

POLLUTION CONTROL LAW
SERIES : PCLS/4/2000-2001

Environmental Standards *for* **Ambient Air, Automobiles, Fuels, Industries and Noise**



**CENTRAL POLLUTION CONTROL BOARD
MINISTRY OF ENVIRONMENT & FORESTS**

July 2000

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Environmental Standards
for
**Ambient Air, Automobiles,
Fuels, Industries and Noise**

CENTRAL POLLUTION CONTROL BOARD

(Ministry of Environment & Forests, Government of India)

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Central Pollution Control Board

(A Govt. of India Organisation)

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FOREWORD

The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission under the statutory powers of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. These standards have been approved and notified by the Government of India, Ministry of Environment & Forests, under Section 25 of the Environmental (Protection) Act, 1986. Till now, Effluent standards for 37 categories of industries and Emission Standards for 31 categories of industries have been evolved and notified besides standards for ambient air quality, ambient noise, automobile and fuels quality specifications for petrol and diesel. Guidelines have also been developed separately for hospital waste management.

Dr. B. Sengupta, Member Secretary and Dr. S.K. Paliwal, Scientist 'B' have put in a lot of efforts in preparing this document. This document is intended to facilitate a ready reference to all standards notified so far. I hope, it would be useful to the industry, regulatory agencies, consultants & others interested in pollution control.

New Delhi
July, 2000

(DILIP BISWAS)

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1.0 ALUMINIUM : EMISSION STANDARDS

	Pollutants	Emission Limit
(a) Alumina Plant		
i) Raw Material Handling (Primary and Secondary Crusher)	Particulate Matter	150 mg/Nm ³
ii) Precipitation Areas - calcination	Particulate Matter Carbon Monoxide Stack Height	250 mg/Nm ³ 1% max. $H=14 (Q)^{0.3}$ where, Q is emission rate of SO ₂ in kg/hr and H is stack height in metres
(b) Smelter Plant		
i) Green Anode Shop	Particulate Matter	150 mg/Nm ³
ii) Anode Bake Oven	-do- Total Fluoride(F)	150 mg/Nm ³ 0.3 kg/tonne of Aluminium
iii) Pot-room	Particulate Matter Total Fluoride (F) VSS HSS PBSW PBCW Stack Height	150 mg/Nm ³ 4.7 kg/tonne of Aluminium produced 6.0 kg/tonne of Aluminium produced 2.5 kg/tonne of Aluminium produced 1.0 kg/tonne of Aluminium produced $H=14(Q)^{0.3}$ where Q is emission rate of SO ₂ in kg/hr and H is stack height in metres.

NOTE :

VSS = Vertical Stud Soderberg; HSS = Horizontal Stud Soderberg

PBSW = Prebacked Side Worked; and PBCW = Prebacked Centre Worked

Source : EPA Notification
[G.S.R. 742(E), dt 30 Aug., 1990]

2.0 AMBIENT AIR QUALITY STANDARDS (NATIONAL)

Pollutants	Time-weighted average	Concentration in ambient air			Method of measurement
		Industrial Areas	Residential, Rural & other Areas	Sensitive Areas	
Sulphur Dioxide (SO ₂)	Annual Average*	80 µg/m ³	60 µg/m ³	15 µg/m ³	- Improved West and Geake Method
	24 hours**	120 µg/m ³	80 µg/m ³	30 µg/m ³	- Ultraviolet Fluorescence
Oxides of Nitrogen as NO ₂	Annual Average*	80 µg/m ³	60 µg/m ³	15 µg/m ³	- Jacob & Hochheiser Modified (Na-Arsenite) Method
	24 hours**	120 µg/m ³	80 µg/m ³	30 µg/m ³	- Gas Phase Chemiluminescence
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m ³	140 µg/m ³	70 µg/m ³	- High Volume Sampling, (Average flow rate not less than 1.1 m ³ /minute).
	24 hours**	500 µg/m ³	200 µg/m ³	100 µg/m ³	
Respirable Particulate Matter (RPM) (size less than 10 microns)	Annual Average*	120 µg/m ³	60 µg/m ³	50 µg/m ³	- Respirable particulate matter sampler
	24 hours**	150 µg/m ³	100 µg/m ³	75 µg/m ³	
Lead (Pb)	Annual Average*	1.0 µg/m ³	0.75 µg/m ³	0.50 µg/m ³	- ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 µg/m ³	1.00 µg/m ³	0.75 µg/m ³	
Ammonia ¹	Annual Average*	0.1 mg/m ³	0.1 mg/m ³	0.1 mg/m ³	-
	24 hours**	0.4 mg/m ³	0.4 mg/m ³	0.4 mg/m ³	
Carbon Monoxide (CO)	8 hours**	5.0 mg/m ³	2.0 mg/m ³	1.0 mg/m ³	- Non Dispersive Infra Red (NDIR) Spectroscopy
	1 hour	10.0 mg/m ³	4.0 mg/m ³	2.0 mg/m ³	

* Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

NOTE:

1. National Ambient Air Quality Standard: The levels of air quality with an adequate margin of safety, to protect the public health,, vegetation and property.
2. Whenever and wherever two consecutive values exceeds the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.
3. The standards for H₂S and CS₂ have been notified seperately vide GSR No. 7, dated December 22, 1998 under Rayon Industry – for details please see Sl. No. 65 of this document.

[S.O. 384(E), Air (Prevention & Control of Pollution) Act, 1981, dated April 11, 1994]

[EPA Notification: GSR 176 (E), April 02, 1996]

1. Included vide Notification SO. 955 (E), Air (Prevention & Control of Pollution) Act, 1981 dated October 14, 1998)

3.0 ASBESTOS MANUFACTURING INDUSTRY: EMISSION STANDARDS

	Pollutants	Emission limit
All types of asbestos manufacturing Units (including all processes involving the use of asbestos)	Pure asbestos material	4 Fibre*/cc
	Total dust	2 mg/Nm ³

* Fibre of length more than 5 micrometre and diametre less than 3 micrometre with an aspect ratio of 3 or more.

Source: EPA Notification
[G.S.R. 913(E), Oct, 24th, 1989]

4.0 BAGASSE-FIRED BOILERS: EMISSION STANDARDS

Type of boilers	Pollutants	Concentration in mg/Nm ³
Step grate	Particulate Matter	250
Horse shoe/pulsating grate	Particulate Matter	500(12% CO ₂)
Spreader stoker	Particulate Matter	800(12% CO ₂)

Note: In the case of horse shoe and spreader stoker boilers, if more than one boiler is attached to a single stack, the standard shall be fixed based on added capacity of all the boilers connected with the stack.

Source: EPA Notification
[GSR 475(E), 5th May, 1992]

5.0 BATTERY MANUFACTURING INDUSTRY

5.1 Lead Acid Manufacturing Industry : Emission Standards

Source	Pollutants	Standards	
		Conc. Based, (mg/Nm ³)	Load based, (kg/tonne of Pb used)
Grid casting	Lead	10	0.020
	Particulate Matter	25	
Oxide Manufacturing	Lead	10	0.010
	Particulate Matter	25	
Paste mixing	Lead	10	0.025
	Particulate Matter	25	
Assembling	Lead	10	0.010
	Particulate Matter	25	
PVC section	Particulate Matter	150	--

- To comply the respective standards, all the emissions from above mentioned sources shall be routed through stack connected with hood and fan. In addition to above installation of control equipment viz. Bag filter/ventury scrubber is also recommended.
- The minimum stack height shall be 30 m.

Liquid Effluent Discharge Standards

Pollutant	Concentration
PH	6.5 – 8.5
Suspended solids	50 mg/l
Lead	0.1 mg/l

5.2 Dry Cell Manufacturing Industry: Emission Standards

Pollutant	Standards	
	Concentration based (mg/Nm ³)	Load based (kg/lakh cell)
Particulate Matter	50	1.5
Manganese as Mn	5	0.3

- To comply with the respective standards, all the emissions from above mentioned sources shall be routed through stack connected with hood and fan. In addition to above installation of control equipment viz. Bag filter/ventury scrubber is also recommended.
- The minimum stack height shall be 30 m.

Effluent Standards

Pollutant	Concentration
pH	6.5 - 8.5
Total suspended solids	100 mg/l
Manganese as Mn	2 mg/l
Mercury as Hg	0.02 mg/l
Zinc as Zn	5 mg/l

5.3 Secondary Lead Smelters

Pollutant	Concentration
Lead as Pb	10 mg/Nm ³
Particulate Matter	50 mg/Nm ³
Minimum stack height	30 m

Source: EPA Notification
(GSR 7, December 22, 1998)

6.0 BEEHIVE HARD COKE OVEN

	Pollutant	Emission limit
New Unit	Particulate Matter (corrected to 6% CO ₂)	150 mg/Nm ³
Existing unit	Particulate Matter (corrected to 6% CO ₂)	350 mg/Nm ³

Note: For control of emissions and proper dispersion of pollutants, the following guidelines shall be followed:

- Units set up after the publication of this notification shall be treated as new units.
- A minimum stack height of 20 metre shall be provided by each unit.
- Emissions from coke ovens shall be channelised through a tunnel and finally emitted through a stack. Damper adjustment techniques shall be used to have optimum heat utilisation and also to control the emission of unburnt carbon particles and combustible flue gases.
- Wet scrubbing system or waste heat utilisation for power generation or byproduct recovery systems should be installed preferably to achieve the prescribed standards.
- After four years from the date of this notification, all the existing units shall comply with the standards prescribed for the new units.

Source: EPA Notification
[GSR 176(E) April 2, 1996]

7.0 BOILER (SMALL)

Steam generation capacity (tph)	Pollutant	Emission limit (mg/Nm ³)
Less than 2	Particulate Matter	1200*
2 to less than 10	-do-	800*
10 to less than 15	-do-	600*
15 and above	-do-	150**

* To meet the respective standards, cyclone/multicyclone is recommended as control equipment with the boiler.

** To meet the standard, bag filter/ESP is recommended as control equipment with the boiler.

Note:

- I. 12% of CO₂ correction shall be the reference value for particulate matter emission standards for all categories of boilers.
- II. These limits shall supercede the earlier limits notified under Schedule I at Sr. No. (34) of EPA, 1986 (GSR 742E, dated 30 August, 1990)
- III. **Stack Height for Small Boilers**

For the small boilers using coal or liquid fuels, the required stack height with the boiler shall be calculated by using the formula

$$H = 14 Q^{0.3}$$

Where H = Total stack height in metres from ground level

Q = Sulphur dioxide (SO₂) emission rate in kg/hr

In no case, the stack height shall be less than 11 metres.

Where providing tall stacks are not feasible using above formula, the limit of 400 mg/Nm³ for SO₂ emission shall be met by providing necessary control equipment with a minimum stack height of 11 metres.

Source: EPA Notification
[GSR 176(E), April 2, 1996]

7.1 Guidelines for Pollution Prevention in Small Boilers

Following GUIDELINES for Pollution Prevention in <2TPH small boilers are suggested. Guidelines are made for both boiler manufacture & boiler users separately.

Guidelines for Boiler Manufacturer

- (i) The boiler should be provided with an ID fan of appropriate capacity.
- (ii) A provision for sucking in secondary air above the fuel bed with adjustable opening area should be provided.
- (iii) A butterfly type damper with appropriate arrangement for fixing damper at various positions easily, should be provided at the inlet side of the fan.
- (iv) The ID fan & damper should be located preferably nearer to the front side of boiler & should be easily accessible such that the boiler operator can access the damper easily & quickly & can operate while looking at boiler furnace condition.

- (v) A single cyclone of appropriate size be provided in the circuit alongwith "bottom storage hopper fitted with an air tight Rotary air lack valve with a handle".
- (vi) An economiser should be provided in the circuit for pre-heating boiler feed water.
- (vii) Proper "tube cleaning" arrangement & required tools should be provided alongwith its operating instructions.
- (viii) Proper instructions to be provided for obtaining & maintaining desired quality of boiler feed water & chemicals to be added to reduce / remove deposits on "water side of tubes".
- (ix) Proper information & instructions should be provided regarding "which different fuels can be fired" in the boiler (Solid & liquid) and how it should be fired, how much at a time and desired frequency of its firing etc. (All the above mentioned information / instruction etc. could be compiled as part of the "Boiler Operating Manual" & supplied by boiler Manufacturer alongwith the boiler).
- (x) The flue gas carrying duct should be sized appropriately, say for peak flowrate gas velocity of 14 to 16 m/s to be maintained.
- (xi) A portable & simple to operate type (say, Pyrite kit) CO₂ monitoring instrument should be provided.

Guidelines for Boiler Users

- (i) Solid fuels like coal, briquettes etc. should be appropriately sized approx. 1 to 2 inch size / dia (large pieces to be broken, wherever required)
- (ii) Fuel should be fired uniformly and in less quantity at a time such that the bed thickness does not exceed about 6 to 9 inches (and not in big heaps). Depending on high/low steam demand, the frequency of firing could be increased or decreased (say 4 to 5 times / hr during higher steam demand, or say 2 to 3 times / hr during lower steam demand).
- (iii) Every time the fuel is fired, the damper should be set to "High" position for a minute or two (this would suck more combustion air required for burning volatile matter & thereby reduce soot / black smoke formation), and then it should be set back to "Low" position, till the next firing. (setting could be made after a few trails). This damper adjustment should be done by the boiler operator throughout the boiler operation as a part of his regular duty like firing fuel for achieving optimised combustion at all time & thereby preventing pollution.

- (iv) "Secondary air opening" to be kept full open at the time of firing for one or two minutes. Later, the opening "Must" be reduced till next firing. (Setting by trial & error).
- (v) Fire bed should be cleaned at appropriate time to avoid build up of "fire bed thickness", if not, this would reduce the primary air supply successively & result into improper combustion.
- (vi) Soot deposits in tubes should be cleaned from time to time with proper tool. Build-up of deposits affects the steam generation adversely & results into higher flue gas temp. & higher stack loss.
- (vii) The economiser should be kept properly insulated.
- (viii) The cyclone bottom opening should be kept air tight & leak proof, else, it would reduce cyclone efficiency. The dust collected should be taken out from time to time (say once per shift) & appropriately disposed avoiding secondary pollution.
- (ix) Good quality feed water should be used for boiler & appropriate chemicals should be added, as directed by boiler supplier, for avoiding tube deposits, else it would reduce steam generation.
- (x) CO₂ % should be checked frequently (say once a day initially) to ensure proper boiler operation & take corrective actions, if required, immediately.

8.0 BRICK KILNS : EMISSION STANDARDS

Size	Kiln Capacity	Maximum limit for the concentration of particulate matter. (mg/Nm ³)
Small	Less than 15,000 bricks per day (less than 15 ft trench width)	1000
Medium	15,000-30,000 bricks per day (15-22 ft trench width)	750
Large	More than 30,000 bricks per day (more than 22 ft trench width)	750

Stack Height Regulation :

The following stack heights are recommended for optimal dispersion of sulphur dioxide.

Kiln Capacity	Stack Height
Less than 15,000 bricks are day (less than 15 ft trench width)	Minimum stack height of 22 m, or, induced draught fan operating with minimum draught of 50 mm Water Gauge with 12 m stack height.
15,000-30,000 bricks per day (15-22 ft trench width)	Minimum stack height of 27 m with gravitational settling chamber or Induced draught fan operating with minimum draught of 50 mm Water Gauge with 15 m stack height.
More than 30,000 bricks per day (more than 22 ft trench width)	Minimum stack height of 30 m with gravitational settling chamber or Induced draught fan operating with minimum draught of 50 mm Water Gauge with 17 m stack height.

Existing moving chimney Bull's trench kilns shall be dispensed with by December 31, 1987 and no new moving chimney kilns shall be allowed to come up.

Considering the immediate need to protect the top soil and to find ways the safe disposal/utilisation of fly ash, it is provided that from the 1st January 1997, all brick manufacturing units within a radius of 50 kms from any thermal power plant, shall utilise fly ash in optimal proportion for making bricks.

Source : EPA Notification
[GSR No. 176(E), April 2, 1996]

Amendments :

- (i) Existing Moving bull's trench kilns shall be dispensed by June 30, 1999 and no new moving chimney kilns shall be allowed to come up.

Source : EPA Notification
[GSR No. 7, Dec. 22, 1998]

- (ii) Existing moving chimney bull's trench kilns shall be dispensed with by June 30, 2000 and no new moving kilns shall be allowed to come up.

Source : EPA Notification
[GSR 682(E), October 5, 1999]

9.0 BRIQUETTE INDUSTRY (COAL)

	Unit size	Pollutant	Emission limit
(a)	Units having capacity less than 10 tonnes	Particulate Matter (corrected to 6% CO ₂)	350 mg/Nm ³
(b)	Units having capacity 10 tonnes or more	Particulate matter (corrected to 6% CO ₂)	150 mg/Nm ³

Note : For control of emissions/and proper dispersal of pollutants, the following guidelines shall be followed by the industry:

- (i) A minimum stack height of 20 metres shall be provided.
- (ii) All ovens shall be modified to single chimney multi-oven systems.
- (iii) Emissions from ovens shall be channelised through in-built draft stack. Optimum heat utilisation techniques shall be used.
- (iv) In case of units having capacity 10 tonnes and above, wet scrubbing system shall be provided to control air pollution.

Source : EPA Notification
[GSR 176 (E) April 2, 1996]

10.0 BULLION REFINING : WASTEWATER DISCHARGE STANDARDS

Parameter	Concentration not to exceed (Limit, mg/l except pH)
pH	6.5 to 8.5
Cyanide as CN	0.2
Sulphide as S	0.2
Nitrate as N	10.0
Free Cl ₂ as Cl	1.0
Zinc as Zn	5.0
Copper as Cu	2.0
Nickel as Ni	2.0
Arsenic as As	0.1
Cadmium as Cd	0.2
Oil and Grease	10.0
Suspended Solids	100

Source : EPA Notification
[G.S.R. 742(E), dt. 30th Aug., 1990]

11.0 CALCIUM CARBIDE PLANT

Source/Process	Pollutants	Emission Limit (mg/Nm ³)
Kiln	Particulate Matter	250
Arc Furnace	-do-	150

Source : EPA Notification
[S.O. 64(E), dt 18th Jan., 1988]

12.0 CARBON BLACK INDUSTRY

Parameter	Emissions limit
Particulate Matter	150 mg/Nm ³

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan., 1988]

13.0 CEMENT INDUSTRY : EMISSION STANDARDS

Plant Capacity	Pollutants	Emission limit (mg/Nm ³)
200 tonnes per day and less (All Sections)	Particulate Matter	400
More than 200 tonnes per day (All Sections)	Particulate Matter	250

Note:

- (1) The Central and the State pollution control boards may fix stringent standards not exceeding 250 mg/Nm³ for smaller plants and 150 mg/Nm³ for larger plant the industry is located in an area which, in their opinion requires more stringent standards.
- (2) Where continuous monitoring equipments are provided on dust emission lines the integrated average values over a period, to be fixed by the central and state boards but not exceeding 72 hours shall be considered instead of momentary dust emission value conformity to standards.

Source : EPA Notification
[S.O. 393(3), dt 16th April, 1987]

14.0 CERAMIC INDUSTRY : EMISSION STANDARDS

Sections	Pollutants	Concentration in mg/Nm ³
A. Kilns		
(a) Tunnel, Top Hat, Chamber	Particulate Matter	150
	Fluoride	10
	Chloride	100
	Sulphur dioxide	**
(b) Down-draft	Particulate Matter	1200
	Fluoride	10
	Chloride	1000
	Sulphur dioxide	**
(c) Shuttle	Particulate Matter	150
	Fluoride	10
	Chloride	100
	Sulphur dioxide	**
(d) Vertical Shaft Kiln	Particulate Matter	250
	Fluoride	10
	Sulphur dioxide	**
(e) Tank Furnace	Particulate Matter	150
	Fluoride	10
	Sulphur dioxide	**
B. Raw Material handling, Processing and operations		
(a) Dry raw materials handling and processing operations	Particulate Matter	150
(b) Basic raw material and processing operations	Particulate Matter	*
(c) Other sources of air pollution generation	Particulate Matter	*
C. Automatic Spray Unit		
(a) Dryers		
(i) Fuel fired dryers	Particulate Matter	150
(ii) For heat recovery dryers	Particulate Matter	*
(b) Mechanical finishing operation	Particulate Matter	*

(Contd.....)

(Contd.....)

