

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION E-71-01
CHLORINATION SYSTEM - GENERAL & DESIGN

1. **GENERAL**

This standard covers the general design of chlorination plant in Water Supplies Department.

2. **SYSTEM**

Chlorine will be supplied in standard 50-kg cylinder or 1-tonne drum. Withdrawal of chlorine from its container will be in gas or liquid state. The latter shall require an evaporator for conversion of liquid chlorine into gas chlorine. Where necessary, chlorine cylinders or drums may be connected together in parallel for operation to achieve a higher gas withdrawal rate. The typical process and instrumentation (P&I) block diagrams for the general arrangement of chlorination plant for gas and liquid chlorine withdrawal are attached at Appendix IA & IB respectively. The scope of a chlorination plant for a complete system shall comprise the union connecting to the cylinder/drum valve upto and including the final dosing point including the cylinder/drum weighing scale.

3. **CHLORINE CYLINDER/DRUM CONNECTION**

The piping arrangement for chlorine cylinders or drums in single or multiple connections are shown in Appendix II. Liquid chlorine shall be withdrawn from a drum only.

Flexible tubing shall be provided for connection between the container and the receiver header. The container end and the header end shall have an auxiliary valve and two line valves for isolation respectively.

4. **CONTROL**

4.1 **Automatic Changeover Control**

An automatic changeover device shall be provided for change over of the draw-off from the emptying duty container(s) to the standby container(s) upon detection of a low pressure (set at 100 kPa) from the duty container. The changeover shall be actuated electrically. The low pressure detector in the chlorine supply line provides a signal to the changeover control panel to effect the operation. The changeover shall take place only if sufficient pressure is detected at the standby container. Otherwise, the changeover shall be inhibited.

A manual changeover facility in the form of a 3-position selector switch which will enable selection among Unit 1 Duty/Off/Unit 2 Duty shall be provided for overriding the automatic system.

4.2 Automatic Control During a Chlorine Leak

Upon detection of a chlorine leak of 3 ppm or above, which can be initiated either manually by pressing the emergency push button installed at the strategic locations of the installation or automatically by chlorine detectors, the following control functions shall be activated automatically.

- (a) To sound the chlorine emergency alarm
- (b) To shut down the ventilation fans
- (c) To close the dampers of the ventilation ducts
- (d) To close all air inlet louvres
- (e) To operate the chlorine scrubbing system if provided
- (f) To shut off the supply from the chlorine containers as described in Clause 4.3 below.

4.3 Shutdown Control

Upon receiving a chlorine leak signal of 3 ppm or above, automatic control shall be provided to shut off the chlorine supply from the duty container(s) and inhibit the changeover to the standby container(s), i.e. the changeover valves for both duty and standby containers shall be closed under this circumstance.

Where evaporators are involved for liquid draw-off of chlorine from drums, the chlorine supply shall be automatically shut off upon detection of a high pressure in the chlorine supply line due to the burst disc of the evaporator.

4.4 Automatic Proportional Control

Automatic proportional dosing control if required for the chlorination system shall be either one or a combination of the following means which will be specified in the Particular Specification:-

- (a) Flow proportional control shall be effected according to a 4-20mA signal from the flowmeter of the installation to a controller. The controller shall be mounted either on the front panel of the chlorinator, or at the chlorine control panel with the necessary output signal to the chlorinator for the control.

The controller shall have a proportional control function with an adjustable proportional band setting for controlling the dosing rate. The controller shall equip with a manual override facility and an indication of both input signal and control signal.

- (b) Direct residual control shall be achieved by a controller similar to that described in paragraph (a) above but with a three-term control P+I+D for receiving a 4-20mA signal from the residual analyzer. This signal shall be used for comparison with the set-point on the controller so as to produce the appropriate control output to the chlorinator.
- (c) Compound loop control if required shall be detailed in the Particular Specification.

5. EQUIPMENT CONSTRUCTION

Components of chlorine equipment shall be housed in an enclosure made of reinforced fibre plastic. The gas inlet and water piping shall be readily accessible for cleaning, inspection and maintenance without the need to disturb the adjacent parts.

