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Indian Standard
**REQUIREMENTS FOR
CHLORINATION EQUIPMENT
PART 4 GRAVITY FEED TYPE GASEOUS
CHLORINATORS**

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**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

Indian Standard

REQUIREMENTS FOR CHLORINATION EQUIPMENT

PART 4 GRAVITY FEED TYPE GASEOUS CHLORINATORS

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Indian Standard
**REQUIREMENTS FOR
CHLORINATION EQUIPMENT
PART 4 GRAVITY FEED TYPE GASEOUS
CHLORINATORS**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 June 1983, after the draft finalized by the Public Health Engineering Equipment Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Gravity feed type gas apparatus by means of which chlorine is added as solution in a minor flow of water, is suitable for cases where it is required to apply chlorine to water flowing through an open channel or to water entering or leaving a sump or well under atmospheric pressure. The apparatus consists of a control panel with provision for connecting the requisite number of chlorine cylinders and a solutionizer or absorption tower with a suitable connection to the point of application.

0.3 The apparatus is made in different sizes with chlorine supply up to 15 kg/h.

0.4 The line diagram for gravity feed type gaseous chlorinators is given in Fig. 1.

0.5 This standard is being published in 5 parts. Other parts in the series are given below:

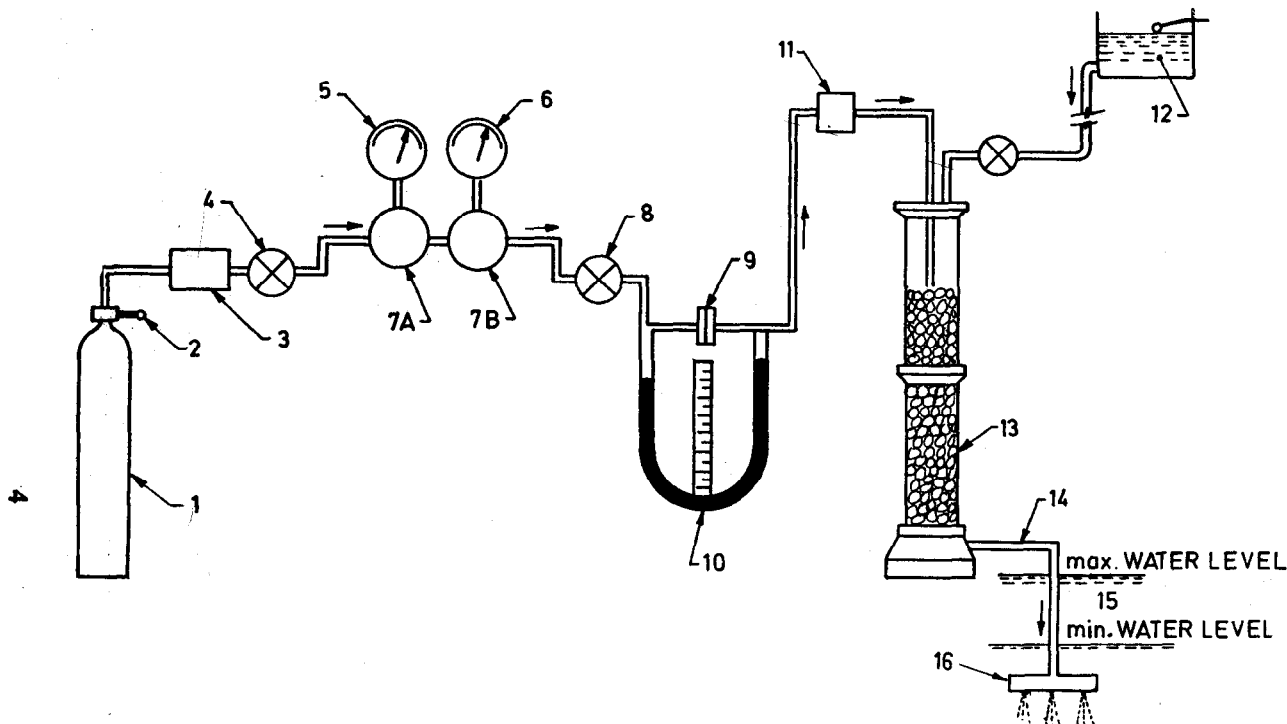
Part 1 General guidelines for chlorination plants including handling, storage and safety of chlorine cylinders and drums.