Sections	Pollutants	Concentration in mg/Nm ³
(c) Lime/Plaster of Paris manufacture		
Capacity: Upto 5 tpd	Stack Height -do-	Hood should be provided with a stack of 30 metre height from ground level (including Kiln height)
Above 5 tpd	-do-	$H=14(Q)^{0.3}$ Where Q is emission rate of SO ₂ in kg/hr and H = Stack Height in metres
more than 5 tpd and up to 40 tpd	Particulate Matter	500 mg/Nm ³
More than 40 tpd	-do-	150 mg/Nm ³

Note : Oxygen reference level for particulate matter concentration calculations for Kilns mentioned at A(c) is 18% and for those at A(b), A(d), and A(e) is 8%.

* All possible preventive measures should be taken to control pollution as far as practicable.

** The standard for sulphur dioxide in terms of stack height limits for kilns with various capacities of coal consumption shall be as indicated below.

Coal Consumption per day	Stack Height (metre)
Less than 8.5 MT	9
More than 8.5 to 21 MT	12
More than 21 to 42 MT	15
More than 42 to 64 MT	18
More than 64 to 104 MT	21
More than 104 to 105 MT	24
More than 105 to 126 MT	27
More than 126 MT	30 or using formula $H - 14(Q)^{0.3}$ which ever is more

Note : H = Physical stack height
Q = Sulphurdioxide emission, kg/hr

Source : EPA Notification
[GER 475 (E), dt. 5.5.1992]

15.0 CHLOR ALKALI (CAUSTIC SODA): EMISSION STANDARDS

Process	Pollutants	Emission limit (mg/Nm ³)
a) Mercury cell	Mercury (from hydrogen gas holder stack)	0.2
b) All processes	Chlorine (from hypo tower)	15
c) All processes	Hydrochloric vapour and mist from (hydrochloric acid plant)	35

Source : EPA Notification
[G.S.R. 913(E), dt 24th Oct., 1989]

15.1 Caustic Soda Industry : Wastewater Discharge Standards

Parameter	Concentration not to exceed Limits, mg/l (except for pH & flow)
Total concentration of mercury in the final effluent*	0.01
Mercury bearing wastewater generation (flow)	10 kl/tonne of caustic soda produced
pH	5.5 to 9.0

* Final effluent is the combined effluent from (a) Cell house; (b) Brine plant; (c) Chlorine handling; (d) Hydrogen handling and (e) Hydrochloric acid plant.

Source EPA Notification
[S.O. 844(E), dt., 19th Nov., 1986]

16.0 COKE OVENS : WASTEWATER DISCHARGE STANDARDS

Parameter	Concentration in the effluent when discharged into inland surface water not to exceed, mg/l (except for pH)
pH	5.5 to 9.0
Biochemical oxygen demand (27°C, 3 days)	30
Suspended solids	100
Phenolic compounds (As C ₆ H ₅ OH)	5
Cyanides (As CN)	0.2
Oil & grease	10
Ammonical nitrogen (As N)	50

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan., 1988]

17.0 COPPER, LEAD & ZINC SMELTING UNITS : EMISSION STANDARDS

Parameter	Source	Emission Limit
Particulate matter	Concentrator	150 mg/Nm ³
Oxides of sulphur*	Smelter & Converter	4 kg/tonne of concentrated (one hundred per cent) acid produced

* Off-gases must be utilised for sulphuric acid manufacturing.

Source : EPA Notification
[S.O. 64(E), dt 18th Jan., 1988]

18.0 COAL MINES

18.1 Air Quality Standards

The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) concentrations at downwind direction, considering predominant wind direction at 500 m from the following dust generating sources shall not exceed the standards given in Tables I, II and III.

Table I

Category	Pollutant	Time wighted Avg.	Concentration in Ambient Air	Method of Measurement
New Coal Mines (Coal Mines coming up after Dec. 1998)	Suspended Particulate Matter (SPM)	Annual Average* 24 hours**	360 µg/m ³ 500 µg/m ³	- High Volume Sampling (Average flow rate not less than 1.1 m ³ /minute)
	Respirable Particulate Matter (size less than 10 µm) (RPM)	Annual Average* 24 hours**	180 µg/m ³ 250 µg/m ³	Respirable Particulate Matter Sampler
	Sulphur Dioxide (SO ₂)	Annual Average* 24 hours**	80 µg/m ³ 120 µg/m ³	1. Improved west and Gaeke method 2. Ultraviolet fluorescence
	Oxide of Nitrogen as NO ₂	Annual Average* 24 hours**	80 µg/m ³ 120 µg/m ³	1. Jacob & Hochheiser Modified (Na-Aresnic) Method 2. Gas phase Chemilumine -science

Table II

Category	Pollutant	Time wighted Avg.	Concentration in Ambient Air	Method of Measurement
Existing coal fields/mines given below: Karanpura, Giridih, Rajhara, Wardha, Nagpur, Silewara, Pench, Kanhan, Patharkhera, Umrer, Korba, Chirimiri, Central India Coalfields (including Baikunthpur, Bistrampur), Singrauli, Ib Valley, Talcher, and Godavary – Vally coalfields	Suspended Particulate Matter (SPM)	Annual Average*	430 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1 m^3/minute)
		24 hours**	600 $\mu\text{g}/\text{m}^3$	
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average*	215 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter Sampler
		24 hours**	300 $\mu\text{g}/\text{m}^3$	
	Sulphur Dioxide (SO_2)	Annual* Average	80 $\mu\text{g}/\text{m}^3$	1. Improved west and Gaeke method
		24 hours**	120 $\mu\text{g}/\text{m}^3$	2. Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average*	80 $\mu\text{g}/\text{m}^3$	1 Jacob & Hochheiser Modified (Na-Aresnic) Method
		24 hours**	120 $\mu\text{g}/\text{m}^3$	2. Gas phase Chemiluminescence

Table III

Category	Pollutant	Time wighted Avg.	Concentration in Ambient Air	Method of Measurement
Old Coal Mines - Jharia - Raniganj - Bokaro	Suspended Particulate Matter (SPM)	Annual Average*	500 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1 m^3/minute)
		24 hours**	700 $\mu\text{g}/\text{m}^3$	
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average*	250 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter Sampler
		24 hours**	300 $\mu\text{g}/\text{m}^3$	
	Sulphur Dioxide (SO_2)	Annual Average*	80 $\mu\text{g}/\text{m}^3$	1 Improved west and Gaeke method
		24 hours**	120 $\mu\text{g}/\text{m}^3$	2. Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average*	80 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Aresnic) Method
		24 hours**	120 $\mu\text{g}/\text{m}^3$	2. Gas phase Chemiluminescence

Note :

- * Annual Arithmetic mean for the measurements taken in a Year, following the guidelines for frequency of sampling laid down in para 18.2.
- ** 24 hourly / 8 hourly values should met 98% of the time in a Year. However 2% of the time it may exceed but not on two consecutive days.
 - The ambient air quality standards shall apply to the nearest residential / commercial places (existing / likely) on the leeward direction on the mining and allied activities.
 - Unauthorised construction will not be taken as a reference of nearest residential / commercial place for monitoring.

18.2 Frequency of Sampling

- Air quality monitoring at a frequency of two days in a month at the nearest residential / commercial place may be carried out.
- As a result of monthly monitoring, if it is found that the value of the pollutant is less than 50% of the prescribed standards, for three consecutive months, then the sampling frequency may be shifted to two days in a quarter (3 months).
- In case, the value exceeds the prescribed standard, the Air Quality sampling should be done twice a week. If the results of four consecutive weeks indicate that the concentration of pollutants is within the prescribed standards, then monthly monitoring may be reverted to.

18.3 Effluent Standards

The standards for effluent discharge into sewer/stream/land, are given below :

PH	-	5.5 to 9.0
Total Suspended Solids	-	100 mg/l
	-	200 mg/l (Land for irrigation)
Oil & Grease	-	10 mg/l
Nitrate Nitrogen	-	10 mg/l

18.4 Noise level standards

The proposed standards are as given below :

	6.00 AM – 9.00 PM	9.00 PM – 6.00 AM
Noise level	Leq 75 dB(A)	Leq 70 dB(A)

Occupational exposure limit of noise prescribed by the Director General, Mines & safety (DGMS) shall be complied with.

Source :
[Evolved by CPCB]

19.0 COAL WASHERIES

1. Fugitive emission standards

- The difference in the value of suspended particulate matter, delta (Δ), measured between 25 and 30 metre from the enclosure of coal crushing plant in the downward and leeward wind direction shall not exceed 150 microgram per cubic meter. Method of measurement shall be High Volume Sampling and Average flow rate, not less than 1.1 cubic metre per minute, using upwind downwind method of measurement.

2. Effluent discharge standards

- The coal washeries shall maintain the close circuit operation with zero effluent discharge.
- If in case due to some genuine problems like periodic cleaning of the system, heavy rainfall etc. it become necessary to discharge the effluent of sewer/land/stream then the effluent shall conform to the following standards at the final outlet of the coal washery.

S.No.	Parameter	Limits
1.	pH	5.5-9.0
2.	Total suspended solids	100 mg/l
3.	Oil & grease	10 mg/l
4.	B.O.D. (3 days, 27° C)	30 mg/l
5.	COD	250 mg/l
6.	Phenolics	1.0 mg/l

3. Noise level standards

- Operational/Working zone-not to exceed 85 dB(A) Leq for 8 hours exposure.
- The ambient air quality standards in respect of noise as notified under Environmental (Protection) Rules, 1986 shall be followed at the boundary line of the coal washery.

4. Code of practice for Coal Washery

- Wate or Water mixed chemical shall be sprayed at all strategic coal transfer points such as conveyors, loading unloading points etc. As far as practically possible conveyors, transfer points etc. shall be provided with enclosures.
- The crushers/pulverisers of the coal washeries shall be provided with enclosures, fitted with suitable air pollution control measures and finally emitted through a stack of minimum height of 30 m, conforming particulate emission standard of 150 mg/Nm³ or provided with adequate water sprinkling arrangement.

- Water sprinkling by using fine atomizer nozzles arrangement shall be provided on the coal heaps and on land around the crushers/pulverisers.
- Area, in and around the coal washery shall be pucca either asphalted or concreted.
- Water consumption in the coal washery shall not exceed 1.5 cubic meter per tonne of coal.
- The efficiency of the settling ponds of the waste water treatment system of the coal washery shall not be less than 90%.
- Green belt shall be developed along the road side, coal handling plants, residential complex, office building all around the boundary line of the coal washery.
- Storage bunkers, hoppers, rubber decks in chutes and centrifugal chutes shall be provided with proper rubber linings.
- Vehicles movement in the coal washery area shall be regulated effectively to avoid traffic congestion. High pressure horn shall be prohibited. Smoke emission from heavy duty vehicle operating in the coal washeries should conform the standards prescribed under Motor Vehicle Rules 1989.

Source : EPA, 1986
[GSR 7, dated December 27, 1998]

20.0 DAIRY INDUSTRY : EFFLUENT STANDARDS

Parameter	Concentration not to exceed in mg/l, except pH	Quantum per product processed
pH	6.5-8.5	-
*BOD at 27°C, 3 days	100	-
**Suspended solids	150	-
Oil and grease	10	-
Wastewater generation	-	3 m ³ /Kl of milk

Note:* BOD may be made stringent upto 30mg/l if the recipient fresh water body is a source for drinking water supply. BOD shall be upto 350mg/l for the chilling plant effluent for applying on land provided the land is designed and operated as a secondary treatment system with suitable monitoring facilities. The drainage water from the land after secondary treatment has to satisfy a limit of 30mg/l of BOD and 10mg/l of nitrate expressed as 'N'. The net addition of the groundwater quality should not be more than 3mg/l of BOD and 3 mg/l of nitrate expressed as 'N'. The limit for applying on land is allowed subject to the availability of adequate land for discharge under the control of the industry, BOD value is relaxable upto

350mg/l, provided the wastewater is discharged into a town sewer leading to secondary treatment of the sewage.

- ** Suspended solids is relaxable upto 450 mg/l, provided the wastewater is discharged into town sewer leading to secondary treatment of the sewage.

Source: EPA Notification
[G.S.R. 475(E), 5th May, 1992]

21.0 CUPOLA FURNACE: EMISSION STANDARD

Parameter	Emission limit
Sulphur dioxide (SO ₂)	300 mg/Nm ³ at 12% CO ₂ corrections

To achieve the standard, foundries may install scrubber, followed by a stack of height six times the diameter of the Cupola beyond the charging door.

Note :

In case due to some technical reasons, installation of scrubber is not possible, then value of SO₂ to the ambient air has to be effected through the stack height.

Source : EPA Notification
[GSR No. 176(E), April 2, 1996]

22.0 DIESEL GENERATOR SETS : STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula :

$$H = h + 0.2 \times \sqrt{\text{KVA}}$$

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

Source : Evolved By CPCB
[Emission Regulations Part IV:COINDS/26/1986-87]

23.0 MOTOR VEHICLES : ENVIRONMENTAL STANDARDS

23.1 Vehicular Exhaust Emission Standards (effective for 1990 – 1996)

Standards for emission of smoke, vapour etc. from motor vehicles

- 1) Every motor vehicle shall be manufactured and maintained in such condition and shall be so driven that smoke, visible vapour, grit, sparks, ashes, cinders or only substances or oily substance do not emit-therefrom.
- 2) On and from the 1st day of March, 1990, every motorvehicle shall comply with the following standards:
 - a) idling CO (carbon monoxide) emission limit for all four wheeled petrol driven vehicles shall not exceed 3 per cent by volume; and
 - b) idling CO emission limit for all two and three wheeled petrol driven vehicles shall not exceed 4.5 per cent by volume;
 - c) smoke density for all diesel driven vehicles shall to as follows:

Method of Test	Maximum Smoke Density		
	Light absorption Co-efficient K(l/m)	Bosch units	Hartridge units
Full load at a speed of 60% to 70% of maximum engine rated speed dec- lared by the manufacture	3.1	5.2	75
Free acceleration	2.3		65

- 3) On and from the 1st day of April, 1991, all petrol driven vehicles shall be so manufactured that they comply, with the mass emission standards as specified at Annexure-I. The breakdown of the operating cycle used for the test shall be as specified at Annexure-II and the reference fuel of such tests shall be as specified in Annexure-III to this schedule.
- 4) On and from the 1st day of April, 1991 all diesel driven vehicles shall be so manufactured that they comply, with the mass emission standard based on exhaust gas capacity specified in Anneuxre-IV to this schedule.
- 5) On and from the 1st day of April, 1992 all diesel driven vehicles shall be so manufactured that they comply with the following levels of emissions under the Indian driving cycle.

Mass of Carbon Monoxide (CO), max, gm/kWH	Mass of Hydrocarbons (HC), max. gm/ kWH	Mass of Nitrogen Oxides (NO _x), max. gm/kWH
14	3.5	18

- 6) Each motor vehicle manufactured on land after the dates specified in paragraphs (2), (3), (4) and (5), shall be certified by the manufacturers to be conforming to the standards specified in the said paragraph and the manufacturer shall further certify that the components liable to effect the emission of gaseous pollutants are so designed, constructed and assembled as to enable to vehicle, in normal use, despite the vibration to which it may be subjected, to comply with the provisions of the said paragraphs.
- 7) Test for smoke emission level and carbomonoxyde level for motor vehicles
 - a) Any officer not below the ran of a sub-inspector of police or an Inspector of motor vehicles, who has reason to believe that a motor vehicles is by virtue of smoke emitted from it or other pollutants like carbonmonoxyde emitted from it, is likely to cause environmental pollution, endangering the health or safety of any other user of environmental pollution, endangering the health or safety of any other use of the road or the public, may direct the driver of any person incharge of the vehicle to submit the vehicle for undergoing a test to measure the standard of black smoke or the standard of any of the other pollutants.
 - b) The driver or any person incharge of the vehicle shall upon demand by any officer referred to sub-paragraph (a), submit the vehicle for testing for the purpose of measuring the standard of smoke or the levels of other pollutants of both.
 - c) The measurement of standard of smoke shall be done with a smoke metre of a type approved by the state government and the measurement of the other pollutants like carbon monoxyde shall be done with instruments of a type approved by the state government.

Source : EPA Notification
[GSR 55(E), Feb. 5, 1990]

ANNEXURE-I
(See Paragraph 3)

MASS EMISSION STANDARDS FOR PETROL DRIVEN VEHICLES

1. Type Approval Tests:

Two and Three Wheeler Vehicles

Reference Mass, R (Kg)	CO (g/km)	HC (g/km)
R<150	12	6
150 R<350	$12 + \frac{18(R-150)}{200}$	$8 + \frac{4(R-150)}{200}$
R>350	30	12

Light Duty Vehicles:

Reference Mass, rw (Kg)	CO (g/km)	HC (g/km)
1	2	3
rw<1020	14.3	2.0
1020<rw<1250	16.5	2.1
1250<rw<1470	18.8	2.1
1470<rw<1700	20.7	2.3
1700<rw<1930	22.9	2.5
1930<rw<2150	24.9	2.7
rw<2150	27.1	2.9

2. Conformity of Production Tests:

Two and Three Wheeler Vehicles:

Reference Mass, R(Kg)	CO(g/km)	HC (g/km)
1	2	3
R<150	15	10
150 < 350	$15 + \frac{25(R-150)}{200}$	$15 + \frac{5(R-150)}{200}$
R>350	40	15

Light Duty Vehicles:

Reference Mass, rw (Kg)	CO(g/km)	HO (g/km)
rw<1020	17.3	2.7
1020<rw<1250	19.7	2.2
1250<rw<1470	22.5	2.8
1470<rw<1700	24.9	3.0
1700<rw<1930	27.6	3.3
1930<rw<2150	29.9	3.5
rw<2150	32.6	3.7

Note: For any of the pollutants referred to above of the three results obtained may exceed the limit specified for the vehicles by not more than 10 per cent.

Mass emission standards refers to the gm. of pollutants emitted per km. run of the vehicle, as determined by a chassis dynamometer test using the Indian Driving Cycle.

ANNEXURE-II

(See Paragraph 3)

Break down of the operating cycle used for the test (km/hr)

No. of Operation	Acceleration (m/sec ²)	Speed (km/hr)	Duration each operation (second)	Cumulative time (second)
01. Idling	-	-	16	16
02. Acceleration	0.65	14	6	22
03. Acceleration	0.56	14-22	4	26
04. Deceleration	0.63	22-13	4	30
05. Steady speed	-	13	2	32
06. Acceleration	0.56	13-23	5	37
07. Acceleration	0.44	23-31	5	42
08. Deceleration	0.56	31-25	3	45
09. Steady speed	-	25	4	49
10. Deceleration	0.56	25-21	2	51
11. Acceleration	0.45	21-34	8	59
12. Deceleration	0.32	34-42	7	66
13. Deceleration	0.46	42-37	3	69
14. Steady speed	-	37	7	76
15. Deceleration	0.42	37-34	2	78
16. Acceleration	0.32	34-42	7	85
17. Deceleration	0.46	42-27	9	94
18. Deceleration	0.52	27-14	7	101
19. Deceleration	0.26	14-00	7	108

ANNEXURE-III

(See Paragraph 3)

Reference Fuel for Type and Production Conformity Tests

Sl. No.	Characters	Requirements		Method of test (ref of P: or IS: 1148*
		87 octane	90 octane	
1	2	3	4	5
1.	Colour, visual	Orange	Red	-
2.	Copper-strip corrosion for 3 hours at 50°C	Not worse than No. 1		P:5(1968)
3.	Density at 15°C	Not Ltd., but to be reported		P:16(1967)
4.	Distillation:			
a)	Initial boiling point	Not Ltd., but to be reported		P:18(1967)
		*Methods of test for petroleum and its products		
b)	Recovery up to 70°C, per cent by volume, min.	10	10	
c)	Recovery up to 180°C, per cent by volume, min.	50	50	
d)	Recovery up to 180°C, per cent by volume, min	90	90	
e)	Final boiling point, Max	215°C	215°C	
f)	Residue percent by volume maximum	2	2	
5)	Octane number (research method)	87	94	P:27 (1960)
6)	Oxidation stability, in minutes, minimum	360	360	P:28(1966)
7)	Residue on evaporation mg/100 ml, max.	4.0	4.0	P:29(1960) (Air jat solvent washed)
8)	Sulphur, total, per cent by weight max.	0.25	0.20	P:34(1966)
9)	Lead content (as Pb), g/l max.	0.56	0.80	P:37(1967) or P:38(1967)
10)	Reid vapour pressure at 38°C kgf.com ³ .max.	0.70	0.70	P:39(1967)

ANNEXURE-IV

(See Paragraph 4)

Limit Values of Exhaust Gas Opacity Applicable for Diesel Drive Vehicles The Engine Tests at Steady Speed

Nominal Flow G(l/s)	Absorption Coefficient (Km-1)
42	2.00
45	1.91
50	1.82
55	1.75
60	1.68
65	1.61
70	1.56
75	1.50
80	1.46
85	1.41
90	1.38
95	1.34
100	1.31
105	1.27
110	1.25
115	1.22
120	1.20
125	1.17
130	1.15
135	1.31
140	1.11
145	1.09
150	1.07
155	1.07
160	1.04
165	1.02
170	1.01
175	1.00
180	0.99
185	0.97
190	0.96
195	0.95
200	0.93

23.2a Diesel Fuel : Specifications for Emission Related Parameters

Sl. No.	Characteristics	Requirement	Method of Test ref. to P:of IS: 1448
(i)	Density at 15°C, kg/m ³	820 to 880 ⁽¹⁾	P : 32
(ii)	Centane Number, min	45.0 ⁽²⁾	P : 9
(iii)	Distillation 85 per cent by volume recovery at °C, max and 95 per cent by volume recovery at °C, max	350 370	P : 18
(iv)	Sulphur, per cent by mass,	0.50 ⁽³⁾	P : 33

⁽¹⁾ 820 to 860 by 2000 AD

⁽²⁾ 48 by 31st December, 1998 (except in the refineries - Digboi, Gauhati and Bongaigaon Refineries & Petrochemicals Ltd.)