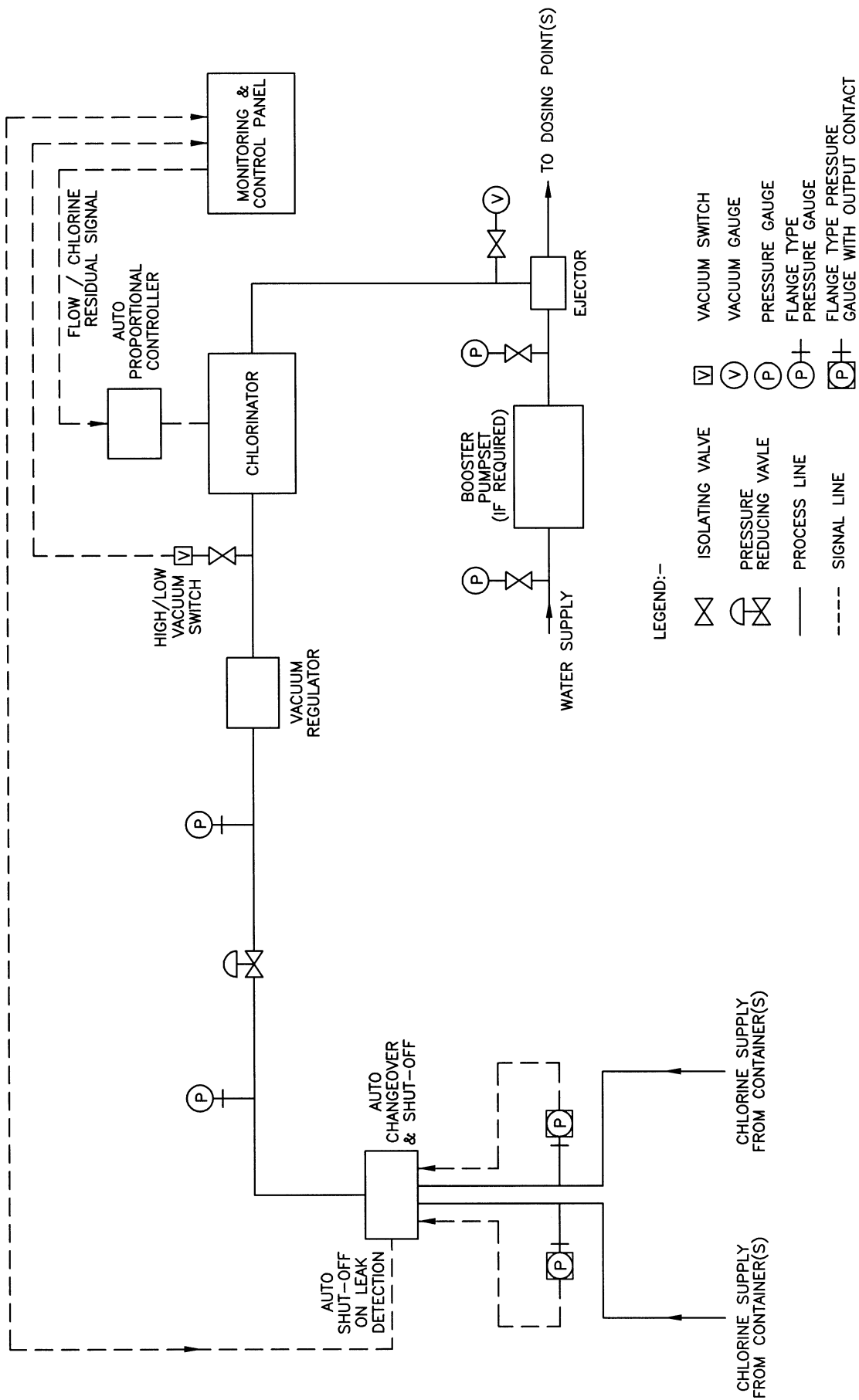
Components shall be fully resistant to the prolonged corrosive attack of chlorine, inclusive of leakage in the installation. Metal parts normally in contact with chlorine shall be monel or Hastelloy C or equal. External metallic parts such as nameplates, bolts and nuts shall be made of stainless steel.

Parts not designed to be in contact with chlorine shall be totally enclosed, with the degree of protection of IP54 to BS EN 60529.

6. ELECTRICAL EQUIPMENT

Power supply transformers, where fitted, shall be of totally encapsulated type. Indicating instruments which are surface mounted shall have a degree of protection of IP54 to BS EN 60529.

