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*Indian Standard*

**REQUIREMENTS FOR CHLORINATION  
EQUIPMENT**

**PART 1 GENERAL GUIDELINES FOR CHLORINATION  
PLANTS INCLUDING HANDLING, STORAGE AND  
SAFTY OF CHLORINE CYLINDERS AND DRUMS**

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**INDIAN STANDARDS INSTITUTION**  
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NEW DELHI 110002

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EQUIPMENT****PART 1 GENERAL GUIDELINES FOR CHLORINATION  
PLANTS INCLUDING HANDLING, STORAGE AND  
SAFETY OF CHLORINE CYLINDERS AND DRUMS**

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## *Indian Standard*

# REQUIREMENTS FOR CHLORINATION EQUIPMENT

## **PART 1 GENERAL GUIDELINES FOR CHLORINATION PLANTS INCLUDING, HANDLING STORAGE AND SAFETY OF CHLORINE CYLINDERS AND DRUMS**

### **0. FOREWORD**

**0.1** This Indian Standard ( Part 1 ) was adopted by the Indian Standards Institution on 31 May 1983, after the draft finalized by the Public Health Engineering Equipment Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Chlorine cylinders and drums with liquid chlorine can rupture at temperatures of over 70°C due to building up of internal pressure. Chlorine gas damages the lungs and attacks the mucous membranes. Therefore, special precautions are required to be observed when working with chlorine gas apparatus and chlorine containers.

**0.3** 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.

**0.4** 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.

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### **1. SCOPE**

**1.1** This standard ( Part 1 ) covers recommendations for installation of chlorination plants including handling and storage of cylinders and drums.

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\*Rules for rounding off numerical values ( revised ).

## 2. INSTALLATION

### 2.1 Chlorination Equipment and Container Room

**2.1.1** Chlorine gas units and cylinders shall be housed in separate rooms, easily accessible, close to the point of application and convenient for truck loading and safe container handling. The floor shall be flat and at least 150 mm above the surrounding ground and drainage shall be adequate. The height of the container room should be at least 4.0 m. Under no circumstances such units shall be housed in basement or below ground level since the chlorine gas is heavy and settles into depressions.

**2.1.2** The exits shall lead directly out in the open and the doors shall open outward. The hinges of the doors should be of parliamentary type. At least two exits shall be provided in each such rooms.

**2.1.3** Adequate arrangements for air circulation and cross ventilation shall be made in the rooms. Air entry shall be from above and air exit shall be from below. Exhaust fans shall be provided at floor level.

NOTE — The blade and the motor (totally enclosed) of the exhaust fan shall resist corrosion by chlorine.

**2.1.3.1** Natural ventilation and means of cross ventilation that allows an air change in approximate 10 minutes is desirable. For small installation, provision of ventilator openings at the bottom, one opposite the other is adequate.

**2.1.3.2** Separate and reasonably gas tight enclosures openings to the outdoor shall be provided for housing the chlorine feeding equipment in large installations ( where tonne containers are used ). These enclosures shall be vented to the upper atmosphere and equipped with positive means of exhaust ( near the floor level, at the centre of the room or opposite to the entrance ) capable of a complete air change within 2 to 4 minutes in an emergency. A satisfactory ventilation scheme involves a combination of fresh air and exhaust system, consisting of fans that force the fresh air into the enclosure through openings near the ceiling with exhaust fans to clear away any chlorine contaminated air near the floor level. The design of exhaust system shall not include the natural ventilation that may be available.

**2.1.4** Rooms for chlorine containers in which more than 200 kg chlorine is stored shall be separated from the chlorine gas apparatus room and shall be accessible only from outside.

**2.1.5** Containers shall rest securely on cradles or on a level rack equipped with adequate safety block to prevent rolling and be slightly elevated from the floor to keep them dry.

**2.1.6** The temperature in the installation room shall be within the range of +4 to + 40°C. The chlorine gas containers and chlorine gas pipes shall not be exposed to direct heat radiations and shall be protected from sun rays.

**2.1.7** Electrical installations inside the chlorine gas rooms shall be limited to the absolute minimum required. While laying electrical wiring and fixtures adequate safety precautions shall be observed during their installation of ensuring safe use of electricity ( *see* IS : 732-1963\* and IS : 5216-1969† ).

NOTE — Regid PVC conduits should be preferred.

**2.1.8** The following information shall be indicated prominently on the outside entry door:

“Chlorine gas dosing apparatus room”

“Smoking and handling naked flame prohibited”

“Admission restricted”.

### 3. HANDLING

**3.1** Ordinarily a plant labourer can handle up to 100-kg cylinder when aided by small hand cart. Heavy containers shall be handled with the aim of mechanical contrivance, such as trucks, monorails, cranes or other such equipment.

**3.2** Chlorine gas containers shall not be bumped, dropped or rolled on the ground and no object shall be allowed to strike them with force.

**3.3** Use of mechanical lifting devices is recommended. For lifting one tonne container, the capacity of the mechanical device should be about 2 tonnes.

### 4. STORAGE

**4.1** All plants, particularly small ones, should keep on hand at all times sufficient supply of chlorine cylinders or drums.