⁽³⁾ (i) 0.50 per cent by mass by 1st April 1996 in four metros and Taj Trapezium
(ii) 0.25 per cent by mass by 1st October, 1996 in Taj Trapezium
(iii) 0.25 per cent by mass by 1st April, 1999 throughout the country

Note:

(a) Above specifications apply to HSD only

(b) For new refineries coming during or after 1997 specification applicable by 2000AD and for existing refineries shall be applicable by 1997.

Source : EPA Notification
[GSR No. 176(E), April 2, 1996]

23.2b Diesel Fuel - Specification for the Year 2000 AD

Sl. No.	Characteristic	HSD	LDO	Method of Test Ref To Annex [P:] of IS 1448
i)	Acidity, inorganic	Nil	Nil	- P : 2
ii)	Acidity, total, mg of KOH/g, Max	0.20	-	- P : 2
iii)	Ash, percent by mass, Max	0.01	0.02	- P : 4

(Contd.....)

(Contd.....)

iv)	Carbon residue (Ramsbottom) on 10 percent residue, percent by mass, Max	0.30 ¹⁾	1.5 (On whole sample)	-	P : 8
v)	Cetane number ²⁾ , Min	48 ³⁾	-	-	P : 9
vi)	Pour point ⁴⁾ , Max	3°C for winter 15°C for summer	12°C for winter 21°C for summer	-	P : 10
vii)	Copper strip corrosion for 3 h at 100°C	Not worse than No.1	Not worse than No.1	-	P : 15
viii)	Distillation, 85 percent volume recovery at °C, Max 95 percent volume recovery at °C, max	350 370	- 	- 	P : 18
ix)	Flash point ⁵⁾				
	a) Abel, °C, Min	35	-	-	P : 20
	b) Pensky-Martens, °C, Min	-	66	-	P : 21
x)	Kinematic viscosity, cSt, at 40°C	2.0 to 5.0	2.5 to 15.7	-	P : 25
xi)	Sediment percent by mass, Max	0.05	0.10	-	P : 30
xii)	Density at 15°C, kg/m ³	820-860 ⁶⁾	To be reported	-	P:16 ⁷⁾ P : 32
xiii)	Total sulphur, percent by mass, Max	0.25	1.8	-	P:33 ⁸⁾
xiv)	Water content, percent by volume, Max	0.05	0.25	-	P : 40
xv)	Cold filter plugging point (CFPP) ⁴⁾ , Max	6°C for winter 18°C for summer	-	-	P : 10
xvi)	Total sediments ⁹⁾ , mg per 100ml, Max	1.6	-	A	-

- 1) This limit is applicable prior to cetane number improvers, if used. In case a value exceeding the limit is obtained on finished fuels in the market, ASTM D 4046 shall be used to establish the presence of nitrate containing cetane number improvers. In such case the present limit for carbon residue cannot be applied. However, the use of cetane number improvers does not exempt the manufacturer from meeting their requirement prior to the addition of additives.
- 2) When a test engine is not available or when the quantity of the sample is too small for an engine rating Calculated Cetane Index by Four Variable Equation by ASTM D 4737 may be used for estimation of cetane number. The error in prediction of the 'Calculated Cetane Index' by this method will be less than +2 Cetane Number for

fuels having Cetane Number within the range of 32 to 56. It may be noted that this method is not applicable to pure hydrocarbons or fuels containing cetane improvers or fuels derived from coal. For arbitration purposes, the direct determination of cetane number by means of the standardized engine test shall be used unless the buyer and the seller agree otherwise.

- 3) For diesel fuel processed from Assam crude, the value of 45 minimum shall apply.
- 4) Winter shall be the period from November to February (both months inclusive) and rest of the months of the year shall be called a summer. The values for maximum pour point and CFPP shall be those as directed by OCC from time to time.
- 5) Diesel fuel for Naval applications including Merchant navy and fishing vessels of 12 metres and above in length shall have a flash point of 66°C, Min, when tested by the method prescribed in IS 1448 [P21] : 1970.
- 6) For diesel fuel processed from Assam crude, the value 820-870 shall apply.
- 7) In case of dispute with regard to the test to be followed, [P- 32] shall be the referee test method.
- 8) The test method given in IP 336 may be permitted for testing of total sulphur as an alternative method. However in case of dispute, method given in [P:33] of IS 1448 shall be the referee method.
- 9) This test shall be carried out only at the refinery or manufacturer's end. As an alternative, the test method ASTM D 2274, may be used and in such case the value of total insolubles shall be 1.5 mg/100 ml, Max. In case of dispute regard to the test to be followed, ASTM D 2274 shall be the referee test method.

Source - IS 1460 : 1995

23.3 Diesel Vehicles : Mass Emission Standards (Effective from 1st April, 1996)

Vehicle Category	HC* (g/kwhr)	CO* (g/kwhr)	NOx (g/kwhr)	Smoke
Medium & Heavy Over 3.5 T/GVW	2.4	11.2	14.4	***
Light diesel upto 3.5 T/GVW	2.4	11.2	14.4	**

or

Reference mass R (kg)	CO** g/km	HC+NOx** g/km
R <1020	5.0	2.0
1020 <R <1250	5.78	2.2
1250 <R <1470	6.4	2.5
1470 <R <1700	7.0	2.7
1700 <R <1930	7.7	2.9
1930 <R <2150	8.2	3.5
R >2150	9.0	40

Note

* The test cycle is as per 13 mode cycle on dynamometer.

** The test should be as per Indian driving cycle with cold start.

*** The emissions of visible pollutants (smoke) shall not exceed the limit value to smoke density. When expressed as light absorption coefficient given in Annexure (4) at Sr. No. 67 for various nominal flows when tested at constant speeds over full load.

Source : [GSR 609(E) Sept. 15, 1993]
Min. of surface Transport under Motor Vehicle Rules, 1989]

23.4a Motor Gasoline: Specifications for Emission Related Parameters

S. No.	Parameter	Requirement	Method of Test ref. to P: of IS : 1448
(i)	Reid Vapour Pressure at 38°C, KPa	35 to 70	P:39
(ii)	Benzene, Percent by volume, max	5.0(1)	P:104
(iii)	Lead Content (as Pb) g/l, max	0.15(low leaded(2)	P:38
(iv)	Sulphur, percent by mass, max	0.10 (unleaded) 0.013 (unleaded)	P:34
(v)	Potential Gum, g/m ³ , max	50	ASTM 873:8
(vi)	Gum (solvent Washed) g/m ³ max	40	P:29
(vii)	Oxygenates Content Ether (MTBE, ETBE) Alcohol, percent by volume, max	15	
(viii)	Phosphorus	See Foot Note (3)	ASTMD 3231

(1) 3.0 per cent volume maximum in metro cities by 2000 AD.

(2) 0.15 g/l by 31st December, 1996 (for entire country).

0.013 g/l by 1st April 1995 (for all State capitals/UTs and major metro cities);
by 1st December, 1998 (for all State capitals/UTs and major metro cities) and

by 1st April, 2000 AD for the entire country.

- (3)(a) Above specifications applies to leaded as well as unleaded petrol except lead content.
- (b) For new refineries coming up during or after 1997 the specification applicable by 2000 AD for existing refineries shall be applicable by 1997.

Source : EPA Notification
[GSR No. 176(E), April 2, 1996]

23.4b Motor Gasolines - Specification for the Year 2000AD

SI Characteristics No.	Requirements			Method of Test	
	Leaded Regular	Unleaded Regular	Unleaded Premium	P:of Annex IS 1448	of this Standard
i) Colour, visual	Orange	Colourless	Red	-	-
ii) Density, 15°C, kg/m ³	710-770	710-770	710-770	[P:16]	-
iii) Distillation:					
a) Recovery upto 70°C (E 70),	10-45	10-45	10-45		
b) Recovery up to 100°C (E 100), percent by volume	40-70	40-70	40-70		
c) Recovery up to 180°C (E180), percent by volume, Min	90	90	90		
d) Final boiling point (FBP), Max	215°C	215°C	215°C		
e) Residue, percent by volume, Max	2	2	2		
iv) Anti-knock index (AKI), Min	84	84	88	[P:26 and P:27] -	
v) Existent gum, g/m ³ , Max	40	40	40	[P:29]	(Airjet - solvent washed)
vi) Potential gum ¹), g/m ³ , max	50	50	50	P:1472)	-
vii) Sulphur, total, percent by mass,	0.20	0.10	0.10	[P:34]	-
ix) Reid vapour pressure (RVP),	35-60	35-60	35-60	[P:39]4)	-
x) Vapour lock index (VLI), (VLI=10 RVP + 7 E 70), Max					
a) Summer	750	750	750		-
b) Other months	950	950	950		
xi) Benzene content, percent by volume, max	5.0	5.0	5.0	[P:104]	-
xii) Copper strip corrosion for 3 h at 50°C	Not more than No. 1			[P:15]	-
xiii) Water tolerance of gasoline-alcohol blends, temperature for phase separation, °C, Max					
a) Summer	10	10	10		
b) Winter ⁶)	0	0	0		

- 1) To be carried out at the refinery end only, and the limit for this test is meant for produces prior to addition of multifunctional additives, if used. However, the use of multifunctional additives does not exempt the manufacturer from meeting this requirement prior to addition of additives.
- 2) This test shall be carried out on the gasoline before addition of multifunctional detergent/dispersant additives, as these may interfere with the test.
- 3) For unleaded motor gasoline test method ASTM D 5059/IP 352 shall be followed.
- 4) For the gasoline-alcohol blends, the dry vapour test method given in Annex A shall be followed.
- 5) From May to July in Central India and northern plains in India.
- 6) In winter it is expected that temperature may be lower than 0°C in the northern hilly region and hence phase separation shall not take place till -10°C.

(Source : IS – 1460 – 1995)

23.5 Petrol Driven Vehicles : Mass Emission Standards Effective from 1st April, 1996 to 2000

i) Passenger Cars

Cubic Capacity (cm ³)	Carbon Monoxide (gm/km)	HC + NO _x (gm/km)
C<1,400	8.68	3.00
C>1,400<2,000	11.20	3.84
C>2,000	12.40	4.36

Note:

1. The tests will be as per Indian Driving Cycle with warm start.
2. There should be no crankcase emission.
3. Evaporative emission should not be more than 2.0 g/test.

ii) Three Wheelers (for all categories)

CO, g/km	6.75
HC + NO _x , g/km	5.40

iii) Two Wheelers (for all categories)

CO, g/km	4.50
HC + NO _x , g/km	3.60

Light Duty vehicles:

(Passenger cars)

20% relaxation in the standards for carbon monoxide and 20% in combined HC & NOs for the COP volumes would be given.

Two & Three wheeler vehicles:

10% relaxation in the standards for carbon monoxide and 20% in combined HC & NOx for the COP volumes would be given.

*[Source G.S.R. 609(E) Sept. 15], 1993
Min. of Surface Transport under Motor Vehicles Rules; 1989]*

23.6 Noise Standards for Motor Vehicles

Every motor vehicle shall be constructed and maintained so as to conform to noise standards as indicated in the table below, and these Standards shall be tested as per Indian Standards IS : 3028.

Category of Vehicles	Maximum Permissible Noise Level
Two wheelers (Petrol driven)	80 dB (A)
All passengers cars, all Petrol driven three-wheelers and diesel driven two wheelers	82 dB (A)
Passenger or Light Commercial Vehicles including three wheelers vehicles fitted with diesel engine with gross vehicles weight upto 4000 kgs.	85 dB (A)
Passenger or Commercial Vehicles with gross vehicles weight above 4000 kgs and upto 12000 kgs	89 dB (A)
Passenger or Commercial Vehicles with gross vehicles weight above 12000 kgs.	91 dB (A)

(Source : Central Motor Vehicles Rules, 1989)

23.7 Mass Emission Standards for Petrol Driven Vehicles (for vehicles fitted with Catalytic Converter) effective for 1998 to 2000

Type Approval Test

(1) Passenger Cars

Cubic Capacity (cm ³)	Carbon Monoxide (gm/km)		HC+NO _x (gm/km)	
	Passenger cars fitted with Catalytic Converter	Passenger cars not fitted with Catalytic Converter	Passenger cars fitted with Catalytic Converter	Passenger cars not fitted with Catalytic Converter
C < 1400	4.34	8.68	1.50	3.0
1400 < C < 2000	5.60	11.20	1.92	3.84
C > 2000	6.20	12.40	2.18	4.36

Note :

The test will be as per Indian driving cycle with warm start. However, with effect from 1st April, 1998 the test will be as per Indian driving cycle with cold start for catalytic converter fitted vehicles as:

Soak Temperature	:	20° – 30° C
Soak Period	:	6 – 30 hrs.
Preparatory running before sampling	:	4 cycles
Number of test cycles	:	6
Break Down of cycles	:	Indian driving cycle

- For passenger cars not fitted with catalytic converter, the test will continue to be with warm start as per existing procedure, till 01.04.2000.
- There should be no crankcase emission
- Evaporative emission should not be more than 2.0 gm per test.
- COP Standards** : 20% relaxation in the standards for Carbon Monoxide and combined HC+NO_x would be given.
- For vehicles fitted with Catalytic converter a deterioration factor of 1.2 on Type Approval limits will be applicable for durability.

(II) Three Wheelers (for all categories)

CO	(gms/km)	6.75
HC+NO _x	(gms/km)	5.40

Note :

1. The test will be as per Indian driving cycle with warm start. However, with effect from 1st April, 1998, the test will be as per Indian driving cycle with cold start.
 2. **COP Standards** : 20% relaxation in the standards for Carbon Monoxide and combined HC+NO_x would be given.
- (III) *Two Wheelers (for all categories)*

CO	(gms/km)	4.50
HC+NO _x	(gms/km)	3.60

Note :

3. The test will be as per Indian driving cycle with warm start. However, with effect from 1st April, 1998, the test will be as per Indian driving cycle with cold start.
4. **COP Standards** : 20% relaxation in the standards for Carbon Monoxide and combined HC+NO_x would be given.

Annexure 1

Nominal Flow G(l/s)	Light Absorption Coefficient K(l/m)	Normal Flow G(l/s)	Light Absorption Coefficient K(l/m)
42	2.26	120	1.37
45	2.19	125	1.345
50	2.08	130	1.32
55	1.985	135	1.30
60	1.90	140	1.27
65	1.84	145	1.25
70	1.775	150	1.205
75	1.72	160	1.19
80	1.665	165	1.17
85	1.62	170	1.155
90	1.574	175	1.14
95	1.535	180	1.125
100	1.495	185	1.11
105	1.465	190	1.095
110	1.425	195	1.08
115	1.395	200	1.065

Source : Central Motor Vehicle Rules, 1989
GSR 461(E), Jan. 21, 1990

23.8 Mass Emission Standards for Vehicles Manufactured on and after 1st April, 2000

A. For Petrol Driven Vehicles

Passenger Cars	CO(g/km)	HC+NO _x (g/km)
Type Approval	2.72	0.97
Conformity of Production	3.16	1.13

Notes :

The test shall be as per the modified Indian Driving Cycle, with cold start as specified in Annexure IV 'B', on chasis dynamometer.

There should be no crankcase emission.

Evaporative emission should not be more than 2 gm/test.

For vehicles fitted with Catalytic Converter, a deterioration factor of 1.2 on Type Approval Limits will be applicable for durability.

Commercial fuel shall be as notified by the Ministry of Environment & Forests vide Notification No. GSR 176 (E), dated the 2nd April, 1996.

Reference test fuel shall be as specified in Annexure IV C.

2 – Wheelers and 3 – Wheelers	CO (g/km)		HC+NO _x (g/km)	
	2-wheelers	3-wheelers	2-wheelers	3-wheelers
Type Approval	2.0	4.0	2.0	2.0
Conformity of Production	2.4	4.8	2.4	2.4

Notes :

The test shall be as per the Indian Driving Cycle, with cold start on Chassis Dynamometer as specified in Annexure IV B to the Principal Rules.

Commercial fuel shall be as notified by the Ministry of Environment & Forests vide Notification No. GSR 176 (E), dated the 2nd April, 1996.

Reference test fuel shall be as specified in Annexure IV C.

B. For Diesel Vehicles (Including Two and Three Wheelers)**1. Vehicles with GVW exceeding 3.5 ton**

Pollutants	Limits for	
	Type Approval	Conformity of Production
CO (g/kWh)	4.5	4.9
HC (g/kWh)	1.1	1.23
NOx (g/kWh)	8.0	9.0
PM (g/kWh) for engines with power exceeding 85 kW	0.36	0.4
PM (g/kWh) for engines with power exceeding 85 kW	0.36	0.4

II. Vehicles with GVW equal to or less than 3.5 tonne

Pollutants	Limits for	
	Type Approval	Conformity of Production
CO (g/kWh)	4.5	4.9
HC (g/kWh)	1.1	1.23
NOx (g/kWh)	8.0	9.0
PM (g/kWh) for engines with power exceeding 85 kW	0.36	0.4
PM (g/kWh) for engines with power equal to or less than 85 kW	0.61	0.68

OR Chassis Dynamometer Test

Reference Mass (kg)	Limits for Type Approval (gm/km)			Limits for conformity of Production (gm/km)		
	CO	HC+NOx	PM	CO	HC+NOx	PM
$R \leq 1250$	2.72	0.97	1.14	3.16	1.13	0.18
$1250 < R \leq 1700$	5.17	1.40	0.19	6.0	1.60	0.22
$1700 > R$	6.90	1.70	0.25	8.0	2.0	0.29

Notes :

The test for vehicles with GVW equal to or less than 3.5 ton shall be as per the 13 mode cycles on engine dynamometer specified in Annexure IVA to the principal rules.

The test shall be as per the Indian Driving Cycles, for 2 wheelers and 3 wheelers and modified Indian Driving Cycle for 4 wheelers with cold start, as specified in Annexure IVB on Chassis Dynamometer.

For vehicles fitted with catalytic converters a deterioration factor 1.1 of CO; 1.0 for HC+NO_x and 1.2 for PM on type approval limits will be applicable for durability.

The emission of visible pollutants (smoke) shall not exceed the limit value to smoke density, when expressed as light absorption co-efficient for various nominal flows as in Annexure to Rule 115(9) (Notification No. GSR 163 (E) dated 29th March, 1996), when tested at constant speeds over full load. These smoke limits are without correction factor and engines are to be tested with conditioned air supplied to the engine to maintain atmospheric factor of 0.98 to 1.02.

Commercial fuel shall be as notified by Ministry of Environment and Forests vide Notification No. GSR 176 (E) dated 2nd April, 1996.

Reference test fuel shall be as specified in Annexure IV D.

Source : Central Motor Vehicles Rules, 1989
GSR 493 (E) dated August 28, 1997

ANNEXURE IV B

[See Rule 115 (10)] Driving Cycles and Cold Start

A. For all 2 and 3 Wheelers except diesel vehicles

Cold Start Procedures:

Test Cell Condition	
Soak Temperature	20° – 30° C
Soak Period	6 – 30 hrs
Preparatory running before sampling	Idling of 40 seconds and 4 cycles
Number of test cycles	6
Break down of cycles	Indian Driving Cycles As per Annexure II to principal rules.