Part 2 Vacuum feed type chlorinators.

Part 3 Pressure feed chlorinators.

Part 5 Bleaching powder solution dosing equipment.

0.6 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.



1. CHLORINE CYLINDER
2. AUXILIARY CYLINDER VALVE
3. CHLORINE FILTER
4. SHUT OFF VALVE
5. HIGH PRESSURE GAUGE
6. LOW PRESSURE GAUGE
- 7A. REDUCING VALVE
- 7B. REDUCING VALVE IN CASE
CAPACITY MORE THAN 500 g/h

8. REGULATING VALVE
9. ORIFICE
10. MANOMETER TUBE
11. MOISTURE SEAL
12. WATER AT CONSTANT HEAD
13. SOLUTION TOWER
14. CHLORINE SOLUTION LINE
15. FILTERED WATER CHANNEL
16. DIFFUSER

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the requirements for materials of construction, types and performance requirements of gravity feed type gaseous chlorinators.

2. TYPES

2.1 The chlorinators shall be of the following three types:

- a) Wall mounted,
- b) Pedestal mounted, and
- c) Cylinder mounted.

3. MATERIAL

3.1 **Control Panel** — The control panel should be of fibre glass moist chlorine/acid resistance plastics or mild steel with 3 coats of epoxy.

3.2 **Solutionizer Tower** — The solutionizer tower should either be made of glazed porcelain, polyvinyl chloride or of rubber lined mild steel plates. The solutionizer tower is generally of a type as shown in Fig. 2 and shall be packed with pebbles of varying sizes. The pebbles shall be of round water worn type. Pumicestone or porcelain or moist chlorine/acid resistant plastic rashing rings may be used as packing materials in place of pebbles.

3.2.1 The water shall be fed in the solutionizer tower at a constant head.

3.2.2 The outlet from the solutionizer tower to the water channel shall be designed for maximum flow.

3.3 **Tubes** — The tubes used in chlorination plant shall be either phosphorus deoxidised non-arsenical copper conforming to IS:191 (Part 8)-1980† or phosphorus deoxidises arsenical copper conforming to IS:191 (Part 10)-1980‡ or carbon steel conforming to IS:1030-1974§.

*Rules for rounding off numerical values (revised).

†Specification for copper: Part 8 Phosphorized copper (DHP) (third revision).

‡Specification for copper: Part 10 Phosphorus deoxidized arsenical copper (DPA) (third revision).

§Specification for carbon steel castings for general engineering purposes (second revision).

NOTE — Minimum wall thickness for tubes is given below:

	<i>Outside diameter mm</i>	<i>Min Wall Thickness mm</i>	<i>Tolerances mm</i>
For copper tubes	up to 5	0.8	± 0.08
	above 5 up to 12	1.0	± 0.10
	above 12 up to 20	1.2	± 0.10
carbon steel	up to 20	2.5	± 0.10
	above 20 up to 30	3.0	± 0.15
	above 30 up to 40	3.2	± 0.20