**4.2** Special consideration shall be given to requirements of monsoon seasons.

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\*Code of practice for electrical wiring installations ( system voltage not exceeding 650 volts ) ( *revised* ).

†Guide for safety procedures and practices in electrical works.

**4.3** Cylinders shall conform to IS : 7681-1975\* and the provisions of IS : 8198 ( Part 6 )-1979† for filling, inspection, testing, maintenance and use of containers for storage and transportation of liquefied chlorine in cylinders shall be observed.

**4.4** Cylinders shall be stored vertically so that a leaking container, if found, can be removed with the least possible handling of others. Tonne containers shall be stored on the sides all the time horizontally with suitable rollers or saddles.

**4.5** Tonne containers are equipped with two valves each with an internal education pipe. A removable hood is provided to protect the valves from injury during shipment and handling. In placing tonne containers in position for use, the two valves shall be in vertical alignment. The education pipes then permit the upper valve to discharge gas and the lower valve liquid chlorine.

**4.6** No other objects except chlorine gas storing containers shall be kept in the room.

## **5. SAFETY**

**5.1** All operating and storing rooms for chlorine gas appliances and containers shall be fire proof.

**5.2** Chlorine storage rooms should preferably be provided with chlorine gas alarm device which gives out an acoustic or an optical signal when the chlorine gas concentration is reached, the set value for which is 1.0 mg chlorine per cubic metre of air in case of a person working in the room and 20 mg chlorine per cubic metre of air when no human being is inside the room.

**5.2.1** The sensor for alarm device shall be placed not higher than 300 mm above the floors of the room.

**5.3** A bottle of ammonia is essential to detect leaks, etc, in case alarm device is not provided.

**5.3.1** Cylinder as well as chlorine shall be tested at every shift period for leaks, first by trying to detect the sharp irritating smell of chlorine, then by passing over each cylinder and around each valve and pipe connections, a rod with a small cotton-wool swab tied on the end, dipped in an aqueous

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\*Specification for welded low carbon steel gas cylinders for chlorine gas.

†Code of practice for steel cylinders for compressed gases: Part 6 Liquefied chlorine gas.

solution of ammonia. If chlorine is present in the air, the swab will appear to smoke due to formation of white cloud of ammonium chloride. If the leak appears to be heavy, all persons not directly concerned should leave the area and the operator should put on his mask and make a thorough search of the leak.

**NOTE** — In tracing a leak, always work down-stream that is start at the cylinder and work down along the line of flow until the leak is found.

**5.4** Safety equipment, like gas masks, rubber gloves, aprons shall be housed in easily accessible (unlocked) cupboard placed outside the chlorination room.

**NOTE** — Faulty gas mask is worse than none at all. Hence these shall be tested frequently and canisters shall be changed at proper intervals.

**5.5** First aid box and eye wash fountain shall be provided outside chlorinator room.

**5.6** The provisions shall be made for emergency disposal of chlorine from leaking containers. The proportions of alkali and water recommended for this purpose are given in Table 1.

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**TABLE 1 RECOMMENDED ALKALINE SOLUTIONS FOR  
ABSORBING CHLORINE**

CONTAINER CAPACITY	CAUSTIC SODA		SODA ASH		HYDRATED LIME	
	100% kg	Water l	kg	Water	kg	Water l
kg						
45	57	180	136	450	57	570
67	85	275	204	680	85	850
1 000	115	3 640	2 272	9 090	115	1 150

**NOTE** — When chlorine is to be absorbed in hydrated lime, the solution should be continuously and vigorously agitated.

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**5.7** Water shall never be applied to the chlorine leak to stop it, as it will only make it worse.

**5.8** When a chlorine leak occurs, the ventilation system should be operated immediately before any person enters the chlorination room.

**NOTE** — Ventilation system should be controlled from outside.

**5.9** The exhaust pipe of the apparatus shall lead to the open through the shortest path and the outlet of this exhaust pipe shall not be readily accessible.



**5.10** In case of fire, the cylinders and drums containing chlorine shall be protected by spraying with water since the containers can burst at temperatures of over 70°C. Source of pressurized water shall be provided adjacent to the chlorination room.

**5.10.1** Fusible plug, a safety device, shall be provided over all cylinders and containers designed to melt or soften between 70 to 75°C to preclude a buildup of hydrostatic pressure resulting from thermal expansion due to fire and other hazardous conditions.

**5.11** Before disconnecting the flexible leads from containers to gas headers, the cylinder valves should be closed first and then the gas under pressure should be drawn from the header and flexible leads before the header valve is closed.

**5.12** Solvents, such as petroleum, hydrocarbons or alcohols should not be used for cleaning parts which come in contact with chlorine. The safe solvents are chloroform or carbon tetrachloride. Grease should never be used where it comes in contact with chlorine.

**5.13** No direct flame should be applied to the chlorine cylinder when heating becomes necessary.

**5.14** The protective hood over the valve should always be kept in place except when the cylinders are in use.

**5.15** In addition to this, the relevant provisions of IS : 4263-1967\* shall also be observed as far as applicable.

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\*Code of safety for chlorine.

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**8419 ( Part 1 )-1977 Requirements for filtration equipment : Part 1 Filtration media —  
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**9222 ( Part 1 )-1979 Recommendations for handling and dosing equipment for  
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