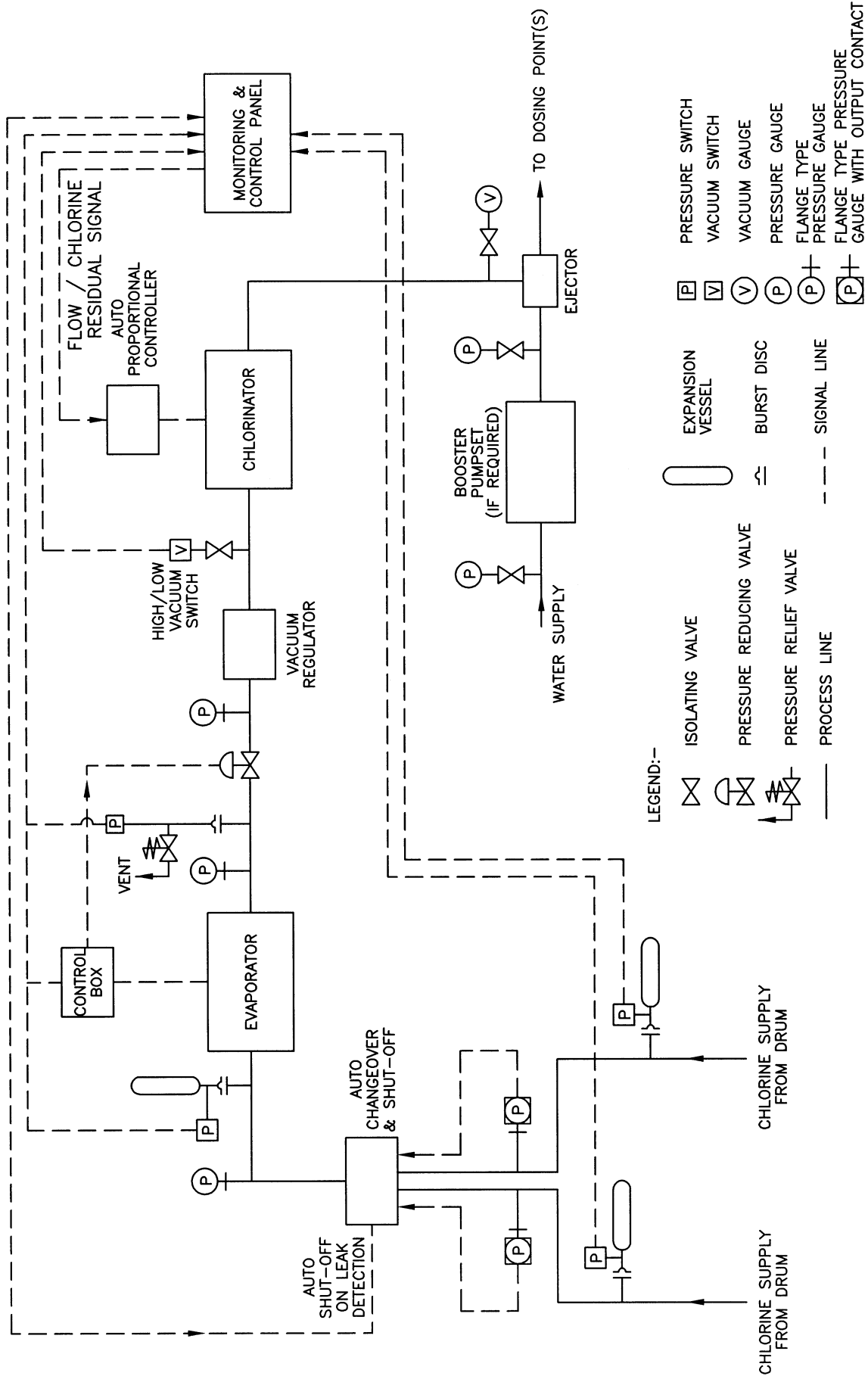
Electrical equipment shall operate on 220V a.c. 50 Hz or 24V d.c. as specified. Switch contacts of instruments shall be of changeover type rated at 2A 220Va.c. 50 Hz and 3A 24V d.c..