B. For all Other Vehicles Including Diesel 2,3 and 4 Wheelers:

Cold Start Procedure:

Test Cell Condition

Soak Temperature	20° – 30° C
Soak Period	6 – 30 hrs
Preparatory running before sampling	Idling of 40 seconds and 4 cycles
Number of test cycles*	4 cycles of Part one and 1 cycle of Part two
Break down of cycles*	Modified Indian Driving Cycle as per Table I and II

For diesel 2 & 3 wheelers

Number of test cycles	-	6
Breakdown of cycles	-	Indian Driving Cycle As per Annexure II to principal rules

Modified Indian Driving Cycle for Year 2000

Table I Operating Cycle on the Chassis Dynamometer (Part one)

No. of Operation	Operation	Phase	Acceleration (m/s ²)	Speed (km/h)	Duration of each		Cumulative time(s)	Gear to be used in the case of manual gear box
					Operation(s)	Phase (s)		
1	Idling				11	11	11	As PM-5sK1 (*)
2	Acceleration	2	1.04	0-15	2	4	15	1
3	Steady Speed	3		15	8	8	23	1
4	Deceleration	4	-0.69	15-10	2	5	25	1
5	Deceleration, Clutch disengaged		-0.92	10-0	3		25	K1 (*)
6	Idling	5			23	21	48	16sPM-5sK1 (*)
7	Acceleration	6	0.83	0-15	5	12	54	1
8	Gear Change				2		56	
9	Acceleration		0.94	15-32	5		61	2
10	Steady Speed	7		32	24	24	85	2
11	Deceleration	8	-0.75	32-10	8	11	93	2
12	Deceleration, clutch disengaged		-0.92	10-0	3		96	K ₂ (*)
13	Idling	9			21	21	117	16 s PM – 5 s K1 (*)
14	Acceleration	10	0.83	0-15	5	26	122	1
15	Gear Change				2		124	
16	Acceleration		0.62	15-35	9		133	2
17	Gear Change				2		135	
18	Acceleration		0.52	35-50	8		143	3
19	Steady Speed	11		50	12	12	155	3
20	Deceleration	12	-0.52	50-35	8	8	163	3
21	Steady Speed	13		35	13	13	176	3
22	Gear Change	14			2	12	178	
23	Deceleration		-0.86	32-10	7		185	2
24	Deceleration, Clutch disengaged		-0.92	10-0	3		188	K ₂ (*)
25	Idling	15			7	7	195	7 s PM (*)

(*) PM = Gearbox in neutral, clutch engaged

K1, K2 = First or second gear engaged, clutch disengaged

Modified Indian Driving Cycle for Year 2000

Table II Operating Cycle on the Chassis Dynamometer (Part Two)

No. of Operation	Operation	Phase	Acceleration (m/s ²)	Speed (km/h)	Duration of each		Cumulative time(s)	Gear to be used in the case of manual gear box
					Operation(s)	Phase (s)		
1	Idling	1			20	20	20	K1 (*)
2	Acceleration	2	0.83	0-15	5	41	25	1
3	Gear Change				2		27	-
4	Acceleration		0.62	15-35	9		36	2
5	Gear Change				2		38	-
6	Acceleration		0.52	35-50	8		46	3
7	Gear Change				2		48	-
8	Acceleration		0.43	50-70	13		61	4
9	Steady Speed	3		70	50	50	111	5
10	Deceleration	4	-0.69	70-50	8	8	119	4 s.5 + 4 s.4
11	Steady Speed	5		50	69	69	188	4
12	Acceleration	6	0.43	50-70	13	13	201	4
13	Steady Speed	7		70	50	50	251	5
14	Acceleration	8	0.24	70-90	24	24	275	5
15	Steady Speed	9		90	83	83	358	5
16	Deceleration	10	-0.69	90-80	4	22	362	5
17	Deceleration		-1.04	80-50	8		370	5
18	Deceleration		-1.39	50-00	10		380	K2 (*)
19	Idling	11			20	20	400	PM (*)

(*) PM = Gearbox in neutral, clutch engaged

K1, K2 = First or second gear engaged, clutch disengaged

ANNEXURE IV C

(See rule 115(10))

REFERENCE FUEL PETROL

			ASTM Method
	Minimum	Maximum	
Research Octane Number	95.0		D 2699
Motor Octane Number	85.0		D 2700
Density at 15°C (kg/l)	0.718	0.762	D 1298
Reid Vapour pressure	0.56 bar	0.64 bar	D 323
Distillation:			
boiling point	24°C	40 °C	D 86
10% vol. point	42° C	58 °C	
50% vol. point	90 °C	110 °C	
90% vol. point	155 °C	180 °C	
Final boiling point	190 °C	215 °C	
Residue		2%	D 86
Hydrocarbon Analysis:			
Olefins		20% vol.	D 1319
Aromatics	(including max. 5% vol. benzene)*	45% vol.	(*) D 3606/D 2267
Saturates	balance		D 1319
Oxidation Stability	480 minutes		D 525
Resistant Gum		4 mg/100 ml	D 381
Sulphur Content		0.04% mass	D 1266/D 2622/ D 2785
Copper Corrosion at 50° C		1	D 130
Lead Content		0.005 g/l	D 3237
Phosphorous Content		0.0013 g/l	D 3231

* Addition of oxygenates prohibited

ANNEXURE IV D

[See rule 115(10)] REFERENCE FUEL DIESEL

			ASTM Method
	Minimum	Maximum	
Cetane Number	49	53	D 613
Density at 15°C (kg/l)	0.835	0.845	D 1298
Distillation:			D 86
50 % point	245 °C		
90% point	320 °C	340 °C	
Final boiling point	-	370 °C	
Flash point	55 °C		D 93
CFPP	-	(--) 5 °C	EN 116 (CEN)
Viscosity at 40 °C	2.5mm ² /s	3.5mm ² /s	D 445
Sulphur content	to be reported	0.3% mass	D 1266/D 2622/ D 2785
Copper corrosion			D 130
Conrdson carbon residue (10% DR)		0.2% mass	D 189
Ash content		0.01 % mass	D 482
Water content		0.05 % mass	D 95/D 1744
Neutralization (strong acid) Ne		0.20 mg/KOH/g	
Oxidation stability		2.5 mg/100 ml	D 2274
Additives	*		

It must not contain any metallic additives or cetane improver additives

23.9 Mass Emission Standards (Bharat Stage-II) (Effective from April 1, 2000)

(A) Motor Cars with seating capacity of and upto 6 persons (including driver) and Gross Vehicle Mass (GVM) not exceeding 2500 kg.

Vehicles with	Standard (Type Approval=COP) (g/km)		
	CO	(HC+Nox)	PM
Gasoline engine	2.2	0.5	-
Diesel engine	1.0	0.7	0.08

(B) Four-wheeler Passenger Vehicles with GVW equal to or less than 3500 kg and designed to carry more than 6 persons (including driver) or maximum mass of which exceeds 2500 kg.

Class	Ref. Mass(rw) kg	Limit Values for Type Approval (TA) as well as COP				
		Mass of CO(g/km)		Mass of HC+NOx(g/km)		Mass of PM(g/km)
		Gasoline	Diesel	Gasoline	Diesel	Diesel
I	rw<1250	2.2	1.0	0.5	0.7	0.08
II	1250<rw<1700	4.0	1.25	0.6	1.0	0.12
III	1700>rw	5.0	1.5	0.7	1.2	0.17

Notes :

- The test including driving cycle shall be as per sub-rule (10), with the modifications that:
 - there shall be no relaxation of norms for COP purposes,
 - the tests shall be on Chasis dynamometer,
 - the driving cycle shall be at a maximum speed of 90 kmph, and
 - the reference fuel shall be of a maximum of 0.05% sulphur content.
- Commercial fuel or meeting above norms shall be upto 0.05% mass maximum sulphur content.
- There shall be no crankcase emissions for petrol driven vehicles.
- Evaporative emission shall not be more than 2.0 g/test from petrol driven vehicles.
- For the above vehicles when fitted with catalytic converter deterioration factor shall be as follows:
Gasoline engines : CO = 1.2; (HC+NOx)= 1.2;
Diesel engines : CO = 1.1; (HC+NOx) = 1.0' PM = 1.2.

Provided that the vehicle manufacturers may opt for an aging test of 80,000 kms for evaluating deterioration factor, as per procedure that may be laid down by the Central Government.

- For diesel engine vehicles, the emission of visible pollutants (smoke) shall not exceed the limit value to smoke density, when expressed as light absorption coefficient for various nominal flows as in Annexure-I to Rule 115(9) when tested at constant speeds over full load.

[Source : Central Motor Vehicles Rules, 1989
GSR 77 (E), dated January 31, 2000]

23.10 Emission of Smoke and Vapour from Agriculture Tractors Driven by Diesel Engines

- (1) Every agriculture tractor manufactured on and from the date of commencement of this rule shall be maintained in such condition and shall be so used that visible and gaseous pollutants emitted by then comply with the standards as prescribed in this rule.
- (2) Every manufacturer of agriculture tractor shall comply with the standards for visible pollutants, emitted by them, when tested as per the procedure described in IS 12062 : 1987.
- (3) The emission of visible pollutants shall not exceed the limit values given below when tested on engine dynamometer at 80% load at six equally spaced speeds, namely:
 - (a) 55% of rated speed declared by the manufacturer of 1000 rpm whichever is higher, and
 - (b) rated speed declared by the manufacturer.

Maximum Smoke Density

Light absorption coefficient K(l/m)	Hartridge Units
3.25	75

- (4) All diesel driven agriculture tractors shall be so manufactured and produced that they comply with the following standards of gaseous pollutants, emitted by them in addition to those of visibility pollutants as provided in sub-rule (2) when tested as per the procedures described under ISO 8178-4 'C1' 8 mode cycle, namely:

The weighted average mass of carbon monoxide (CO), Hydrocarbons (HC) and mass oxides of Nitrogen (NO_x) in g/kwhr emitted during the test shall not exceed the limits given below, both for type approval and COP tests, namely:

Mass of Oxides of Nitrogen (NO _x)	-	18.0 g/kwhr
Mass of Carbon Monoxide (CO)	-	14.0 g/kwhr
Mass of Hydrocarbon (HC)	-	3.5 g/kwhr

[Source : Central Motor Vehicles Rule, 1989, GSR 627(E) September, 99]

23.11 Mass Emission Standards for Compressed Natural Gas Driven Vehicles

Mass emission standards for vehicles when operating on Compressed Natural Gas shall replace Hydrocarbon by Non Methane Hydrocarbon. Non Methane Hydrocarbon (NMHC) may be estimated by an analyzer or by the following formula, namely:

$$\text{NMHC} = \text{HC} \times (1 - K/100)$$

Where

HC	= total hydrocarbon measured
K	= % Methane content in natural gas fuel

Methane content in Compressed Natural Gas to be used as reference fuel shall not be less than 70%.

(i) For gasoline vehicles with OE fitment : Prevalent type approval norms shall be applicable with "Non Methane Hydrocarbon" in place of total Hydrocarbon.

(ii) For in-use gasoline vehicles:

The in-use vehicles fitted with CNG kits shall meet the emission norms prescribed for gasoline vehicles as applicable to the prevailing norms corresponding to the year of manufacture of the vehicle for purposes of CNG kit approval, the kit supplier shall obtain the certificate from any of the test agencies authorised under rule 126 based on vehicles of engine capacity in the range of (a) upto 750 cc, (b) from 751 cc to 1300 cc, and (c) from 1301 cc and above, and such kits shall be permissible to be retrofitted on any vehicle falling in the respective engine capacity range. For purposes of COP for such a kit, kit supplier/manufacturer shall have the certificate of the kit renewed after every 5 years.

Provided that the approved kit shall not be retrofitted on a vehicle of higher capacity engine than the engine for which it has been tested.

(iii) For diesel vehicles with OE fitment : Prevalent type-approval norms for diesel vehicles shall be applicable with "Non Methane Hydrocarbon" in place of total Hydrocarbon.

(iv) For in use diesel vehicles : The in-use diesel vehicles when converted for operation on CNG, shall meet type approval norms for diesel vehicles corresponding to the year of manufacturer of the vehicle and the procedure for testing shall be as applicable to in-use gasoline vehicles. Such converted vehicles shall also meet road-worthiness requirements as may be specified by the Central Government.

Explanation :

1. For OE fitment and retrofitment on "In-use" vehicles, the responsibility of Type Approval shall be that of the vehicle manufacturer and kit manufacturer/importer respectively.
2. The Type Approval of CNG kit for retrofitment shall be valid for five years from the date of issue and shall be renewable.
3. Four-wheeled/three-wheeled vehicles converted for dedicated operation on CNG and fitted with a standby gasoline tank not exceeding 5 ltr/ 3 ltr/2 ltr capacity respectively, shall be exempted from mass emission test, crank case test and evaporative emission test.
4. The retrofitment of CNG kits in in-use vehicles, shall be carried by workshops authorised by the kit manufacturer/kit supplier.

[Source : Central Motor Vehicles Rule, 1989
GSR 99 (E) dated Feb. 9, 2000]

24.0 DYE & DYE INTERMEDIATE INDUSTRY : WASTEWATER DISCHARGE STANDARDS

Parameter	Concentration not to exceed, mg/l (except pH, colour and bio-assay test)
pH	6.0 to 9.0
Colour, hazen unit	400
Suspended solids	100
BOD (27°C, 3 days)	100
Oil & Grease	10.0
Phenolics as C ₆ H ₅ OH	1.0
Cadmium as Cd	0.2
Copper as Cu	2.0
Manganese as Mn	2.0
Lead as Pb	0.1
Mercury as Hg	0.01
Nickel as Ni	2.0
Zinc as Zn	5.0
Chromium asCr	
hexavalent	0.1
total	2.0
Bio-assay test	90 per cent survival in 96 hours

Source : EPA Notification
[G.S.R. 742(E), dt., 30th Aug; 1990]

25.0 EDIBLE OIL & VANASPATI INDUSTRY

Parameter	Concentration not to exceed
Temperature	Not more than 5°C above ambient temperature of the recipient waterbody.
PH	6.5-8.5
Suspended solids	150 mg/l
Oil & grease	20 mg/l
BOD at 27°C, 3 days	100 mg/l
COD	200 mg/l

Wastewater discharge

(i)	Solvent extraction	2.0 m ³ /tonne of product oil
(ii)	Refinery/vanaspati (refined oil/vanasapti)	2.0 m ³ /tonne of product
(iii)	Integrated unit of solvent extraction & refinery/vanaspati	4.0 m ³ /tonne of refined oil/Vanaspati produced
(iv)	Barometric cooling water/deodoriser wateroil/vanasapti	15.0 m ³ /tonne of refined

Note :

- (i) The above standards will be applicable to wastewater from processes and cooling.
- (ii) BOD shall be made stringent upto 30 mg/l if the recipient fresh water body is a source of drinking water supply.
- (iii) The standards for boiler emissions shall be applicable as notified under GSR 176(E), April 2, 1996.

Source : EPA Notification
[GSR 176(E) April 2, 1996]

26.0 ELECTROPLATING INDUSTRY : WASTEWATER DISCHARGE STANDARDS

Parameter	Concentration not to exceed, mg/l (except for pH and temperature)
pH	6.0 to 9.0
Temperature	should not exceed 5° C above the ambient temperature of the receiving body
Oil & grease	10
Suspended solids	100
Cyanides (as 'CN')	0.2
Ammonical nitrogen (as N)	50
Total residual chlorine (as Cl ₂)	1.0
Cadmium (as Cd)	2.0
Nickel (as Ni)	3.0
Zinc (as Zn)	5.0
Chromium as Cr	
Hexavalent	0.1
Total	2.0
Copper (as Cu)	3.0
Lead (as Pb)	0.1
Iron (as Fe)	3.0
Total Metal	10.0

Source : EPA Notification
[S.O. 393(E), dt. 16th April, 1987]

27.0 FERMENTATION INDUSTRY : WASTEWATER DISCHARGE STANDARDS

(Distilleries, Maltries & Breweries)

Parameter	Concentration in the effluent not to exceed, mg/l (except for pH, colour and odour)
pH	5.5 to 9.0
Colour & odour	Absent
Suspended solids	100
BOD (27°C, 3 days)	
- disposal into inland surface water/ river/streams	30
- disposal on land or for irrigation	100

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan; 1988
GSR 176(E), April 2, 1996]

28.0 FERTILISER INDUSTRY

28.1 Urea Plants

Year of Commissioning	Pollutants	Emission Limit
Prilling tower commissioned prior to 1.1.1982	Particulate Matter	150 mg/Nm ³ or 2 kg/tonne of Urea
Prilling tower commissioned after 1.1.1982	-do-	50 mg/Nm ³ of 0.5 kg-/tonne of Urea

Source : EPA Notification
[S.O. 63(4), dt. 18th Jan; 1988]

28.2 Straight Nitrogenous Fertiliser Industry : Wastewater Discharge Standards

(Excluding the Calcium Ammonium Nitrate and Ammonium Nitrate Fertiliser)

Parameter	Concentration not to exceed, mg/l (except for pH)	
	Plants commissioned	
	January 1, 1982 onwards	prior to January 1, 1982
pH	6.5 to 8.0	6.5 to 8.0
Ammonical nitrogen	50	75
Total kjeldahl nitrogen (TKN)	100	150
Free ammonical nitrogen	4	4
Nitrate nitrogen	10	10
Cyanide as CN	0.2	0.2
Vanadium as V	0.2	0.2
Arsenic as As	0.2	0.2
Suspended solids	100	100
Oil & grease	10	10
Chromium as Cr		
hexavalent*	0.1	0.1
total	2.0	2.0

* To be complied with at the outlet of chrome removal unit.

Source : EPA Notification
[S.O. 64(E) dt. 18th Jan; 1988]

28.3 Straight Nitrogenous Fertiliser Industry : Wastewater Discharge Standards (Including for Calcium Ammonium Nitrate and Ammonium Nitrate Fertiliser)

Parameter	Concentration not to exceed, mg/l (except for pH) Plant commissioned	
	January 1, 1982, onwards	prior to January 1, 1982
pH	6.5 to 8.0	6.5 to 8.0
Ammonical nitrogen	50	75
Total kjeldahl nitrogen (TKN)	100	150
Free ammonical nitrogen	4	4
Nitrate nitrogen	10	10
Cyanide as CN	0.2	0.2
Vanadium as V	0.2	0.2
Arsenic as As	0.2	0.2
Suspended solids	100	100
Oil & grease	10	10
Chromium as Cr		
hexavalent*	0.1	0.1
total	2.0	2.0

* To be complied with at the outlet of chrome removal unit.

Source : EPA Notification
[S.O. 64(E) dt. 18th Jan; 1988]

28.4 Straight Phosphatic Fertiliser Industry : Wastewater Discharge Standards

Parameter	Concentration and to exceed mg/l (except for pH)
pH	7.0 to 9.0
Phosphate as P	5
Oil & grease	10
Suspended solids	100
Fluorides as F*	10
Chromium as Cr**	
Hexavalent	0.1
Total	2.0

* To be complied with at the outlet of fluoride removal unit, if the recipient system so demands, fluoride as F shall be limited to 1.5 mg/l.

** To be complied with at the outlet of chromate removal unit.

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan. 1988]

28.5 Phosphatic Fertilizer : Emission Standards

Parameter	Source	Emission limit, mg/Nm ³
Total fluoride	Phosphoric acid manufacturing unit	25
Particulate Matter	Granulatin, mixing and grinding of rock phosphate	150

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan; 1988]

28.6 Complex Fertiliser Industry : Wastewater Discharge Standards

(Including Calcium, Ammonium, nitrate and Ammonium phosphate fertilisers)

Parameter	Concentration not to exceed, mg/l (except for pH)	
	Plants commissioned January 1, 1982 onwards	prior to January 1, 1982
pH	6.5 to 8.0	6.5 to 8.0
Ammonical nitrogen	50	75
Free ammonical nitrogen	4	4
Total kjeldahl nitrogen (TKN)	100	150
Nitrate nitrogen	10	10
Cyanide as CN	0.2	0.2
Vanadium as V	0.2	0.2
Arsenic as As	0.2	0.2
Phosphate as P	5	5
Oil & grease	10	10
Suspended solids	100	100
Fluoride as F*	10	10
Chromium**		
hexavalent*	0.1	0.1
total	2.0	2.0

* To be complied with at the outlet of fluoride removal unit, if the recipient system so demands, fluoride as F shall be limited to 1.5 mg/l.

** To be complied with at the outlet of chromate removal unit.

Source : EPA Notification
[S.O. 64(E) dt. 18th Jan; 1988]

29.0 FLOUR MILLS

Parameter	Concentration not be exceed
pH	6.5-8.5
BOD at 27°C for 3 days	100 mg/l
Total suspended solids	100 mg/l
Oil & grease	10 mg/l
Wastewater discharge	2 cubic metre per tonne of wheat processed

Note :

- (i) BOD shall be made stringent upto 30 mg/l if the recipient fresh water body is a source of drinking water supply.
- (ii) BOD shall be allowed upto 350 mg/l for applying on land, provided the land is designed and operated as a secondary treatment system with the requisite monitoring facilities. The drainage water from the land after secondary treatment has to satisfy the limit of 30 mg/l of BOD and 10 mg/l of nitrate expressed as 'N'. The net addition to the groundwater quality should not more than 3 mg/l of BOD and 10 mg/l of nitrate expressed 'N'.
- (iii) BOD shall be allowed upto 350 mg/l for discharge into a town sewer, if such sewer leads to a secondary biological treatment system.
- (iv) Suspended solids limit shall be allowed upto 450 mg/l for discharge into a town sewer if, such sewer leads to a treatment system.

