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Indian Standard

REQUIREMENTS FOR
CHLORINATION EQUIPMENT

PART 2 VACUUM FEED TYPE CHLORINATORS

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Indian Standard

REQUIREMENTS FOR CHLORINATION EQUIPMENT

PART 2 VACUUM FEED TYPE CHLORINATORS

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Indian Standard
REQUIREMENTS FOR
CHLORINATION EQUIPMENT

PART 2 VACUUM FEED TYPE CHLORINATORS

0. FOREWORD

0.1 This Indian Standard (Part 2) 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 Vacuum feed type chlorination apparatus works according to indirect method where aqueous chlorine solution is prepared at site before delivering it to the water to be treated. The system is brought under vacuum by using high pressure water passing through the injector. The minimum pressure of the water depends upon the mixing equipment which may be 0.1 to 0.5 N/mm² according to the capacity of plant and depends also on the pressure that has to be overcome at the inlet. The quantity of the water should correspond to the solubility of chlorine gas in water.

NOTE — If the pressure of water exceeds 0.5 N/mm², pumping is necessary to regulate the required chlorine dose.

0.3 The chlorinators are made in different sizes with chlorine supply up to 50 kg/h.

0.4 Typical flow diagram of vacuum feed type chlorinator is shown in Fig. 1.

0.5 In formulating this standard assistance has been derived from the following:

TGL 11074-1961 Wasseraufbereitung Chlorgasgerate : Betrieb, Aufstellung (Water treatment chloriné gas apparatus, operation installation) Deutsche Demokratische Republik,

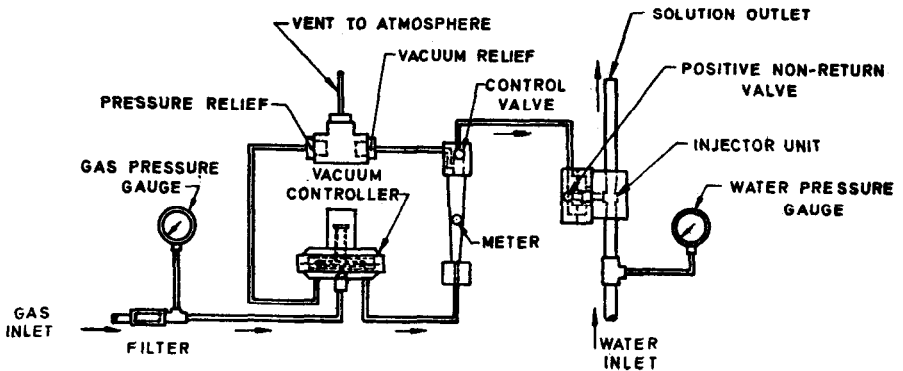


FIG. 1 TYPICAL FLOW DIAGRAM OF VACUUM FEED TYPE CHLORINATOR

ONORM M 5879-1975 Anforderungen an chlorungsanlagen und-gerate Zur Wasserbehand Lung. (Requirements for chlorine plants and apparatus for treatment of water). Osterreichisches Normungsinstitut.

ONORM M 5879-1981 (Teil 1) Anforderungen an Chlorungsanlagen Zur Wesser-behandlung. (Specification for chlorination plants for water treatment, gas chlorination equipment). Osterreichisches Normungsinstitut.

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.

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 (Part 2) lays down the requirements for materials of construction, types and performance requirements of vacuum feed type gaseous chlorinators.

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

2. TYPES

2.1 The chlorinators shall be of the following types:

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

3. APPARATUS

3.1 Vacuum feed type chlorination equipment is provided with the following:

- a) Chlorine gas stop valve in the tube connecting the chlorine gas container and chlorination apparatus;
In case of chlorination apparatus with several chlorine gas container connections, a stop valve shall be provided for each container;
- b) Pressure gauges, one for indicating the cylinder pressure and the other for delivery pressure;
- c) Filter for retaining solid impurities of chlorine gas before it enters the main units;
- d) A desiccator valve or non-return valve containing concentrated sulphuric acid or calcium chloride through which chlorine should pass to free it from moisture;
- e) Chlorine gas automatic closer (rapid closing valve) which closes when there is a reduction of vacuum due to stoppage of water supply;
- f) A compensating vacuum regulating valve to maintain a constant upstream pressure;
- g) A back pressure valve to maintain constant downstream pressure;
- h) Device for keeping constant the adjusted quantity of chlorine gas;
- j) Device for measuring the chlorine gas flow;

