
After January 1, 1970	88
After January 1, 1973	86
After January 1, 1975	84
After January 1, 1980	75
Vehicles heavier than 8000 lb	
After January 1, 1968	88
After January 1, 1973	86
After January 1, 1975	84
After January 1, 1980	75
Private cars and other motor vehicles	
Before January 1, 1973	86
After January 1, 1973	84
After January 1, 1975	80
After January 1, 1980	75

Source: "The Impact of Noise Pollution" by George Bugliarello, et al. Pergamon Press, New York. 1976.

Chicago's Noise Limits (6). 1971

Octave Band Center Frequency, Hz	Maximum Sound Pressure Levels, dB, Along District Boundaries					
	Restricted Manufacturing Zoning Districts		Manufacturing Zoning Districts			
			Residence		Business	Commercial
	Residence	Business-Commercial	(General Manufacturing District)	(Heavy Manufacturing District)	(General Manufacturing District)	(Heavy Manufacturing District)
31.5	72	79	72	75	79	80
63	71	78	71	74	78	79
125	65	72	66	69	73	74
250	57	64	60	64	67	69
500	51	58	54	58	61	63
1000	45	52	49	52	55	57
2000	39	46	44	47	50	52
4000	34	41	40	43	46	48
8000	32	39	37	40	43	45
A-scale levels (for monitoring purposes)	55 dB(A)	62 dB(A)	58 dB(A)	61 dB(A)	64 dB(A)	66 dB(A)

Source: "Handbook of Noise Assessment"
Edited by Daryl N. May, Ph.D.
Van Nostrand. Reinhold Environmental Engineering Series.

SECTION 17 - RAILROAD NOISE EMISSION STANDARDS

Under this Section of the Act, EPA promulgated on December 31, 1975, regulations setting specific maximum in-use noise standards applicable to trains operated by interstate rail carriers.

The standards, which are measured at 100 feet perpendicular to the center line of the track, are:

- (Effective December 31, 1976)
  Locomotives
  (Best maintenance)
  73 dBA at idle
  93 dBA stationary at all other throttle settings
  96 dBA moving at any speed

- (Effective December 31, 1976)
  Rail cars
  88 dBA at speeds up to and including 45 mph
  93 dBA at speeds greater than 45 mph

- (Effective December 31, 1979)
  Locomotives
  (Newly manufactured)
  70 dBA at idle
  87 dBA stationary at all other throttle settings
  90 dBA moving at any speed

A detailed background study report on railroad noise was prepared as a part of the rule making process.

The Department of Transportation, through the Federal Railroad Administration, is responsible for the enforcement of this regulation. Compliance procedures were published in the Federal Register on August 23, 1977 (42 FR 42343).

On August 23, 1977, the U.S. Circuit Court of Appeals for the District of Columbia, on litigation brought by the Association of American Railroads, ordered EPA to revise its rail carrier rules to encompass *all* railroad equipment and facilities. This would provide for comprehensive Federal preemption over State and local rail carrier noise ordinances. The Court ordered that final EPA rules be issued by August 1978.

SECTION 18 - MOTOR CARRIER NOISE EMISSION STANDARDS

On October 29, 1974, EPA promulgated regulations, effective October 15, 1975, setting specific maximum in-use noise standards applicable to vehicles over 10,000 pounds Gross Vehicle Weight Rating (GVWR) operated by interstate motor carriers. This regulation will lessen the noise impact for approximately 10 million people. The standards are:

/88 dBA

88 dBA stationary runup
86 dBA up to and including 35 mph
90 dBA over 35 mph

The regulation also requires vehicle exhaust systems not to be defective and bans the use of noisy tires on vehicles subject to the regulation.

Present plans call for revising these in-use standards to require new trucks meeting the more stringent new product standards promulgated under Section 6 to continue to meet more stringent levels while in use.