Source : EPA Notification
[GSR (176)E, April 2, 1996]

30.0 FOOD & FRUIT PROCESSING INDUSTRY : WASTEWATER DISCHARGE STANDARDS**

Category	Concentration not to exceed				Quantum
	pH	Suspended solids (mg/l)	Oil & Grease (mg/l)	BOD at 27 ⁰ C for 3 days (mg/l)	gm/tonne of product
A. Soft drinks					
a) Fruit based/ synthetic (more than 0.4 tonne/day) Bottles and tetrapack	6.5-8.5	100	10	30	
b) Synthetic (<0.4 tonne/day)	disposal via septic tank				
B. Fruits & Vegetables					
a) Above 0.4 tonne/day	6.5-8.5	50	10	30	-
b) 0.1-0.4 tonne/day	6.5-8.5	-	-	300*	-
C. Pakery					
a) Bread and biscuit					
1. Continuous process (more than 20 tonne/day)	6.5-8.5	-	-	200*	25
2. Noncontinuous Process (less than 20 tonne/day)	disposal via septic tank				
b) Biscuit production					
1. 10 tonne/day & Above	6.5-8.5	-	-	300*	35
2. Below 10 tonne/day	disposal via septic tank				
D. Confectionaries					
a) 4 tonne/day & Above	6.5-8.5	50	10	30	-
b) Below 4 tonne/day	disposal via septic tank				

* The standard shall be reviewed by 1992 and stringent standards shall be prescribed with respect to BOD.

** The emission from boiler house shall conform to the standards already prescribed under EPA, 1986, vide Notification No. GSR 176(E), 02.04.96.

Note :

To ascertain the category of unit falls, the average of daily production and wastewater discharge for the preceding 30 operating days from the date of sampling shall be considered.

Source : EPA Notification
[GSR 93(E), Feb 21, 1991]

31.0 FOUNDRIES : EMISSION STANDARDS

	Pollutant	Concentration (mg/Nm ³)
(a) Cupola Capacity (melting rate):		
Less than 3 tonne/hr	particulate matter	450
3 tonne/hr and above	-do-	150
(b) Arc Furnaces Capacity: All sizes	particulate matter	150
(c) Induction Furnaces Capacity: All sizes	-do-	150

Note:

- (i) It is essential that stack is constructed over the cupola beyond the charging door and the emissions are directed through the stack which should be atleast six times the diameter of cupola.
- (ii) In respect of arc furnaces and induction furnaces, provision has to be made for collecting the metal fumes before discharging the emissions through the stack

Source : EPA Notification
[G.S.R. 742(E), dt 30th Aug., 1990]

31.1 Re-Heating (Reverbearatory) Furnaces

	Pollutant	Concentration (mg/Nm ³)
Capacity : All sizes		
Sensitive area	particulate matter	150
Other area	particulate matter	450

Source : EPA Notification
[G.S.R. 913 (E) dt 42th Oct., 1989]

32.0 GENERAL STANDARDS* FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS

Part-A: Effluents

S. No.	Parameter	Standards			
		Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
2		3			
		(a)	(b)	(c)	(d)
1.	Colour and odour	See 6 of Annexure-I	-	See 6 of Annexure-I	See 6 of Annexure-I
2.	Suspended solids mg/l, max.	100	600	200	(a) For process waste water (b) For cooling water effluent 10 per cent above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve	-		(a) Floatable solids, solids max. 3 mm (b) Settleable solids, max 856 microns
4.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 5°C above the receiving water temperature	-	-	shall not exceed 5°C above the receiving water temperature
6.	Oil and grease, mg/l max,	10	20	10	20
7.	Total residual chlorine, mg/l max.	1.0	-	-	1.0
8.	Ammonical nitrogen (as N), mg/l, max.	50	50	-	50
9.	Total kjeldahl nitrogen (as N); mg/l, max.	100	-	-	100
10.	Free ammonia (as NH ₃), mg/l, max.	5.0	-	-	5.0
11.	Biochemical oxygen demand (3 days at 27°C), mg/l, max.	30	350	100	100

12.	Chemical oxygen demand, mg/l, max.	250	-	-	250
13.	Arsenic(as As).	0.2	0.2	0.2	0.2
14.	Mercury (As Hg), mg/l, max.	0.01	0.01	-	0.01
15.	Lead (as Pb) mg/l, max.	0.1	1.0	-	2.0
16.	Cadmium (as Cd) mg/l, max	2.0	1.0	-	2.0
17.	Hexavalent chromium (as Cr + 6), mg/l, max.	0.1	2.0	-	1.0
18.	Total chromium (as Cr) mg/l, max.	2.0	2.0	-	2.0
19.	Copper (as Cu) mg/l, max.	3.0	3.0	-	3.0
20.	Zinc (as Zn) mg/l, max.	5.0	15	-	15
21.	Selenium (as Se)	0.05	0.05	-	0.05
22.	Nickel (as Ni) mg/l, max.	3.0	3.0	-	5.0
23.	Cyanide (as CN) mg/l, max.	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max.	2.0	15	-	15
25.	Dissolved phosphates (as P), mg/l, max.	5.0	-	-	-
26.	Sulphide (as S) mg/l, max.	2.0	-	-	5.0
27.	Phenolic compounds (as C ₆ H ₅ OH) mg/l, max.	1.0	5.0	-	5.0
28.	Radioactive materials:				
	(a) Alpha emitters micro curie mg/l, max.	10 ⁻⁷	10 ⁻⁷	10 ⁻⁸	10 ⁻⁷
	(b) Beta emitters micro curie mg/l	10 ⁻⁶	10 ⁻⁶	10 ⁻⁷	10 ⁻⁶
29.	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100%effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese	2 mg/l	2 mg/l	-	2 mg/l
31.	Iron (as Fe)	3mg/l	3 mg/l	-	3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l	-	0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l

* These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified in Schedule of the Environment Protection Rules, 1989.

Part-B Wastewater Generation Standards

S. No.	Industry	Quantum
1.	Integrated Iron & Steel	16 m ³ /tonne of finished steel
2.	Sugar	0.4m ³ /tonne of cane crushed
3.	Pulp & Paper Industries	
	(a) Large pulp & paper	
	(i) Pulp & paper	175 m ³ /tonne of paper produced
	(ii) Rayon grade pulp	150 m ³ /tonne of paper
	(b) Small pulp & paper	
	(i) Agro-residue based	150 m ³ /tonne of paper produced
	(ii) Waste paper based	50 m ³ /tonne of paper produced
4.	Fermentation Industries	
	(a) Maltry	3.5 m ³ /tonne of grain processed
	(b) Brewer	0.25 m ³ /KL of beer produced
	(c) Distillery	12 M ³ /KL of alcohol produced
5.	Caustic Soda	
	(a) Membrane cell process	1m ³ /tonne of caustic soda produced excluding cooling tower blowdown
	(b) Mercury cell process	4 m ³ /tonne of caustic soad produced (mercury bearing). 10% below down permitted for cooling tower.
6.	Textile Industries:	
	Man-made fibre	
	(i) Nylon & Polyster	120 m ³ /tonne of fibre produced
	(ii) Voscose Staple Fibre	150 m ³ /tonne of product
	(iii) Viscose Filament Yarn	500 m ³ /tonne of product
7.	Tanneries	28 m ³ /tonne of raw hide
8.	Starch Glucose and related products	8 m ³ /tonne of maize crushed
9.	Dairy	3 m ³ /kl of Milk
10.	Natural rubber processing industry	4 m ³ /tonne of rubber
11.	Fertiliser	
	(a) Straight nitrogenous fertiliser	5 m ³ /tonne of urea or equivalent produced
	(b) Straight phosphatic fertiliser (SSP & TSP) excluding manufacture of any acid	0.5 m ³ /tonne of SSP/TSP
	(c) Complex fertiliser	Standards of nitrogenous and phospathic fertilisers are applicable depending on the primary product.

Part-C Load based standards

1. Oil Refinery Industry

Parameter	Quantum in Kg/1000 tonnes of crude processed
Oil & grease	10.00
Phenol	0.70
BOD	10.50
Suspended solids	14.00
Sulphide	0.35

2. Large Pulp & Paper, News Print/Rayon grade plants of capacity above 24,000 tonne/annum

Parameter	Quantum
Total Organic Chloride (TOCI)	2 kg/tonne of product

Part-D Concentration Based Standards

1. General Emission Stanadards

S. No.	Parameter	Concentration not to exceed (in mg/Nm ³)
1.	Particulate matter (PM)	150
2.	Total fluoride	25
3.	Asbestos	4 Fibres/cc and dust should not be more than 2 mg/Nm ³
4.	Mercury	0.2
5.	Chlorine	15
6.	Hydrochloric acid vapour and mist	35
7.	Sulphuric acid mist	50
8.	Carbon monoxide	1%
9.	Lead	10

II. Equipment based standards

For dispersion of sulphur dioxide; a minimum stack height limit is accordingly prescribed as below :

S. No.	Power generation capacity/ Steam generation capacity	Stack height (metre)
(i)	Power generation capacity:	
	- 500 MW and more	275
	- 200/210 MW and above to less than 500 MW	220
	- Less than 200/210 MW	$H=(Q)^{0.3}$
(ii)	Steam generation capacity	
	- Less than 2 tonne/hr	09
	- 2 to 5 tonne/hr	12
	- 5 to 10 tonne /hr	15
	- 10 to 15 tonne/hr	18
	- 15 to 20 tonne/hr	21
	- 20 to 25 tonne/hr	24
	- 25 to 30 tonne/hr	27
	- More than 30 tonne/hr	30 or as per formula $H=14(Q)^{0.3}$ whichever is more

Note: H=Physical height of the stack in metre
Q=Emission rate of SO₂ in kg/hr.

III. Load/Mass-Based Standards

S. No.	Industry	Parameter	Standard
1.	Fertilizer (urea)	Particulate Matter	2kg/tonne of product
	- commissioned prior to 1.1.82		
	- commissioned after 1.1.82	Particulate Matter	0.5 kg/tonne of product
2.	Copper, lead and zinc semitor	Sulphur dioxide	4 kg/tonne of concentrated (100%) acid produced
3.	Nitric acid	Oxides of nitrogen	3 kg/tonne of weak acid (before concentration) produced

4. Sulphuric acid	Sulphur dioxide	4 kg/tonne of concentrated (100%) acid produced
5. Coke oven	Carbon monoxide	3 kg/tonne of coke produced
6. Oil Refineries		
- Distillation (atmospheric+vacuum)	Sulphur dioxide	0.25kg/tonne of feed in this process
- Catalytic cracker	-do-	2.5 kg/tonne of feed in this process
- Sulphur recovery unit	-do-	120 kg/tonne of Sulphur in the feed
7. Aluminium plants:		
(i) Anode bake oven	Total fluoride	0.3 kg/tonne of aluminium
(ii) Pot room		
(a) VSS	-do-	4.7 kg/tonne of aluminium
(b) HSS	-do-	6 kg/tonne of aluminium
(c) PBSW	-do-	2.5 kg/tonne of aluminium
(d) PBCW	-do-	1.0 kg/tonne of aluminium
8. Glass industry		
(a) Furnace capacity		
(i) Up to the product draw capacity of 60 tonne/day	Particulate Matter	2 kg/hr
(ii) Product draw capacity more than 60 tonne/day	-do-	0.8 kg/tonne of product drawn

Note: VSS = vertical stud soderberg; HSS = horizontal stud soderberg;
 PBSW = pre backed side work and PBCW = pre backed centre work

PART-E Noise Standards

A. Noise limits for automobiles (from at 7.5 metre in dB(A) at the manufacturing stage)

(a) Motorcycle, scooters & three wheelers	80
(b) Passenger cars	82
(c) Passenger or commercial vehicles upto 4 tonne	85
(d) Passenger or commercial vehicles above 4 tonne and upto 12 tonne	89
(e) Passenger or commercial vehicles exceeding 12 tonne	91

B. Domestic appliances and construction equipments at the manufacturing stage to be achieved by 31st December, 1993.

(a) Window air conditioners of 1 - 1.5 tonne	68
(b) Air coolers	60
(c) Refrigerators	46
(d) Diesel generator for domestic purposes	85-90
(e) Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

ANNEXURE-I

(For the purpose of Parts-A, B and C)

The state boards shall follow the following guidelines in enforcing the standards specified under Schedule IV.

1. The wastewater and gases are to be treated with the best available technology (BAT) in order to achieve the prescribed standards.
2. The industries need to be encouraged for recycling and reuse of waste materials as far as practicable in order to minimise the discharge of wastes into the environment.
3. The industries are to be encouraged for recovery of biogas, energy and reusable materials.
4. While permitting the discharge of effluents and emissions into the environment, State Boards have to taken into account the assimilative capacities of the receiving bodies, especially water bodies so that quality of the intended use of the receiving waters is not affected. Where such quality is likely to be affected, discharges should not be allowed into water bodies.
5. The central and state boards shall put emphasis on the implementation of clean technologies by the industries in order to increase fuel efficiency and reduce the generation of environmental pollutants.
6. All efforts should be made to remove colour and unpleasant odour as far as practicable.
7. The standards mentioned in this Schedule shall also apply to all other effluents discharged such as mining, and mineral processing activities and sewage.
8. The limit given for the total concentration of mercury in the final effluent of caustic soda industry, is for the combined effluent from (a) cell house; (b) brine plant; (c) chlorine handling; (d) hydrogen handling; and (e) hydrochloric acid plant.
9. All effluents discharged including from the industries such as cotton textile, composite woollen mills, synthetic rubber, small pulp & paper, natural rubber, petro-chemicals, tanneries, paint, dyes, slaughter houses, food & fruit processing and dairy industries into surface waters shall conform to the BOD limit specified above, namely, 30 mg/l. For discharge of an effluent having a BOD more than 30 mg/l, the standards shall conform to those given above for other receiving bodies, namely, sewers, coastal waters and land for irrigation.
10. Bio-assay shall be made compulsory for all the industries, where toxic and non-biodegradable chemicals are involved.

11. In case of fertilizer industry, the limits in respect of chromium and fluoride shall be complied with at the outlet of chromium and fluoride removal units respectively.
12. In case of pesticides.
 - (a) The limits should be complied with at the end of the treatment plant before dilution.
 - (b) Bio-assay test should be carried out with the available species of fish in the receiving water, the COD limits to be specified in the consent conditions should be correlated with the BOD limits.
 - (c) In case metabolites and isomers of the pesticides in the given list are found in significant concentrations, standards should be prescribed for these also in the same concentration as the individual pesticides.
 - (d) Industries are required to analyse pesticides in wastewater by advanced analytical methods such as GLC/HPLC.
13. The chemical oxygen demand (COD) concentration in a treated effluent, if observed to be persistently greater than 250 mg/l before disposal to any receiving body (public sewer, land for irrigation, inland surface water and marine coastal areas), such industrial units are required to identify chemicals causing the same. In case these are found to be toxic as defined in the Schedule-I of the Hazardous Rules, 1989, the state boards in such cases shall direct the industries to install tertiary treatment stipulating time limit.
14. Standards specified in Part A of Schedule-VI for discharge of effluents into the public sewer shall be applicable only if such sewer leads to a secondary treatment including biological treatment system otherwise the discharge into sewers shall be treated as discharge into inland surface waters.

ANNEXURE-II
(For the purpose of Part D)

1. The States Boards shall follow the following guidelines enforcing the standards specified under Schedule-VI.
 - (a) In case of cement plants, the total dust (from all sections) shall be within 400 mg/Nm³ and 250 mg/Nm³ for the plants upto 200 tpd and more than 200 tpd capacities respectively.
 - (b) In respect of calcination process (e.g. aluminium plants), kilns and step grate bagasse-fired-boilers, particulate matter emissions shall be within 250 mg/Nm³.
 - (c) In case of thermal power plants commissioned prior to 1-1- 1982 and having generation capacity less than 62.5 MW, the particulate matter emission shall be within 350 mg/Nm³.
 - (d) In case of Lime Kilns of capacity more than 5 tpd and 40 tpd, the particulate matter emission shall be within 500 mg/Nm³.
 - (e) In case of horse shoe/pulsating grate and spreader stoker bagasse-fired-boilers, the particulate matter emission shall be within 500 (12% CO₂) and 800 (12% CO₂) mg/Nm³ respectively. In respect of these boilers, if more than one is attached to a single stack, the emission standard shall be fixed, based on added capacity of all the boilers connected with the stack.
 - (f) In case of asbestos dust, the same shall not exceed 2 mg/Nm³.
 - (g) In case of the urea plants commissioned after 1.1.1982, coke ovens and lead glass units, the particulate matter emission shall be within 50 mg/Nm³.
 - (h) In case of small boilers of capacity less than 2 tonne/hr and between 2 to 5 tonnes/hr, the particulate matter emissions shall be within 1600 and 1200 mg/Nm³.
 - (i) In case of integrated iron & steel plants, particulate matter emission upto 400 mg/Nm³ shall be allowed during oxygen lancing.
 - (j) In case of stone crushing units, the suspended particulate matter contribution value at a distance of 40 metres from a controlled, isolated as well as from a unit located in a cluster should be less than 600 micrograms/Nm³.

These units must also adopt the following pollution control measures:

- (i) dust containment cum suppression system for the equipment;
 - (ii) construction of wind breaking walls;
 - (iii) construction of the metalled roads within the premises;
 - (iv) regular cleaning and wetting of the ground within the premises;
 - (v) growing of a green belt along the periphery.
 - (k) In case of ceramic industry, from the other sources of pollution, such as basic raw material and processing operations, heat recovery dryers, mechanical finishing operation all possible prevention measures should be taken to control particulate matter emissions as far as practicable.
2. The total fluoride emissions in respect of glass and phosphatic fertilizers shall not exceed 5 mg/Nm³ and 25 mg/Nm³ respectively.
 3. In case of copper, lead and zinc smelting, the off-gases may as far as possible be utilized for manufacturing sulphuric acid.
 4. In case of cupolas (foundries) having capacity (melting rate) less than 3 tonne hour, the particulate matter emissions shall be within 450 mg/Nm³. In these cases it is essential that stack is constructed over the cupolas beyond the charging door and the emissions are directed through the stack, which should be at least six times the diameter of cupola. In respect of arc furnaces and induction furnaces. Provision has to be made collecting the fumes before discharging the emissions through the stack.

Source
[GSR 801 (E), EPA, 1986, dated Dec. 31, 1993]

33.0 GLASS INDUSTRY : EMISSION STANDARDS

A. Sodalime & borosilicate glass and other special glass (other than Lead glass)

Section of the Plant	Parameter	Emission limit
a) Furance Capacity		
Upto a product draw capacity of 60 tpd	Particulate matter	2.0 kg/hr
Product draw capacity more than 60 tpd	Particulate matter	0.8 kg/tonne of product drawn
All capacities	Sulphur dioxide	minimum stack height (H in mt) = $14Q^{0.3}$ where Q is SO ₂ emission rate in kg/hour.
	Total fluorides NO _x	5.0 mg/Nm ³ use of low NO _x burners in new plants.
b) Implementation of the following measures for fugitive emission control from other sections		
i. Raw materials should be transported in leak proof containers.		
ii. Cullet preparation should be dust free using water spraying.		
iii. Batch preparation section should be covered.		

B. Lead Glass

a) Furance

All capacities	Total particulate matter	50 mg/Nm ³
	Lead	20 mg/Nm ³

(dust emission from furance feeding "dog house" should be connected to control equipments and meet above standards)

b) Implementation of the following measures for the fugitive emission control from other sections

- (i) Batch mixing, proportioning section and transfer points should be covered and it should be connected to control equipments to meet following standards:

Particulate matter	50 mg/Nm ³
Lead	20 mg/Nm ³

C. Pot Furnace of Firozabad

Parameter	Standards
Particulate matter	1200 mg/Nm ³

Note: Depending upon local environmental conditions, the State/Central Pollution Control Board can prescribe more stringent standards than those prescribed above.