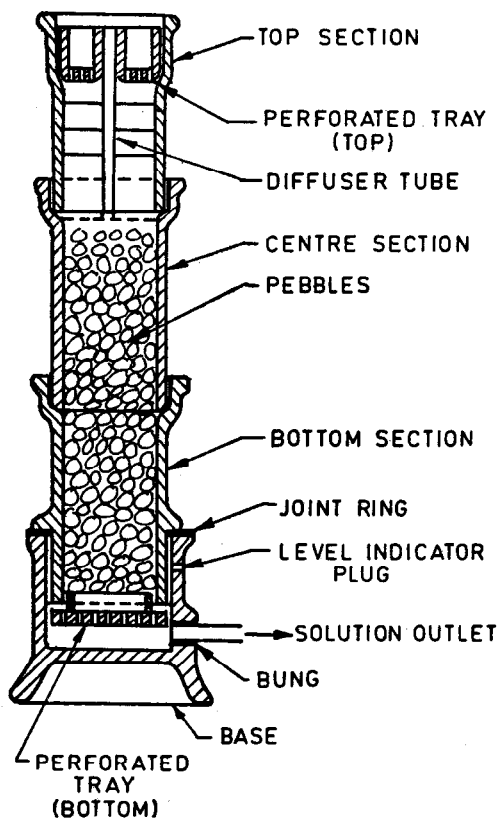


FIG. 2 SOLUTIONISER TOWER

3.3.1 For carrying moist chlorine, the pipelines should be made of silver, platinum, corrosion resistance alloy steel conforming to grade 19 of IS:3444-1978*, HDEP conforming to IS:4984-1978† or UPVC conforming to IS:4985-1981‡.

3.4 Nuts Bolts and Brackets — Nuts bolts and brackets shall be of chromium plated brass or cadmium plated mild steel.

3.5 Chlorine gas filter media shall be of glass wool.

3.6 Other Components — The ancillary components incorporate a chlorine gas, filter, pressure reducing valves, manometer or rate of discharge meter, regulating valve, moisture trap, chlorine pressure gauge and a stop valve. All metallic parts coming in contact with gas should be made of silver-plated brass or nickel. Stainless steel may also be used for components coming in contact with dry chlorine gas only. Non-metallic materials used in construction of various components shall be of glass, ebonite and moist chlorine/acid resistant plastic.

4. PERFORMANCE REQUIREMENTS

4.1 Concentration of chlorine gas in solution after the solutionizer tower shall be at least 90 percent of the saturation value of chlorine gas at that temperature.

4.1.1 Solubility of chlorine gas in water in the solutionizer tower depends on the surrounding temperature. For guidance Table 1 may be adopted for designing solutionizer tower.

5. CHLORINATION REQUIREMENT

5.1 Rate of withdrawal of chlorine from container depends upon the size of container and the surrounding temperature. For guidance Table 2 may be followed.

NOTE — If the discharge rate of chlorine is exceeded beyond the recommended rate, the liquid chlorine may freeze.

5.2 When the gas discharge rate from a single container may not meet the requirements, two or more containers may be connected to a manifold so as to discharge simultaneously. It is advisable not to couple more than four containers to a manifold.

*Specification for corrosion resistant alloy steel and nickel based castings for general applications (*first revision*).

†Specification for high density polyethylene pipes for potable water supplies sewage and industrial effluent (*second revision*).

‡Specification for unplasticised PVC pipes for potable water supplies (*first revision*).

**TABLE 1 SOLUBILITY OF CHLORINE IN WATER AT
DIFFERENT TEMPERATURES**

(Clause 4.1.1)

TEMPERATURE °C	PERCENTAGE SOLUBILITY (wt/wt)
10	0.997 2
11	0.965 4
12	0.934 6
13	0.905 0
14	0.876 8
15	0.849 5
16	0.823 2
17	0.797 9
18	0.773 8
19	0.751 0
20	0.729 3
21	0.710 0
22	0.691 8
23	0.673 9
24	0.657 2
25	0.641 3
26	0.625 9
27	0.611 2
28	0.597 5
29	0.584 7
30	0.572 3
35	0.510 4
40	0.459 0

5.2.1 When discharging through a manifold, all the containers shall be at the same temperature, particularly when connecting a new cylinder to the manifold.

5.2.2 When more than 3 cylinders are used, the connections should be arranged in groups so that one complete group may be changed at a time.

6. INSTALLATION AND SAFETY

- 6.1** For installation of the chlorination plants including handling, storage and safety of chlorine cylinders and drums IS: 10553 (Part 1)-1983* may be followed.

*Requirements of chlorination equipment: Part 1 Guidelines for chlorination plants including handling, storage and safety of chlorine cylinders and drums.

**TABLE 2 RATE OF WITHDRAWAL OF CHLORINE
FROM CONTAINER**

(Clause 5.1)

TEMPERATURE °C	kg OF CHLORINE DISCHARGE PER DAY		
	Cylinders		Tonne Container
	45 kg	67 kg	
4	2.72	4.08	45
10	6.35	9.5	110
15	10.75	16.10	130
20	14.50	21.54	245
Above 27	18.70	28.12	315

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