The Department of Transportation's Bureau of Motor Carrier Safety (BMCS) is responsible for enforcement of this regulation. BMCS issued compliance regulations on September 12, 1975. BMCS and several States and localities are now enforcing these regulations.

STUDIES AND SPECIAL PROJECTS

A document of major importance is the National Noise Abatement Strategy, which was published for comment in October of 1976 and has been revised and was reissued in April of 1977. This general strategy will form the basis for specific program strategies in surface transportation noise and construction noise that were developed in 1978.

Machine Type	HP	(dBA)	Effective Date
Crawler Tractor	20-199	77	March 1981
		74	March 1984
Crawler Tractor	200-450	83	March 1981
		80	March 1984
Wheel Loader	20-249	79	March 1981
		76	March 1984
Wheel Loader	250-500	84	March 1981
		80	March 1984
Wheel Tractor	20 plus	74	March 1981

On August 26, 1977, the Agency proposed standards for *new truck mounted solid waste compactors*, better known as *garbage trucks* (42 FR 43226). This proposed regulation calls for a noise limit, during compaction and measured at 7 meters, of 78 dBA by January 1, 1979. Effective January 1, 1982, the noise limit would be 75 dBA.

On September 12, 1977, EPA proposed regulations to substantially reduce exterior and interior noise emitted from *new city buses, school buses,* and *inter-city buses* (42 FR 45776). The proposed bus standards, in dBA measured at 50 feet, are:

Effective	Exterior Noise Level	Interior Noise Level (at noisiest seat location)
1979	83	86
1983	80	83
1985	77	80

/On

On March 15, 1978, EPA proposed regulations to reduce noise from *new motorcycles* and *new motorcycle replacement exhaust systems*. Street, off-road, and moped-typed motorcycles are also covered. The proposed noise limits, in dBA measured at 15 meters are:

Street Motorcycles

Effective Date	*Sound Level*
January 1, 1980	83
January 1, 1982	80
January 1, 1985	78

Moped-Typed Street Motorcycles

Effective Date	*Sound Level*
January 1, 1980	70

Off-Road Motorcycles
170 cc Displacement and Less

Effective Date	*Sound Level*
January 1, 1980	83
January 1, 1982	80
January 1, 1985	78

Off-Road Motorcycles
More than 170 cc Displacement

Effective Date	*Sound Level*
January 1, 1980	86
January 1, 1983	82

The proposed regulation also calls for compliance labeling for new motorcycles and a label concerning its Stationary Sound Level. This label will aid State and local officials in enforcement against tampering and unlawful modifications.

Source: EPA Noise Control Program. Progress To Date, March 1978. U.S. Environmental Protection Agency, Washington, D.C.

7. U.S.S.R.

In the Soviet Union, current standards laid down in the 1969 Sanitary Norm for Industrial Noise are based on the recommendations of the International Standards Organization (TK43 "Acoustic Committee"), (EPA, 1971) and are more rigorous than the U.S. (OSHA) provisions.

Table 19.2 gives the maximum noise levels for an 8-hour shift permitted in various types of workplace. The tradeoffs allowed between noise exposure and noise levels are very strict. The duration of the noise has to be less than 1½ hours before the permitted level rises to 90 dBA, and the maximum for a noise lasting less than 15 minutes is 108 dBA.

Enforcement of these regulations is the responsibility of the Sanitary-Epidemiological Service (SES), and violations of the norms can be punished by "disciplinary action, administrative action, or punishment under the criminal code" (EPA, 1971). However, it appears that enforcement is lax. A variety of reasons are put forward for this, including the over-centralized administrative system in the Soviet Union, the lack of priority given to environmental problems, and the economic pressures on factory managers.

Table 19.2

Basic Provisions of Soviet Law Concerning Maximum Levels of Noise in Occupational Settings (for an 8-hour exposure). (Source: EPA, 1971)

Key	ISO Index No.	Approximate Equivalent in dB(A)
1. Ordinary work places in factories, etc.	80	85
2. Laboratories with noise sources	70	75
3. Remote control and observation stations in factory automated processes	60	65
4. Offices with office machinery	55	60
5. Offices where thinking work demanding high levels of concentration occurs	45	50

Note. OSHA: Occupational Safety and Health Act.