33.1 Glass Industry : Wastewater Discharge Standards

Parameter	Concentration not to exceed
pH	6.5 to 8.5
Total suspended solids	100 mg/l
Oil & grease	10 mg/l

Source : EPA, Notification
[GSR 93(E); Feb. 21, 1991]

34.0 HOSPITAL (BIO-MEDICAL) WASTES : ENVIRONMENTAL STANDARDS & GUIDELINES FOR MANGEMENT

34.1 Standards for Incinerators

All incinerators shall meet the following operating and emission standards:

A. Operating Standards

1. Combustion efficiency (CE) shall be at least 99.00%.
2. The Combustion efficiency is computed as follows:

$$\text{C.E.} = \frac{\% \text{CO}_2}{\% \text{CO}_2 + \% \text{CO}} \times 100$$

3. The temperature of the primary chamber shall be 800 + 50 deg C.
4. The secondary chamber gas residence time shall be at least 1 (one) second at 1050+ 50°C, with minimum 3% Oxygen in the stack gas.

B. Emission Standards

	Parameters	Concentration mg/Nm ³ at (12% CO ₂ correction)
(1)	Particulate matter	150
(2)	Nitrogen Oxides	450
(3)	HCl	50
(4)	Minimum stack height shall be 30 metres above ground	
(5)	Volatile organic compounds in ash shall not be more than 0.01%	

Note:

- * Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- * Wastes to be incinerated shall not be chemically treated with any chlorinated disinfections.
- * Chlorinated plastics shall not be incinerated.
- * Toxic metals in incineration ash shall be limited within the regulatory quantities as defined under the Hazardous Waste (Management and Handling Rules), 1989.
- * Only low sulphur fuel like L.D.O./L.S.H.S./Diesel shall be used as fuel in the incinerator.

34.2 Standards for Waste Autoclaving:

The autoclave should be dedicated for the purposes of disinfecting and treating bio-medical waste,

- (I) When operating a gravity flow autoclave, medical waste shall be subjected to:
 - (i) a temperature of not less than 121°C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or
 - (ii) a temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or
 - (iii) a temperature of not less than 149°C and a pressure of 52 spi for an autoclave residence time of not less than 30 minutes.
- (II) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following.
 - (i) a temperature of not less than 121°C and pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or
 - (ii) a temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes.

(III) Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.

(IV) Recording of operational parameters

Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.

(V) Validation test

Spore testing:

The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be *Bacillus stearothermophilus* spores using vials or spore strips, with at least 1×10^4 spores per millilitre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121°C or a pressure less than 15 psi.

(VI) Routine Test

A chemical indicator strip/tape that changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different location to ensure that the inner content of the package has been adequately autoclaved.

34.3 Standards for Liquid Waste

The effluent generated from the hospital should conform to the following limits:

PARAMETERS	PERMISSIBLE LIMITS
pH	6.5-9.0
Suspended solids	100 mg/l
Oil and grease	10 mg/l
BOD (3 days at 27°C)	30 mg/l
COD	250 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent

These limits are applicable to those hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

34.4 Standards of Microwaving

1. Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal carcasses, body parts and large metal items.
2. The microwave system shall comply with the efficacy test/routine tests and a performance guarantee may be provided by the supplier before operation of the unit.
3. The microwave should completely and consistently kill the bacteria and other pathogenic organisms that is ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be *Bacillus subtilis* spores using vials or spore strips with at least 1×10^4 spores per millilitre.

34.5 Standards for Deep Burial

1. A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.
2. It must be ensured that animals do not have any access to burial sites. Covers of galvanised iron/wire meshes may be used.
3. On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.
4. Burial must be performed under close and dedicated supervision.
5. The deep burial site should be relatively impermeable and no shallow well should be close to the site.
6. The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.
7. The location of the deep burial site will be authorised by the prescribed authority.
8. The institution shall maintain a record of all pits for deep burial.

EPA, 1998
[Source : GSR 7 dated Dec. 22, 1998]

35.0 INTTEGRATED IRON & STEEL PLANT: EMISSION STANDARDS

Pollutant	Source	Emission limit
Particulate Matter	A. Sintering plant	150 mg/Nm ³
	B. Steel making	
	i) during normal operation	150 mg/Nm ³
	ii) during oxygen lancing	400 mg/Nm ³
	C. Rolling mill	150 mg/Nm ³
Carbon Monoxide	D. Coke-oven	3 kg/tonne of coke produced

Source : EPA Notification
[S.O. 64(E), dt 18th Jan; 1988]

35.1 Integrated Iron & Steel Plant: Emission Standards

Source	Parameter	Emission limit (mg/Nm ³)
(a) Coke oven	Particulate Matter	50
(b) Refractory material plant	Particulate Matter	150

35.2 Integrated Iron & Steel Plant: Waste-water Discharge Standards

	Parameter	Concentration in mg/l except pH (Not to exceed)
1. Cokeoven by product plant	pH	6.0 to 8.5
	Suspended solids	100
	Phenol	1.0
	Cyanide	0.2
	BOD, 3 days at 27 ⁰ C	30
	COD	250
	Ammonical Nitrogen	50
	Oil & grease	10
2. Other plants such as sintering plant, blast furnace, steel melting furnace	pH	6.0 to 9.0
	suspended solids	100
	Oil & grease	10

Source : EPA Notification
[G.S.R. 913tE), dt. 24th Oct., 1989]

36.0 INORGANIC CHEMICAL INDUSTRY : WASTEWATER DISCHARGE STANDARD

(Part I - Metal Compounds of Chromium, Manganese, Nickel, Copper, Zinc, Cadmium, Lead & Mercury)

Parameter	Concentration in mg/l except pH (Not to exceed)
pH	6.0 to 8.5
Chromium as Cr	
Hexavalent	0.1
Total	2.0
Manganese as Mn	2.0
Nickel as Ni	2.0
Copper as Cu	2.0
Zinc as Zn	5.0
Cadmium as Cd	0.2
Lead as Pb	0.1
Mercury as Hg	0.01
Cyanide as CN	0.2
Oil & grease	10.0
Suspended solids	30.0

Source : EPA Notification
[G.S.R. 742 (E) dt., 30th Aug., 1990]

37.0 JUTE* PROCESSING INDUSTRY : LIQUID EFFLUENT STANDARDS

Parameter	Concentration not to exceed, in mg/l except pH
pH	5.5 TO 9.0
BOD at 27 °C for 3 days	30
Total suspended solids	100
Oil & grease	10

Note :

1. Water consumption from the Jute processing industries will be 1.5 cum/tonne of product from January, 1992.
2. At present no limit for colour is given for liquid effluent however, as far as possible colour should be removed.
3. Stack emissions from boiler house shall conform to the standards already prescribed under the Environment (Protection) Act, 1986 vide Notification No. GSR 176(E), 02.04.1996.

Source : EPA Notification
[No. GSR 93(E), Feb. 21, 1991]

38.0 LIME KILNS : EMISSION STANDARDS

Capacity of the lime kiln	Pollutant	Emission limit
Upto 5 tpd	Particulate Matter	A hood should be provided with a stack of 30 metre height from ground level (including kiln height)
More than 5 tpd and Upto 40 tpd	-do-	500 mg/Nm ³
Above 40 tpd	-do-	150 mg/Nm ³

S₀₂ in kilns above 5 tonne/day capacity

Sulphur dioxide shall be dispersed through a tall stack and the stack height shall be calculated using the formula $H = 14Q^{0.3}$; where H is the stack height in metre and Q is sulphur dioxide emission rate in kg/hour.

Source : EPA Notification
[GSR 92(E), Feb 21, 1991]

39.0 LARGE PULP & PAPER/NEWS PRINT/RAYON GRADE PULP PLANTS OF CAPACITY ABOVE 24000 TONNE/ANNUM: WASTEWATER DISCAHRGE STANDARDS

Parameter/ Flow	Concentration not to exceed
(i) (Large pulp & paper)	200 cum/tonne of paper
(ii) (Large rayon grade/news print)	175 cum/tonne of paper
pH	6.5 to 8.5
SS	100 mg/l
BOD at 27°C for 3 days	30 mg/l
COD	350 mg/l
TOCL*	2.0 kg/tonne of paper produced

* The standards for TOCL will be applicable from January, 1992.

Source : EPA Notification
[GSR 93(E), dt. Feb. 21, 1991]

39.1 Large Pulp & Paper : Emission Standards

Parameter	Concentration in mg/Nm ³
Particulate Matter	250**
H ₂ S	10

** This standard of 250 mg/m³ (normal) shall apply only for a period of 3 years with effects from the date on which the Environmental (Protection) Second Amendment Rules, 1989, came into force. After three years the standards to be applicable is 150 mg/m³ (normal).

Source : EPA Notification
[G.S.R. 913(E), dt 24th Oct., 1989]

40.0 LEATHER INDUSTRY : WASTEWATER DISCHARGE STANDARDS

Parameter	Concentration in the effluents not to exceed, mg/l (except for pH and per cent sodium) Mode of disposal			
	Inland surface water	Public sewer	Land for irrigation	Marine coastal areas
Suspended solids	100	600	200	100
BOD, 3 days at 27 °C	30	350	100	100
pH	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
Chlorides as (Cl)	1000	1000	600	-
Chromium hexavalent	0.1	0.2	0.1	1.0
total	2.0	2.0	2.0	2.0
Sulphides (as S)	2.0	5.0	-	5.0
Sodium percent	-	60	60	-
Boron (as B)	2.0	2.0	2.0	-
Oil & grease	10	20	10	20

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan; 1988]

41.0 MAN-MADE FIBRE INDUSTRY : WASTEWATER DISCHARGE STANDARDS

Process	Parameter	Concentration not to exceed, mg/l (except for pH)
(i) Synthetic	Suspended solids	100
	BOD, 3 days 27°C	30
	pH	5.5 to 9.0
(ii) Semi-synthetic	pH	5.5 - 9.0
	Suspended solids	100
	BOD, 3 days at 27°C	30
	Zinc (as Zn)	5

Source : EPA Notification
[S.O. 844(E), dt 19th Nov., 1986]
[G.S.R. 801 E, 31st Dec. 1993]

41.1 Cotton Textile Industry : Wastewater Discharge Standards

(Composite & Processing)

Parameter	Concentration not to exceed, mg/l (except for pH & bio-assay)
Common	
PH	5.5 to 9.0
Suspended solids	100
BOD, 3 days at 27°C	150
Oil & grease	10
Bio-assay test	90% survival of fish after 96 hrs in 100% effluent
Special	
Total chromium (as Cr)	
Sulphide (as S)	
Phenolic compounds as (C ₆ H ₅ OH)	

The special parameters are to be stipulated by the Central Board in case of Union Territories and state boards in case of states depending upon the dye used in the industry. Where the industry uses chrome dyes, sulphur dyes and/or phenolic compounds in the dyeing/printing process, the limits of chromium of 2 mg/litre, sulphides

of 2 mg/litre and phenolic compounds of 5 mg/litre respectively shall be imposed.

Where the quality requirement of the recipient system so warrants, the limit of BOD should be lowered up to 30 according to the requirement by the state boards for the States and the Central Board for the Union Territories.

A limit on sodium absorption ratio (SAR) of 26 should be imposed by the state board for the States and the Central Board for the Union Territories if the disposal of effluent is to be made on land.

Source : EPA Notification
[S.O. 844(E), dt 19th Nov. 1986]

41.2 Composite Woolen Mill : Wastewater Discharge Standards

Parameter	Concentration
Common	
Suspended solids	100
PH	5.5 to 9.0
BOD, 3 days at 27 °C	100
Oil & grease	10
Bio-assay	90% survival of fish after 96 hrs in 100% effluent
Special	
Total chromium (as Cr)	2
Sulphide (as S)	2
Phenolic Compounds as (C ₆ H ₅ OH)	5

The special parameters are to be stipulated by the Central Board in case of Union Territories and State Boards in case of States depending upon the dye used in the industry. Where the industry uses chrome dyes, sulphur dyes and/or phenolic.

Where the quality requirement of the recipient system so warrants, the limit of BOD should be lowered up to 30 according to the requirement by the state boards for the States and the Central Board for the Union Territories.

A limit on sodium absorption ratio (SAR) of 26 should be imposed by the state boards for the State and the Central Board for the Union Territories if the disposal of effluent is to be made on land.

Source : EPA Notification
[S.O. 844 (E), dt., 19th Nov., 1986]

42.0 NATURAL RUBBER PROCESSING INDUSTRY

Parameters	Centrifuging and creaming units for disposal		Crape and crumb units for disposal	
	into inland surface water	on land for irrigation	into inland surface water	on land for irrigation
	(a)	(b)	(a)	(b)
	(concentration in mg/l, except pH & quantum of waste water generation)		(concentration in mg/l, except pH and quantum of waste water generation)	
pH	6-8	6-8	6-8	6-8
Total Kjeldahl nitrogen (as N)	200(100*)	***	50	***
Ammoniacal nitrogen (as N)	100 (50*)	***	25	***
BOD at 27°C for 3 days	50	100	30	100
COD	250	***	250	***
Oil & grease	10	20	10	20
Sulphide (as S)	2	***	10	20
TDS	2100	NP**	2100	NP**
SS	100	200	100	200
Quantum of waste water generation	5 lit/kg of product processed	8 lit/kg of product processed	40 lit/kg of product processed	40 lit/kg of product processed

* To be achieved in three years

** Not prescribed in case effluent is used for rubber plantation of their own. In othercases suitable limit, as necessary may be prescribed by the State Board.

*** Not specified.

NOTE : These standards supercede the standards notified at serial No. 26 vide notification No. S.O. 8(E), dated 3rd June, 1989.

Source : EPA Notification
[GSR 475 (E) 5th May 1992]

43.0 NITRIC ACID PLANT : EMISSIONSTANDARDS

Parameter	Emission limit
Oxides of nitrogen	3 kg of oxides of nitrogen per tonne of weak acid (before concentration produced).

Source : EPA Notification
[S.O. 65(E), dt. 18th Jan; 1988]

44.0 NOISE : (AMBIENT STANDARDS)

Area code	Category of Area	Limit in dB (A) Leq	
		Day Time	Night Time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

Note-1 Day time is reckoned in between 6 a.m., and 9 p.m.

Note-1 Night time is reckoned in between 9 p.m., and 6 a.m.

Note-1 Silence zone is defined as areas upto 100 metres around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority.

Note-1 Mixed categories of areas should be declared as "one of the four above mentioned categories by the Competent Authority and the corresponding standard shall apply.

Source : EPA Notification
[G.S.R. 1063(E), dt. 26th Dec., 1989]

44.1 Noise Limits for Automobile (Free Field at one Metre in dB(A) at the Manufacturing Stage) to be Achieved by the Year 1992

(a)	Motorcycle, scooters & three wheelers	80
(b)	Passenger cars	82
(c)	Passenger or commercial vehicles upto 4 tonne	85
(d)	Passenger or commercial vehicles above 4 tonne and upto 12 tonne	89
(e)	Passenger or commercial vehicles exceeding 12 tonne	91

44.2 Domestic Appliances and Construction Equipments at the Manufacturing Stage to be Achieved by the Year, 1993

Standards, dB(A)

(a)	Window Air Conditioners of 1 tonne of 1.5 tonne	68
(b)	Air coolers	60
(c)	Refrigerators	46
(d)	Diesel generators for domestic purposes	85 to 90
(d)	Compactors (rollers) front loaders, mixers, Cranes (movable) vibrators and saws.	75

Source : EPA Notification
[GSR 742(E), dt 30 Aug., 1990]

45.0 OIL REFINERY : STANDARDS FOR LIQUID EFFLUENT

Parameter	Concentration not to exceed, limit in mg/l (except for pH)	Quantum, kg/1000 tonne Crude processed not to exceed
Oil & grease	10	7
Phenol	1	0.7
Sulphide	0.5	0.35
Bio-chemical oxygen demand (3 days, 27°C)	15	10.5
Suspended solids	20	14
pH	6 to 8.5	

Source : EPA Notification
[S.O. 844(E), dt. 19th Nov., 1986]

45.1 Oil Refinery : Standards for Sulphur Dioxide

Process	Emission limit
Distillation (Atmospheric Plus Vacuum)	0.25 kg/tonne of feed
Catalytic Cracker	2.5 kg/tonne of feed
Sulphur Recovery Unit	120 kg/tonne of sulphur in the feed

Source : EPA Notification
[G.S.R. 742(E), dt. 30th Aug; 1990]

46.0 OIL DRILLING & GAS EXTRACTION INDUSTRY

A: Standards for Liquid Effluent

	Parameters	Concentration not to exceed
1.0 On-shore facilities (for marine disposal)	pH	5.5-9.0
	Oil & grease	10 mg/l
	Suspended solids	100 mg/l
	BOD, 27°C for 3 days	30 mg/l

Note:

- (i) For on-shore discharge of effluents, in addition to the standards prescribed above, proper marine outfall has to be provided to achieve the individual pollutant concentration level in sea water below their toxicity limits as given below, within a distance of 50 metre from the discharge point, in order to protect the marine aquatic life :

Parameter	Toxicity limit, mg/l
Chromium, as Cr	0.1
Copper, as Cu	0.05
Cyanide, as CN	0.005
Fluoride, as F	1.5
Lead, as Pb	0.05
Mercury, as Hg	0.01
Nickel, as Ni	0.1
Zinc, as Zn	0.1

- (ii) Oil and gas drilling and processing facilities, situated on land and away from saline water sink, may opt either for disposal of treated water by onshore disposal or by re- injection in abandoned well, which is allowed only below a depth of 1000 m from the ground level. In case of re- injection in abandoned well the effluent have to comply only with respect to suspended solids and oil & grease at 100 mg/l and 10 mg/l, respectively. For on-shore disposal, the permissible limits are given below:

S. No.	Parameter	On-shore discharge standards (Not to exceed)
1.	pH	5.5 - 9.0
2.	Temperature	40°C
3.	Suspended solids	100 mg/l
4.	Zinc	2 mg/l
5.	BOD at 27°C for 3 days	30 mg/l
6.	COD	100 mg/l
7.	Chlorides	600 mg/l
8.	Sulphates	1000 mg/l
9.	Total Dissolved Solids	2100 mg/l
10.	% Sodium	60 mg/l
11.	Oil & grease	10 mg/l
12.	Phenolics	1.2 mg/l
13.	Cyanides	0.2 mg/l
14.	Flourides	1.5 mg/l
15.	Sulphides	2.0 mg/l
16.	Chromium (hexavalent)	0.1 mg/l
17.	Chromium (Total)	1.0 mg/l
18.	Copper	0.2 mg/l
19.	Lead	0.1 mg/l
20.	Mercury	0.01 mg/l
21.	Nickel	3.0 mg/l

2.0 Off-shore facilities

For off-shore discharge off effluents, the oil content of the treated effluent without dilution shall not exceed 40 mg/l for 95% of the observation and shall never exceed 100 mg/l. Three 8-hourly grab samples are required to be collected daily and the average value of oil and grease content of the three samples should comply with these standards.

B. Guideline for Discharge for Gaseous Emissions

DG sets

DG sets at drill site as well as production station should conform with the norm notified under the Environment (Protection) Act, 1986. (i.e. guidelines mentioned under Sr. No. 22 of this document).

Elevated/ground flares

- Cold venting of gases never be resorted to and all the gaseous emissions are to be flared.
- All flaring shall be done by elevated flares except where there is any effect on crop production in adjoining areas due to glaring. In such cases, one should adopt ground flaring.
- In case of ground flare, to minimise effects of flaring, the flare pit at GGS/OCS should be made of RCC surrounded by a permanent wall (made of refractory brick) of minimum 5 m height, to reduce the radiation and glaring effects in the adjoining areas.
- A green belt of 100 m width may be developed around the flare after the refractory wall in case of ground flaring.
- If the ground flaring with provision of gree belt is not feasible, enclosed ground flare system should be adopted, and should be designed with proper enclosure height to meet the ground level concentration (GLC) requirement.
- In case of elevated flaring, the minimum stack height shall be 30 m, Height of the stack shall be such that the max. GLC never exceeds the prescribed ambient air quality limit.

Burning of effluent in the pits should not be carried out at any stage.

C. Guideline for Disposal of Solid Wastes

Disposal of drill cuttings.

The drill cuttings shall be conveyed through a conveyor system to the disposal pit after proper washing.

No drill cuttings (of any composition) shall be disposed Off-shore installation, drill cuttings separated from mud, shall be transported on shore through supply vessel, for secured land-fill disposed as per Ministry of Environment & Forests guidelines. The site shall be approved by the concerned authority (State Govt./SPCB).

The disposal of drill cuttings (on-shore/off-shore) shall conform to the guidelines provided by the Ministry of Environment and Forests.

The secured land fill pit should be covered with a thick layer of local top soil provided with proper top slope, after drilling operation is over.

Disposal of drilling mud

The unusable of the drilling mud (of any composition) after reclamation shall be disposed only at a second land fill site approved by the concerned authority (State Govt./SPCBS). The disposal of mud should be conforming to the guidelines provided by the MoE&F under the Hazardous Wastes (Management and Handling) Rules, 1989.