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- k) Automatic switch device may be provided for shifting to a full chlorine gas container if a continuous chlorination has to be ensured;
- m) Stop valve and measuring device for the water passing through the injector;
- n) Injector for creating vacuum to control flow of gas from the main unit and for mixing chlorine gas with water prior to injection to main supply. The injector is either of fixed throat type, adjustable throat type or antisiphon fixed throat type;
- p) Safety device or non-return valve which prevents backflow of chlorine water in the main unit under adverse condition;
- q) Venting device which prevents the building up the pressure in the vacuum dozing apparatus. The vent line shall lead outside the building housing the chlorination equipment;
- r) Evaporators are provided in case liquid chlorine is to be withdrawn from tonne container;
- s) Chlorine gas pressure reducing valve, shut off valve and evaporator pressure relief system are provided where evaporators are used; and
- t) Diffusers for delivering the chlorine water solution into the main line (for dia exceeding 300 mm)/open channel.

4. MATERIALS

4.1 Main body of units should be fiber glass reinforced polyester in case of plants of large capacity (equipment with chlorine supply above 60 kg/h) and in smaller plants, the main body of units may be of rigid PVC.

4.2 The injector should be of chlorine resistant PVC, bronze, hard rubber in cast iron or ebonite body with renewable nozzle and throat.

4.3 All the metal parts inside the main body coming in contact with chlorine shall be made of corrosion resistant material, such as silver plated brass, monel, nickel or silver.

4.4 The pipeline for carrying dry chlorine or liquid chlorine under pressure should be either phosphorus dioxide non-arsenical copper conforming to IS : 191 (Part 8)-1980* phosphorous dioxide arsenical copper

*Specification for copper (*third revision*).

conforming to IS : 191 (Part 10)-1980* or carbon steel conforming to IS : 1030-1974†.

NOTE — Minimum wall thickness for tubes is recommended below :

	<i>Outside Diameter</i> (mm)	<i>Min Wall Thickness</i> (mm)	<i>Tolerances</i> (mm)
Copper tubes	Up to 5	0.8	± 0.08
	Above 5 to 12	1.0	± 0.10
	Above 12 to 20	1.2	± 0.10
Carbon steel	Up to 20	2.5	± 0.10
	Above 20 to 30	3.0	± 0.15
	Above 30 to 40	3.2	± 0.20

4.5 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||.

4.6 Diaphragm of gauges should be of silver and body should be of cast iron alloy, finished in enamel, brass or aluminium alloy. The dial and the pointer should be of anodised aluminium.

4.7 Diaphragm of valves should be of teflon silver, or bronze or steel backed with silver or teflon foil.

4.8 Filter for retaining impurities of chlorine gas should be of silvered metal with renewable glass wool insert.

4.9 Flowmeter tube should be of borosilicate glass.

4.10 Nuts, bolts and brackets should be of chromium plated brass or cadmium plated mild steel.

4.11 Gaskets and packings should be of bonded asbestos fibre or anti-mony lead (with 2 to 3 percent antimony).

5. OPERATION

5.1 With the start of water supply the entire system shall come under vacuum.

*Specification for copper (*third revision*).

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

‡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 effluents (*second revision*).

||Specification for unplasticized PVC pipes for potable water supplies (*first revision*).

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5.2 The built up valve in the main unit shall be able to reduce pressure.

5.3 Only after the system comes under vacuum the valve of the chlorine cylinder shall be opened slowly and then the rate of flow control valve in the unit shall be adjusted.

5.4 At the point of injection the chlorine water concentrate line should dip to about 1.5 m in the receiving tank.

6. CHLORINE REQUIREMENT

6.1 Rate of withdrawal of chlorine from container depends upon the size of container and the surrounding temperature. For guidance, Table 1 may be followed.

TABLE 1 RATE OF WITHDRAWAL OF CHLORINE FROM CONTAINER

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	254
Above 27°	18.70	28.12	315

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

6.2 When the gas discharge rate from a single container does not meet the requirements, two or more containers can be connected to a manifold and discharge simultaneously. It is advisable not to couple more than four containers to a manifold.

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

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

7. INSTALLATION AND SAFETY

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

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

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