Source: "The Impact of Noise Pollution" by George Bugliarello, et al. Pergamon Press, New York. 1976.

8. UNECE

United Nations Economic Commission for Europe:
Maximum Limits of Sound Level for New Vehicles (1968)
(Source: OECD, 1970)

Category of Vehicle	Maximum Noise Level (dBA)*
Two-wheeled motor vehicles	
Two-stroke engine:	
Between 50 and 125 cm^3	82
Over 125 cm^3	84
Four-stroke engine:	
Between 50 and 125 cm^3	82
Between 125 and 500 cm^3	84
Over 500 cm^3	86
Three-wheeled motor vehicles (except public works vehicles, etc.)	
Over 50 cm^3	85
Motor vehicles with four or more wheels (except public works vehicles, etc.)	
Private automobiles and their conversions	84
Trucks:	
Not exceeding 3.5 tons	85
Between 3.5 and 12 tons	89
Over 12 tons - with an engine of 200 h.p. DIN or less	89
- with an engine of more than 200 h.p.	92
Buses:	
Less than 3.5 tons maximum weight	85
Over 3.5 tons - with an engine of 200 h.p. DIN or less	89
- with an engine of more than 200 h.p. DIN	92

* Maximum noise possible under normal town driving conditions, that is, during acceleration at full throttle in an intermediate gear, starting from an engine speed corresponding approximately to the speed of maximum torque (the initial speed before acceleration being limited to 50 km.p.h.) along a line at 7.5 m from the microphone (ISO measurement procedure).

Source: "The Impact of Noise Pollution" by George Bugliorello, et al. Pergamon Press, New York. 1976.

9. COUNCIL OF THE EUROPEAN COMMUNITIES

Council of the European Communities (Common Market):
Maximum Permissible Noise Levels for New Vehicles
(Source: OECD, 1970)

Class of Vehicle	Acceptable Noise Levels (dBA)*
Passenger vehicles with seating capacity of no more than 9 persons (including the driver)	82
Passenger vehicles with seating capacity of more than 9 persons (including the driver) and maximum permissible weight less than 3.5 tons	84
Trucks with maximum permissible weight less than 3.5 tons	84
Passenger vehicles with seating capacity of more than 9 persons (including the driver) and a maximum permissible weight more than 3.5 tons	89
Trucks with a maximum permissible weight more than 3.5 tons	89
Passenger vehicles with seating capacity of more than 9 persons (including the driver) and engine of 200 h.p. DIN or over	91
Trucks with an engine of 200 h.p. DIN or over and maximum permissible weight of over 12 tons	91

* Measurement procedure as in above table.
(To allow for uncertainties in the measuring instruments, the result of each measurement made at a distance of 7.5 m is the instrument reading less 1 dBA.)

Source: "The Impact of Noise Pollution" by George Bugliarello, et al. Pergemon Press, New York. 1976.

COMPARISON OF NOISE STANDARDS

	Predominantly industrial dB(A)		Predominantly residential dB(A)		Rural residential hospitals, etc. dB(A)	
	DAY	NIGHT	DAY	NIGHT	DAY	NIGHT
BS 4142 (U.K.)	75	65	65	55	50	40
ISO R 1996 (International)	60-70	45-55	50-60	35-45	35-45	20-30*
TALärm (West Germany)	65	50	55	40	45	35
Switzerland	65	55	60	45	45	35
Austria	55-60	45-60	45	35	35-40	25-30
France (NF S 31-010)	60-70	50-60	50-60	40-50	35-45	25-35

* This range obviously is unrealistic. It has been derived at arithmetically by applying the most unfavourable conditions. A range 30-40 is probably better (and possible within the scope of ISO R 1996).