No mud (of any composition) shall be disposed off-shore. For off-shore installation, the unusable portion of the mud shall be brought back to the shore for disposal in a secured landfill.

Only water-based mud system to be used. However, where oil-based muds are used, the mud should be properly treated/incinerated, after they become unusable, in a centralised treatment facility. These should be brought to the shore and treated in case of off-shored installation.

Production stage solid waste disposal

The dried sludge from wastewater treatment plant and other solid wastes at production stage shall be disposed in a secured land fill.

In case oil content in the sludge is high, it shall be properly treated/incinerated and ash should be disposed in a secured land fill.

Source : EPA Notification
[GSR 176(E), April, 1996]

47.0 ORGANIC CHEMICALS MANUFACTURING INDUSTRY

	Parameter	Concentration not to exceed units in mg/l except pH
(a) Compulsory	pH	6.5-8.5
	BOD (3 days at 27°C)	100
	Oil & grease	10
	Bioassay test	Minimum 90% survival after 96 hours with fish at 10% effluent
(b) Additional Parameter	Nitrate (as N)	10
	Arsenic	0.2
	Chromium hexavalent	0.1
	total	1.0
	Lead	0.1
	Cyanide as CN	0.1
	Zinc	5.0
	Mercury	0.01
	Copper	2.0
	Nickel	2.0
	Phenolics as C ₆ H ₅ OH	5.0
	Sulphide	2.0

Note:

- i. No limit for COD is prescribed but it should be monitored. If the COD in a treated effluent is persistently greater than 250 mg/l, such industrial units are required to identify chemicals causing the same. In case these are found to be toxic as defined in Hazardous Chemicals Rules, 1989 in Part-I of Schedule-I, the State Boards in such cases shall direct the industries to install tertiary treatment system stipulating time limit. Otherwise, COD may not be stipulated. This may be done on case-to-case basis.
- ii. These standards are not applicable to small-scale detergent (formulating units).
- iii. The standards for boiler emissions will be applicable as per the existing emission regulations.
- iv. Industry covered under this group are halo-aliphatics, plasticizers, aromatics (alcohols, phenols, esters, acids and salts, aldehydes and ketone), substituted aromatics, aliphatics (alcohols, esters, acids, aldehydes, ketones, amines and amides) and detergents.

Source : EPA Notification
[GSR (176)E, April 2, 1996]

48.0 PAINT INDUSTRY : WASTEWATER DISCHARGE STANDARD

Parameter	Concentration not to exceed units in mg/l except pH
pH	6.0 to 8.5
Suspended solids	100
BOD at 27°C for 3 days	50
Phenolics as C ₆ H ₅ OH	1.0
Oil & grease	10.0
Bioassay test	90% survival of fish in 96 hours in 100% effluent
Lead as Pb	0.1
Chromium as Cr	
hexavalent	0.1
total	2.0
Copper as Cu	2.0
Nickel as Ni	2.0
Zinc as Ni	5.0
Total heavy metals	7.0

Source : EPA Notification
[G.S.R. 742(E), dt. 30th Aug; 1990]

49.0 PESTICIDE INDUSTRY

Parameter		Concentration not to exceed, mg/l (except pH)
(i) Compulsory		
	pH	6.5-8.5
	BOD (3 days at 27°C)	100
	Oil & grease	10
	Suspended solids	100
	Bioassay test	Minimum 90% survival of fish after 96 hrs with 90% effluent and 10% dilution water. Test should be carried out as per IS:6502- 1971
(ii) Additional		
(a) Heavy Metal		
	Copper	1.0
	Manganese	1.0
	Zinc	1.0
	Mercury	0.01
	Tin	0.1
	Any other like nickel	shall not exceed 5 times the drinking water standards (BIS) individually
(b) Organics		
	Phenol & Phenolic compounds as C ₆ H ₅ OH	1.0
(c) Inorganics		
	Arsenic as As	0.2
	Cyanide as CN	0.2
	Nitrate as NO ₃	50
	Phosphate as P	5.0
(d) Specific pesticide		
		(microgram/litre)
	Benzene hexachloride	10
	DDT	10
	Dimethoate	450
	Copper oxychloride	9,600
	Ziram	1,000
	2.4D	400
	Paraquat	23,000
	Propanil	7,300
	Nitrofen	780
	Other (below mentioned pesticides individually)	100

(Contd.....)

(Contd.....)

Parameter	Concentration not to exceed, mg/l (except pH)	
Other Pesticides		
(i) Insecticides:		
Aluminium phosphide	Lindane	Pyrethrum extract
Dichlorovos	Malathion	Quinalphos
EDTC Mixer	Methyl bromide	Monocrotophos
Ethylene dibromide	Nicotine sulphate	Carbaryl
Ethion	Oxydemeton methyl	Endosulfan
Fenitrothion	Methyl parathion	Fenvalerate
Lime-sulphur	Phosphamidon	Phorate
Temephos		
(ii) Fungicides:		
Aureofungin	Organomercurials (MENC & PMA)	
Barium polysulphide	Sulphur (Colloidal, Wettable & Dust)	
Cuprous oxide	Streptocycline	
Ferbam	Thiram	
Mancozeb	Zineb	
Manab	Carbendzim	
Nickel chloride	Tridemorph	
(iii) Rodenticides:		
Comafuryl		
Warfarin		
Zinc phosphide		
(iv) Nematicides:		
Metham N-sodium		
(v) Weedicides:		
Fluchloralin		
Isoproturon		
Butachlor		
Anilphos		
(vi) Weedicides:		
Fluchloralin		
Butachlor		
Anilphos		
(vi) Plant Growth Regulants:		
Chloromequat chloride		
Nemphalene acetic acid		
(vii) Any other pesticide not specific above.		

Note :

- (1) Limits should be complied with at the end of the treatment plant before any dilution.
- (2) From the additional parameters specified in 49 (ii), only the relevant parameters

(based on the raw materials used and products manufactured) shall be prescribed by the concerned State Board on a case-to-case basis.

- (3) No limit for COD is prescribed. If the COD in a treated effluent is persistently more than 250 mg/l, such industrial units are required to identify the chemicals causing the same. In case these are found to be toxic as defined in Schedule-I of the Hazardous Chemicals Rules, 1989, the State Board in such cases shall direct the industries to install tertiary treatment, stipulating time limit. Otherwise COD may not be stipulated. This may be done on a case-to-case basis.
- (4) Solar evaporation followed by incineration is a recognised practice, provided the guidelines of solar evaporation as given below are followed.

Guidelines on solar evaporation system for wastewater from pesticides industry

- (i) Solar evaporation pans shall be constructed in such a way that the bottom is at least one meter above the ground level.
- (ii) Solar evaporation pans shall be leak proof and of impervious construction and designed as per IS:7290.
- (iii) The solar evaporation pans shall be designed on the basis of evaporation rate matching to the output of wastewater.
- (iv) Wastewater must be pretreated as below before subjecting to solar evaporations.
 - (a) Oil & grease and floating organics shall be removed so that the rate of evaporation is not affected.
 - (b) Acidic/alkaline waste must be neutralised before solar evaporation to maintain pH in the range of 6.5 to 8.5.
 - (c) Toxic volatile matter shall be removed so as not to cause air pollution.
- (v) During the rainy seasons, storm water shall not be allowed to mix with process waste and enter the pans. The wastewater shall in no case overflow from the evaporation pans. Alternative arrangements shall be made to hold the wastewater in proper impervious tanks and, if necessary, force evaporated.
- (vi) In no circumstances, the liquid effluent shall be discharged without conforming to the minimal national standards or stored in a holding arrangement which is likely to cause pollution.
- (vii) The sludge, from the solar evaporation pans shall be incinerated or disposed as per the guidelines for management and handling of hazardous waste, published by the Ministry of Environment & Forests, Government of India, after obtaining authorization from the state pollution control board under the Hazardous Wastes

(Handling & Management) Rules, 1989 of the Environment (Protection) Act, 1986.

- (viii) The facility should be protected from flood and storm to prevent embankments from erosion or any other damage which may render any portion inoperable.
- (ix) Facilities should have protective enclosure to keep wildlife, domestic animals, unauthorised persons, etc. away.

Source : EPA Notification
[GSR 176(E) April 2, 1996]

50.0 PHARMACEUTICALS INDUSTRY (Bulk Drugs)

Parameter	Concentration not to exceed limits in mg/l (except pH)
Compulsory	
pH	6.5 - 8.5
Oil & grease	10
BOD (3 days at 27°C)	100
Total Suspended solids	100
Bioassay test	90% survival after 96 hours in 10% effluent. (Test should be carried out as per IS:9582- 1971.)
Additional	
Mercury	0.01
Arsenic	0.2
Chromium (Hexavalent)	0.1
Lead	0.1
Cyanide	0.1
Phenolics (C ₆ H ₅ OH)	1.0
Sulfides (as S)	2.0
Phosphate (as P)	5.0

Note:

- i) The limit of BOD at 27°C for 3 days will be 30 mg/l if effluent is discharged directly to a fresh water body.
- ii) The additional parameters are applicable to bulk drug manufacturing units depending upon the process and product.
- iii) No limit for COD is prescribed, but it should be monitored. If the COD of the treated effluent is greater than 250 mg/l, such industrial units are required to identify chemicals causing the same. In case these are found to be toxic, as defined in the Hazardous Chemicals Rules, 1989 (Schedule I), the state boards

in such cases shall direct the industries to install tertiary treatment system within the stipulated time limit. Otherwise COD may not be stipulated. This may be done on a case-to-case basis.

Source : EPA Notification
[GSR 176(E) : April 2, 1996]

51.0 PETROCHEMICALS (BASIC & INTERMEDIATES) : STANDARDS FOR LIQUID EFFLUENT

Parameter	Concentration not to exceed limits in mg/l (except pH)
pH	6.5 - 8.5
BOD (3 days at 27°C)	50
Phenol**	5
Sulphide as S	2
COD	250
Cyanide as CN0.	2
Fluoride as F***	15
Total suspended solids	100
Chromium****	
Hexavalent	0.1
Total	2.0

- * The state boards may prescribed the BOD value of 30 mg/l if the recipient system so demands.
- ** The limit for phenol shall be conformed at the outlet of effluent treatment of phenol cumeme plant. However, at the final disposal point, the limit shall be less than 1 mg/l.
- *** The limit for fluoride shall be conformed at the outlet of fluoride removal unit. However, at the disposal point fluoride concentration shall be lower than 5 mg/l.
- **** The limits for total and hexavalent chromium shall be conformed at the outlet of the chromate removal unit. This implies that in the final treated effluent, total and hexavalent chromium shall be lower than prescribed herein.

Source : EPA Notification
[G.S.R. 742(E), dt 30th Aug; 1990]

52.0 SLAUGHTER HOUSE, MEAT & SEA FOOD INDUSTRY* : LIQUID EFFLUENT STANDARDS

Category	Concentration not to exceed, limit in mg/l		
	BOD (3 days at 27°C)	TSS	Oil & grease
A. Slaughter House			
a) Above 70 TLWK	100**	100	10
b) 70 TLWK & Below	500	-	-
B. Meat Processing			
a) Frozen meat	30	50	10
b) Raw meat from own Slaughter house	30	50	10
c) Raw meat from other sources	disposal via screen and septic tank		
C. Sea Food Industry	30	50	10

Note :

- (i) TLWK - Total live weight killed.
- (ii) In case of disposal into municipal sewer where sewage is treated, the industries shall install screen and oil & grease separation units.
- (iii) The industries having slaughter house alongwith meat processing units will be considered in meat processing category as far as standards are concerned.
- * Stack emissions from boiler house and DG set shall conform to the standards prescribed under E(P) Act, 1986 vide notification No. GSR 176(E), dated 02.04.96 (i.e. mentioned under Sr. No. 7&22 of this publication respectively).
- ** The standard shall be reviewed by 1992 and stringent standards shall be prescribed with respect to BOD.

Source : EPA Notification
[GSR 93 (E), Feb. 21, 1991]

53.0 SMALL PULP & PAPER INDUSTRY : STANDARDS FOR LIQUID EFFLUENTS

Mode of Disposal	Parameter	Concentration not to exceed, mg/l (except for pH and sodium absorption ratio)
Inland Surface Water	pH	5.5 to 9.0
	Suspended solids	100
	BOD at 27°C, 3 days	30
Land	pH	5.5 to 9.0
	Suspended solids	100
	BOD, 3 days at 27°C	100
	Sodium absorption ratio	26

Source : EPA Notification
S.O. 64(E), dt. 18th Jan, 1998]

53.1 Small Pulp & Paper Industry : Waste Water Discharge Standards*

CATEGORY

A:	Agrobased	200 cum/tonne of paper produced
B:	Waste Paper Based	75 cum/tonne of paper produced

* The agrobased mill to be established from January, 1992 will meet the standards of 150 cum/tonne of paper produced.

** The waste paper mills to be established from January, 1992 will meet the standards of 50 cum/tonne of paper produced.

Source : EPA Notification
[GSR 93(E), Feb 21, 1991]

54.0 SMALL SCALE INDUSTRY : WASTEWATER DISCHARGE STANDARDS

Sl. No.	Parameter	Concentration not to exceed, limits in mg/l (except pH, temperature and bio-assay test)
1.	Mercury (Hg)	0.01
2.	pH	5.5 – 9.0
3.	Suspended solids	250
4.	Biochemical oxygen demand (3 days at 27°C)	150
5.	Temperature	Shall not exceed 5°C above the ambient temperature of the receiving body
6.	Free available chlorine	0.5
7.	Oil & grease	10
8.	Cu (total)	3.0
9.	Iron (total)	3.0
10.	Zinc	5.0
11.	Cr (total)	3.0
12.	Phosphate (as P)	5.0
13.	Bioassay test	90% of test animals survival after 96 hrs with 1:8 dilution
14.	Sulphide (as S)	2
15.	Phenolic compounds	5
16.	(as C ₆ H ₅ OH)	
16.	Hexavalent chromium (as Cr)	0.1
17.	Nickel (as Ni)	3.0
18.	Cadmium (Cd)	2.0
19.	Chloride (as Cl)	1000
20.	Sulphate (as SO ₄)	1000
21.	Cyanide (asCN)	0.2
22.	Ammoniacal nitrogen (as N)	50
23.	Lead (as Pb)	0.1
24.	Total Metal	10.0

Note:

The standards may be relaxed in cases where the wastewater from small scale industrial units are collected and treated in a Terminal Treatment Plant. These standards are laid down without prejudice to the Board varying or modifying them while issuing consents pursuant to Section 25 and 26 of the Water (Prevention and Control of Pollution) Act, 1974.

Source : CPCB Notification No. 1/2(71)/87 plg.
dt 7th April, 1988, The Gazette of India, April 23, 1988.

55.0 STONE CRUSHING UNIT : STANDARDS FOR SUSPENDED PARTICULATE MATTER

The standards consist of two parts:

- i) Implementation of the following pollution control measures:
 - a) Dust containment cum suppression system for the equipment.
 - b) Construction of wind breaking walls.
 - c) Construction of the metalled roads within the premises.
 - d) Regular cleaning and wetting of the ground within the premises.
 - e) Growing of a green belt along the periphery.
- ii) Quantitative standard for the SPM
The suspended particulate matter measured between 3 to 10 metres from any process equipment of a stone crushing unit shall not exceed $600 \mu\text{g}/\text{m}^3$

Source : EPA Notification
[G.S.R. 742(E) dt. 30th Aug; 1990] &
[S.O. 8(E) dt. Dec. 31, 1990]

56.0 SUGAR INDUSTRY : STANDARDS FOR LIQUID EFFLUENT

Parameter	Concentration not to exceed, mg/l
Bio-chemical oxygen demand, 3 days at 27°C	100 for disposal on land
Suspended solids	30 for disposal in surface waters 100 for disposal on land 30 for disposal in surface water

Source : EPA Notification
[S.O. 844(E), dt. 19th No. 1986]

57.0 SULPHURIC ACID PLANT

Parameters	Emission limit
Sulphur dioxide	4 kg/tonne of concentrated (100% acid produced)
Acid mist	50 mg/Nm ³

Source : EPA Notification
[S.O. 64(E), dt. 18th Jan; 1988]

58.0 SYNTHETIC RUBBER : STANDARDS FOR LIQUID EFFLUENT

Parameter	Concentration not to exceed, mg/l (except for colour & pH)
Colour	Absent
pH	5.5 to 9.0
Bio-chemical oxygen demand (27°C for 3 days)	50
Chemical oxygen demand	250
Oil & grease	10

Source : EPA Notification
[S.O. 65(E), dt. 18th Jan; 1988]

59.0 SODA ASH INDUSTRY

A: Solvay Process Soda Ash Plants

Parameter	Concentration not to exceed		
	Marine	Brackish	Inland surface water
pH	6.5-9	6.5-9	6.5-9
Temperature	45°C or less	45°C or less	45°C or less
Oil & grease	20 mg/l	20 mg/l	10 mg/l
Suspended solids (SS)	500 mg/l	200 mg/l	100 mg/l
Ammonical nitrogen	50 mg/l	50 mg/l	30 mg/l
Bio-assay (96 hours)	90% survival	90% survival	90% survival

Note: MINAS for disposal in brackish and inland surface water are without any dilution.

B: Dual Process Soda Ash Plants

Parameter	MINAS (Inland Surface Water)
pH	6.5 - 8.0
Ammonical nitrogen, as N (mg/l)	50
Nitrate nitrogen, as N (mg/l)	10
Cyanide, as CN (mg/l)	0.2
Hexavalent chromium (mg/l)	0.1
Total chromium (mg/l)	2.0
Suspended solids, (mg/l)	100
Oil and grease (mg/l)	10

Note:- The standards are to be implemented by the industry in a time targetted schedule by December, 1999. The progress on the time targetted implementation schedule shall be periodically submitted by the industry to the State Pollution Control Board and the Central Pollution Control Board.

Source : EPA Notification
(GSR No. 176(E), April 2, 1996) and
(GSR No. 57(E), Feb. 4, 1997)
(GSR 682(E), Oct. 5, 1999)

60.0 STARCH INDUSTRY (MAIZE PRODUCTS)

Parameter	Concentration not to exceed, mg/l (except pH and wastewater discharge)
pH	6.5 - 8.5
BOD at 27°C for 3 days*	100
Suspended solids*	150
Wastewater discharge	8 m ³ /tonne of maize processed

*Note: The prescribed limits for BOD and suspended solids shall be made more stringent or less stringent depending upon the local requirements as mentioned below.

- (i) BOD shall be made stringent upto 30 mg/l if the recipient fresh water body is a source for drinking water supply.
- (ii) BOD shall be allowed upto 350 mg/l for applying on land, provided the land is designed and operated as a secondary treatment system with the requisite monitoring facilities. The drainage water from the land after secondary treatment has to satisfy a limit of 30 mg/l of BOD and 10 mg/l of nitrate expressed as 'N'. The pet addition to ground waste quality should not be more than 3 mg/l of BOD and 10 mg/l of nitrate expressed as 'N'.
- (iii) BOD shall be allowed 350 mg/l for discharge into a town sewer, if such sewer leads to a biological secondary treatment system.

- (iv) Suspended solids shall be allowed upto 450 mg/l for discharge into town sewer, if such sewer leads to a biological secondary treatment system.
- (v) In the event of bulking of sludge, the industry shall immediately apprise the respective State Pollution Control Board.

Source : EPA Notification
[GSR 176(E), April 2, 1996]

61.0 SOFT COKE INDUSTRY

Pollutant	Emission limit
Particulate matter (Corrected to 6% CO ₂)	350 mg/Nm ³

Note: Wet scrubbing system alongwith by-product recovery system shall be provided.

Guidelines for Emission Control to Improve Work Zone Environment.

- (a) Water used for quenching and wet scrubbing shall be recirculated and reused through catch-pits.
- (b) Leakages in the oven be sealed by bentonite or by any suitable paste and by proper maintenance to avoid fugitive emission.

Guidelines for Coal Handling and Crushing Plant

- (a) Unloading of coal trucks should be carried out with proper care avoiding dropping of the materials from height. It is advisable to moist the material by sprinkling water while unloading.
- (b) Pulverisation of coal shall be carried out in an enclosed place and water sprinkling arrangement shall be provided at coal heaps, crushing area and on land around the crushing unit.
- (c) Work area surrounding the plant shall be asphalted or concreted.
- (d) Green belt shall be developed along the boundary of the industry.
- (e) Open burning of coal to manufacture soft coke shall be stopped.