Source: CONCAWE Report No. 6/76. "Published Regulatory Guidelines of Environmental Concern to the Oil Industry in Western Europe". CONCAWE, The Hague, Netherlands. October 1976.

Part 4

ODOUR STANDARDS

1. PHILIPPINES

Odour Emission Control

1. Definition - The following words and phrases when used in this Chapter shall have the meanings described in this Section:

(a) "Reduction" means any heated process, including cooking, drying, dehydrating, digesting, evaporating and protein-concentrating.

(b) "Animal Matter" means any product or derivative of animal life.

(c) "Food-Service Establishment" means any fixed or mobile restaurant, coffee shop, cafeteria, short order cafe, luncheonette, grill, tea room, sandwich shop, soda fountain, tavern, bar, cocktail lounge, nigh club, roadside stand, industrial feeding establishment, private, public or nonprofit organization or institution routinely serving food; catering kitchen, commissary or similar place in which food or drink is placed for sale or for service on the premises or elsewhere; and any other eating or drinking establishment or operation where food is served or provided for the public with or without charge.

(d) "Objectionable Odor" means any odor present in the outdoor atmosphere which, by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life and property, or which creates a nuisance.

2. Prohibitions

(a) No person shall cause, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor.

(b) No person shall store, pump, handle, process, load, unload, or use in any process or installation volatile organic compounds or organic solvents without applying known vapor emission control devices or systems deemed necessary and ordered by the Commission.

/3. Control

3. Control of Odors from Processing of Animal Matter - The provisions of this Section shall not apply to any device, machine, equipment or other contrivance used exclusively for the processing of food for human consumption in food service establishments.

(a) No person shall operate or use any device, machine, equipment or other contrivance for the reduction of animal matter unless all gases, vapors and entrained effluents from such facility are incinerated at a temperature of not less than 646°C for a period of not less than 0.3 second, or processed in such a manner as determined by the Commission to be equally or more effective for the purpose of air pollution control.

(b) A person incinerating or processing gases, vapors or gas-entrained effluents pursuant to this Sub-section shall provide, properly install and maintain in good working order and in operations devices as specified by the Commission for indicating temperature, pressure, or other operating conditions.

4. Other Odor Control Measures Requirement

(a) Effective devices and/or measures shall be installed and operated such that no vent, exhaust pipe, blow-off pipe or opening of any kind shall discharge into the outdoor air any odorous matter, vapors, gases or dust, or any combination thereof that create odors or other nuisances in the neighborhood of the plant.

(b) Odor-producing materials shall be stored and handled in a manner such that odors produced from such materials are confined at the point of origin so as to prevent liberation of odorous matter. Confined gases, vapors, fumes or dusts shall be treated before discharge into the atmosphere, as required in Subsection (a) above.

Source: Official Gazette, Republic of the Philippines
Vol. 74, No. 23, 5 June 1978

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Offensive Odour Substances (Latest revision, September 1976)

(i) Scope of regulatory standards boundary line

Offensive odour substances	Scope of standards (ppm)
Ammonia	1 ~ 5
Methyl mercaptan	0.002 ~ 0.01
Hydrogen sulfide	0.02 ~ 0.2
Dimethyl sulfide	0.01 ~ 0.2
Dimethyl disulfide	0.009 ~ 0.1
Trimethylamine	0.005 ~ 0.07
Acetaldehyde	0.05 ~ 0.5
Styrene	0.4 ~ 2

(ii) Reguratory standards at the outlet*
(Except in the cases of methyl mercaptan, dimenthyl sulfide, dimethyl disulfide, acetaldehyde and styrene)

$$q = 0.108 \times He^2 \cdot Cm$$

q : Gas emission rate (Unit: Nm^3/hr)

He : Effective height of outlet (Unit: m)

Cm : Reguratory standard on boundary line (Unit: ppm)

* This standards apply to those outlets which are higher than five meters.

Source: Quality of the Environment in Japan 1979.
Environment Agency.