Source : EPA Notification
[GSR 176(E) April 2, 1996]

62.0 TANNERY EFFLUENT STANDARD (AFTER PRIMARY TREATMENT) : DISPOSAL CHANNEL/CONDUIT CARRYING WASTEWATER TO SECONDARY TREATMENT PLANT

Type of tanneries	Parameter	Concentration limit not exceed, mg/l (except pH)
Chrome tanneries/combined chrome & vegetable tanneries	pH	6.5 to 9.0
	SS	Not to exceed 600
	Chromium concentration after treatment in the chrome waste water stream	45
Vegetable tanneries	pH	6.5 to 9.0
	SS	Not to exceed 600

Note: The above standards will apply to those tannery units which have made full contribution to a Common Effluent Treatment (CETP) comprising secondary treatment. Those who have not contributed will be governed by earlier Notification No. S.O. 64 (E) dated January 18, 1988.

Source : EPA Notification
[G.S.R 742(E) dt. 30th Aug; 1990]

62.1 Tanneries : Effluent Standards

Parameter	Concentration in mg/l, except pH	Quantum per raw hide Processed
pH	6.5-9.0	-
*BOD (at 27°C, 3 days)	100	-
Suspended solids	100	-
Sulphides (as S)	1	-
Total chromium (as Cr)	2	-
Oil and grease	10	-
Wastewater generation	-	28 m ³ /tonne

* For effluent discharged into inland surface waters BOD limit shall be made stricter to 30 mg/l by the concerned State Pollution Control Board.

Source : EPA Notification
[G.S.R. 415(E), 5th May 1992]

63a THERMAL POWER PLANT : STANDARDS FOR LIQUID EFFLUENTS

Source	Parameter	Concentration not to exceed, mg/l (except for pH & Temp.)
Condenser Cooling Water (once through cooling system)	pH	6.5 to 8.5
	Temperature*	Not more than 5°C higher than the intake
	Free available Chlorine	0.5
Boiler Blowdown	Suspended solids	100
	Oil & grease	20
	Copper (Total)	1.0
	Iron (Total)	1.0
Cooling Tower Blowdown	Free available Chlorine	0.5
	Zinc	1.0
	Chromium (Total)	0.2
	Phosphate	5.0
	Other corrosion inhibiting material on	Limit to be established on case by case basis by Central Board in case of Union Territories and State Boards in case of States
As pond effluent	pH	6.5 to 8.5
	Suspended solids	100
	Oil & grease	20

* Limit has been revised, please see new limit at Sr. No. 66C of the document

Source : EPA Notification
[S.O. 844(E), dt 19th Nov; 1996]

Thermal Power Plant : Emission Standards

Generation Capacity	Pollutant	Emission limit
Generation capacity 210 MW or more	Particulate matter	150 mg/Nm ³
Generation capacity less than 210 MW	-do-	350 mg/Nm ³

* Depending upon the requirement of local situation, such as protected area, the State Pollution Control Boards and other implementing agencies under the Environment (Protection) Act, 1986, may prescribe a limit of 150 mg/Nm³, irrespective of generation capacity of the plant.

Source : EPA Notification
[S.O. 8(E), dt 3rd Jan; 1983]

Thermal Power Plants : Stack Height/Limits

Generation Capacity	Stack Height (Metres)
500 MW and above	275
200 MW/210 MW and above to less than 500 MW	220
Less than 200 MW/210 MW	$H=14(Q)^{0.3}$ where Q is emission rate of SO ₂ in kg/hr, and H is Stack height in metres.

Source : EPA Notification
[G.S.R. 742(E), dt. 30th Aug; 1990]

63b ENVIRONMENTAL STANDARDS FOR GAS / NAPHTHA-BASED THERMAL POWER PLANTS

- (i) Limit for emission of NO_x
 - (a) For existing units-150 ppm (v/v) at 15% excess oxygen.
 - (b) For new units with effect from 1-6-99.

Total generation of gas turbine	Limit for Stack NO _x emission (v/v), at 15% excess oxygen)
(a) 400 MW and above	(i) 50 ppm for the units burning natural gas. (ii) 100 ppm for the units burning naphtha
(b) Less than 400 MW but upto 100 MW	(i) 75 ppm for the units burning natural gas (ii) 100 ppm for the units burning naphtha
(c) Less than 100 MW	100 ppm for units burning natural gas or naphtha as fuel
(d) For the plants burning gas in a conventional boiler.	100 ppm

- (ii) Stack height H in m should be calculated using the formula $H = 14 Q^{0.3}$, where Q is the emission of SO₂ in kg/hr, subject to a minimum of 30 mts.

(iii) Liquid waste discharge limit

Parameter	Maximum limit of concentration (mg/l except for pH and temperature)
pH	6.5 – 8.5
Temperature	As applicable for other thermal power plants
Free available chlorine	0.5
Suspended solids	100.0
Oil & grease	20.0
Copper (total)	1.0
Iron (total)	1.0
Zinc	1.0
Chromium (total)	0.2
Phosphate	5.0

Source : EPA Notification
[GSR 7, dt. Dec. 22, 1998]

63c TEMPERATURE LIMIT FOR DISCHARGE OF CONDENSER COOLING WATER FROM THERMAL POWER PLANT

A. New thermal power plants commissioned after June 1, 1999.

New thermal power plants, which will be using water from rivers/lakes/reservoirs, shall install cooling towers irrespective of location and capacity. Thermal power plants which will use sea water for cooling purposes, the condition below will apply.

B. New projects in coastal areas using sea water.

The thermal power plants using sea water should adopt suitable system to reduce water temperature at the final discharge point so that the resultant rise in the temperature of receiving water does not exceed 7°C over and above the ambient temperature of the receiving water bodies.

C. Existing thermal power plants.

Rise in temperature of condensor cooling water from inlet to the outlet of condenser shall not be more than 10°C.

D. Guidelines for discharge point:

1. The discharge point shall preferably be located at the bottom of the water body at mid-stream for proper dispersion of thermal discharge.
2. In case of discharge of cooling water into sea, proper marine outfall shall

be designed to achieve the prescribed standards. The point of discharge may be selected in consultation with concerned State Authorities/NIO.

3. No cooling water discharge shall be permitted in estuaries or near ecologically sensitive areas such as mangroves, coral reefs/spawning and breeding grounds of aquatic flora and fauna.

Source : EPA Notification
[GSR 7, dated Dec. 22, 1998]

64.0 WATER QUALITY STANDARDS FOR COASTAL WATERS MARINE OUTFALLS

In a coastal segment marine water is subjected to several types of uses. Depending of the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose. Among the various types of uses there is one use that demands highest level of water quality/purity and that is termed a "designed best use" in that stretch of the coastal segment. Based on this, primary water quality criteria have been specified for following five designated best uses:-

Class	Designated best use
SW-I (see Table 1.1)	Salt pans, Shell fishing, Mariculture and Ecologically Sensitive Zone.
SW-II (see Table 1.2)	Bathing, Contact Water Sports and Commercial fishing.
SW-III (see Table 1.3)	Industrial cooling, Recreation (non-contact) and Aesthetics.
SW-IV (see Table 1.4)	Harbour.
SW-V (see Table 1.5)	Navigation and Controlled Waste Disposal.

The standards along with rationale/remarks for various parameters, for different designated best uses, are given in Table 1.1 to 1.5.

Table 1.1 Primary Water Quality Criteria For Class SW-I Waters
(For Salt pans, Shell fishing, Mariculture and Ecologically Sensitive Zone)

S. No.	Parameter	Standards	Rationale/Remarks
1.	pH range	6.5-8.5	General broad range, conducive for propagation of aquatic lives, is given. Value largely dependant upon soil-water interaction.

(Contd.....)

(Contd.....)

2.	Dissolved Oxygen	5.0 mg/l or 60 percent saturation value, whichever is higher.	Not less than 3.5 mg/l at any time of the year for protection of aquatic lives.
3.	Colour and Odour	No noticeable colour or offensive odour.	Specially caused by chemical compounds like creosols, phenols, naphtha, pyridine, benzene, toluene etc. causing visible colouration of salt crystal and tainting of fish flesh.
4.	Floating Matters	Nothing obnoxious or detrimental for use purpose.	Surfactants should not exceed an upper limit of 1.0 mg/l and the concentration not to cause any visible foam.
5.	Suspended Solids	None from sewage or industrial waste origin	Settleable inert matters not in such concentration that would impair any usages specially assigned to this class.
6.	Oil and Grease (including Petroleum Products)	0.1 mg/l	Concentration should not exceed 0.1 mg/l as because it has effect on fish eggs and larvae.
7.	Heavy Metals: Mercury (as Hg) Lead (as Pb) Cadmium (as Cd)	0.01 mg/l 0.01 mg/l 0.01 mg/l	Values depend on: (i) Concentration in salt, fish and shell fish. (ii) Average per capita consumption per day. (iii) Minimum ingestion rate that induces symptoms of resulting diseases.

Note : SW-1 is desirable to be safe and relatively free from hazardous chemicals like pesticides, heavy metals and radionuclide concentrations. Their combined (synergistic or antagonistic) effects on health and aquatic lives are not yet clearly known. These chemicals undergo bio-accumulation, magnification and transfer to human and other animals through food chain. In areas where fisheries, salt pans are the governing considerations, and presence of such chemicals apprehended/reported, bioassay test should be performed following appropriate methods for the purpose of setting case-specific limits.

Table 1.2 Primary Water Quality Criteria for Class SW-II Waters

(For Bathing, Contact Water Sports and Commercial Fishing)

S. No.	Parameter	Standards	Rationale/Remarks
1.	pH range	6.5-8.5	Range does not cause skin or eye irritation and is also conducive for propagation of aquatic life.
2.	Dissolved Oxygen	4.0 mg/l or 50 percent saturation value whichever is higher.	Not less than 3.5 mg/l at anytime for protection of aquatic lives.
3.	Colour and Odour	No noticeable colour or offensive odour.	Specially caused by chemical compounds like creosols phenols, naptha, benzene pyridine, volume etc. causing visible colouration of water and tainting of and odour in fish flesh.
4.	Floating Matters	Nothing obnoxious or detrimental for use purpose.	None in concentration that would impair usages specially assigned to this class.
5.	Turbidity	30 NTU (Nephelo Turbidity Unit)	Measured at 0.9 depth.
6.	Fecal Coliform	100/100 ml (MPN)	The average value not exceeding 200/100 ml. in 20 percent of samples in the year and in 3 consecutive samples in monsoon months.
7.	Biochemical Oxygen Demand (BOD) (3 days at 27°C)	3 mg/l	Restricted for bathing (aesthetic quality of water). Also prescribed by IS:2296-1974.

Table 1.3 Primary Water Quality Criteria for Class SW-III Waters
[For Industrial cooling, Recreation (non-contact) and Aesthetics]

S. No.	Parameter	Standards	Rationale/Remarks
1.	pH range	6.5-8.5	The range is conducive for propagation of aquatic species and restoring natural system.
2.	Dissolved Oxygen	3.0 mg/l or 40 percent saturation value whichever is higher.	To protect aquatic lives.
3.	Colour and Odour	No noticeable colour or offensive odour.	None in such concentration that would impair usages specifically assigned to this class.
4.	Floating Matters	No visible/obnoxious floating debris, oil slick, scum.	As in (3) above.
5.	Fecal Coliform	500/100 ml (MPN)	Not exceeding 1000/100 ml in 20 percent of samples in the year and in 3 consecutive samples in monsoon months.
6.	Turbidity	30 NTU	Reasonably clear water for Recreation, Aesthetic appreciation and Industrial cooling purposes.
*7.	Dissolved Iron (as Fe)	0.5 mg/l or less	It is desirable to have the collective concentration of dissolved Fe and Mn less or equal to 0.5 mg/l to avoid scaling effect.
*8.	Dissolved Manganese (as Mn)	0.5 mg/l or less	

* Standard included exclusively for Industrial Cooling purpose. Other parameters same.

Table 1.4 Primary Water Quality Criteria for Class SW-IV Waters
(For Harbour Waters)

S. No.	Parameter	Standards	Rationale/Remarks
1.	pH range	6.5-9.0	To minimize corrosive and scaling effect.
2.	Dissolved Oxygen	3.0 mg/l or 40 percent saturation value whichever is higher	Considering bio-degradation of oil and inhibition to oxygen production through photosynthesis.
3.	Colour and Odour	No visible-colour or offensive odour.	None from reactive chemicals which may corrode paints/metallic surfaces.
4.	Floating materials Oil, grease and scum (including Petroleum products)	10 mg/l	Floating matter should be free from excessive living organisms, which may clog or coat operative parts of marine vessels/equipment.
5.	Fecal Coliform	500/100 ml (PAN)	Not exceeding 1000/100 ml in 20 percent of samples in the year and in 3 consecutive samples in monsoon months.
6.	Biochemical Oxygen Demand (3 days at 27°C)	5 mg/l	To maintain water relatively free from pollution caused by sewage and other decomposable wastes.

Table 1.5 Primary Water Quality Criteria for Class SW-V Waters
(For Navigation and Controlled Waste Disposal)

S. No.	Parameter	Standards	Rationale/Remarks
1.	pH range	6.0-9.0	As specified by New England Interstate Water Pollution Control Commission.
2.	Dissolved Oxygen	3.0 mg/l or 40 percent saturation value which ever is higher	To protect aquatic lives.

(Contd.....)

(Contd.....)

3.	Colour and Odour	None is such concentration that would impair any usages specifically assigned to this class.	As in (1) above
4.	Sludge deposits, Solid refuse floating oil, grease & scum.	None except for such small solids, amount that may result from discharge of appropriately treated sewage and/or individual waste effluents.	As in(1) above
5.	Fecal Coliform	500/100 ml (MPN)	Non exceeding 1000/100 ml in 20 percent of samples in the year and in 3 consecutive samples in monsoon months.

Source : EPA, 1986
[GSR 7, dated Dec. 22, 1998]

65.0 EMISSION REGULATIONS FOR RAYON INDUSTRY

a. Existing Plants

Estimation of Uncontrolled Emission Quantity (EQ) of CS₂

For VSF,

EQ = 125 kg of CS₂/t of fibre

For VFY,

EQ = 225 kg of CS₂/t of fibre

Stack Height (H) requirement, m	Remarks
$H = Q^{0.41} - 3 \frac{3V_s D}{u}$	A minimum of 80% of total emission shall pass through stack. If the calculated stack height is less than 30 m, a minimum of height 30 m shall be provided.

where

Q	= CS ₂ emission rate, kg/hr
V _s	= stack exit velocity, m/sec.
D	= diameter of stack, m
u	= annual average wind speed at top of stack, m/sec.

Multiple Stacks

1. If there are more than one stack existing in the plant, the required height of all stacks shall be based on the maximum emission rate in any of the stacks. In

other words, all the stacks carrying CS₂ emission shall be of same heights (based on the maximum emission rate).

2. Number of stacks shall not be increased from the existing number. However, the number of stacks may be reduced. The existing stacks may be rebuilt and if stacks are to be relocated, condition 3 below applies.
3. Spacing among the stacks (x) at the minimum shall be 3.0 H (in m). If distance, x, between two stacks is less than 3.0 H (in m), emission shall be considered as single point source and height of both the stacks shall be calculated considering all emission is going through one stack.

b. Ambient Air Quality Monitoring

The industry shall install three air quality monitoring stations for CS₂ and H₂S measurements in consultation with the State Pollution Control Board (SPCB) to ensure attainment of WHO recommended ambient air quality norms (CS₂ = 100 µg/m³ and H₂S = 150 µg/m³, 24-hr average).

c. For new plants/expansion projects being commissioned on or after 1-6-1999

Permissible emission limits are :

CS₂ = 21 kg/t of fibre

H₂S = 6.3 kg/t of fibre

(Note : a and b above also apply to new plants/expansion projects).

Source : EPA, 1986
[GSR 7, dated Dec. 22, 1998]

66.0 STANDARDS AND GUIDELINES FOR CONTROL OF NOISE POLLUTION FROM STATIONARY DIESEL GENERATOR (DG) SETS

(A) Noise Standards for DG sets (15-500 KVA)

The total sound power level, L_w, of a DG set should be less than 94+10 log₁₀ (KVA), dB(A), at the manufacturing stage, where, KVA is the nominal power rating of a DG set.

This level should fall by 5 dB(A) every five years, till 2007, i.e. in 2002 and then in 2007.

(B) Mandatory acoustic enclosure/acoustic treatment of room for stationary DG sets (5 KVA and above)

Noise from the DG set should be controlled by providing an acoustic enclosure on by treating the room acoustically.

The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.

The DG set should also be provided with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).

(C) Guidelines for the manufacturers/users of DG sets 5 KVA and above)

- 06 The manufacturer should offer to the user a standard acoustic enclosure of 25 dB(A) Insertion Loss and also a suitable exhaust muffler with Insertion Loss of 25 dB(A).
- 06 The user should make efforts to bring down the noise levels due to the DG set; outside his premises, within the ambient noise requirements by proper siting and control measures.
- 06 The manufacturer should furnish noise power levels of the unsilenced DG sets as per standards prescribed under (A).
- 06 The total sound power level of a DG set, at the user's end, shall be within 2 dB(A) of the total sound power level of the DG set, at the manufacturing stage, as prescribed under (A).
- 06 Installation of a DG set must be strictly in compliance with the recommendation of the DG set manufacturer.
- 06 A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

Source : EPA, 1986
[GSR 7, dated Dec. 22, 1998]

67.0 APPROVED FUELS IN THE NATIONAL CAPITAL TERRITORY OF DELHI

Coal with low sulphur (S-0.4%)

Fuel oil/LDO/LSHS/with low sulphur (S-1.8%)

Motor gasoline (as per specifications given in the notification GSR 176(E), April 2, 1996 under EPA, 1986, See. at Sr. No. 23.b.

Diesel (as per specifications given in the notification GSR 176(E) April 2, 1996

under EPA, 1986, See. at Sr. No. 23A of the document)
 Liquid Petroleum Gas (LPG)
 Compressed Natural Gas (CNG)
 Kerosene
 Naphtha (for power station)
 Aviation turbine (For aircraft)
 Fir wood (only for domestic use in rural areas and crematorium)
 Bio-gas

Source : Air (Prevention & Control of Pollution) Act, 1981
 (No. F25 (258)/SC/LC/DPCC/95/65 dated : August 27, 1996

68.0 EMISSION STANDARDS (G/KW-HR) FOR NEW GENSETS (UP TO 19 KILOWATT, KEROSENE AND PETROL BASED) WITH IMPLEMENTATION SCHEDULE

A. From June 1, 2000

Class	Displacement (cc)	CO (g/kw-hr)		HC + NOx (g/kw-hr)	
		2-stroke engine	4-stroke engine	2-stroke engine	4-stroke engine
1	≤65	603	623	166	65
2	>65≤99	-	623	-	36
3	>99≤225	-	623	-	19.3
4	>225	-	623	-	16.1

B. From June 1, 2001

Class	Displacement (cc)	CO (g/kw-hr)	HC + NOx (g/kw-hr)
1	≤65	519	54
2	>65≤99	519	30
3	>99≤225	519	16.1
4	>225	519	13.4

C. Test method shall be as specified in SAE J 1088. Measurement mode shall be D1 cycle specified under ISO 8178 (weighting factor of 0.3 for 100% load, 0.5 for 75% load and 0.2 for 50% load)

D. Following organisations are recommended for testing and certifying the gensets:

- (i) Automotive Research Association of India, Pune
- (ii) Indian Institute of Petroleum, Dehradun

- (iii) Indian Oil Corporation (R & D Centre), Faridabad
- (iv) Vehicle Research Development Establishment, Ahmednagar

Source : EPA, 1986
GSR 682 (E), dated Oct. 5, 1999]

69.0 NOISE STANDARDS FOR FIRE-CRACKERS

- A.**
 - (i) The manufacture, sale or use of fire-crackers generating noise level exceeding 125 dB(AI) or 145 dB(C)pk at 4 m distance from the point of bursting, are prohibited.
 - (ii) For individual fire-cracker constituting the series (joined fire-crackers), the above mentioned limit be reduced by $5 \log_{10} (N)$ dB, where N = number of crackers joined together.
- B.** The broad requirements for measurement of noise from fire- crackers shall be
 - (i) The measurements shall be made on a hard concrete surface of minimum 5 m diameter or equivalent
 - (ii) The measurements shall be made in free field conditions. That is, there should not be any reflecting surfaces upto 15 m distance from the point of bursting.
 - (iii) The measurements shall be made with an approved sound level meter.
- C.** The Department of Explosives shall ensure implementation of these standards.

Note : dB (A1) : A – Weight Impulse Sound Pressure Level in decible
dB (C)_{pk} : C – Weight Peak Sound Pressure Level in decible.

Source : EPA, 1986
[GSR 682 (E) October 5, 1999]