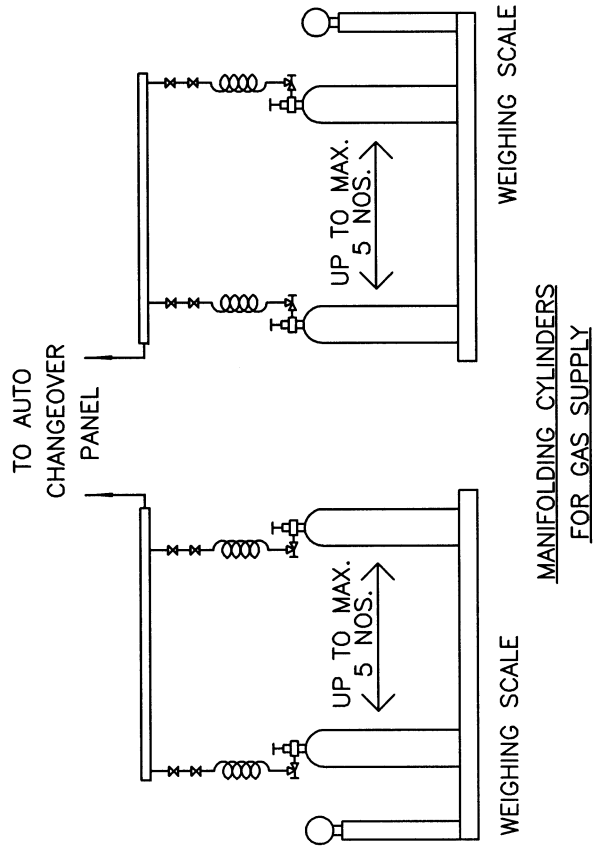
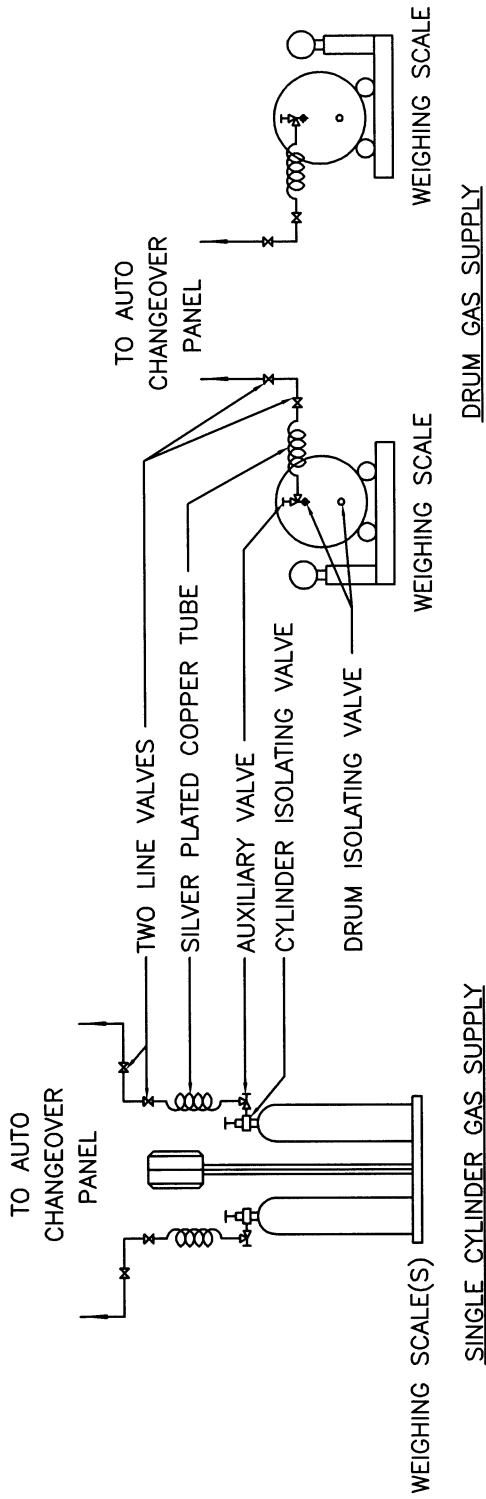
LEGEND:-

- ⊗ ISOLATING VALVE
- ⊗ VACUUM SWITCH
- ⊗ VACUUM GAUGE
- ⊗ PRESSURE REDUCING VALVE
- ⊗ PRESSURE GAUGE
- PROCESS LINE
- ⊗ FLANGE TYPE PRESSURE GAUGE
- SIGNAL LINE
- ⊗ FLANGE TYPE PRESSURE GAUGE WITH OUTPUT CONTACT

**BLOCK DIAGRAM FOR CHLORINATION PLANT
(GAS DRAW-OFF)**



**BLOCK DIAGRAM FOR CHLORINATION PLANT
(LIQUID DRAW-OFF)**



CYLINDER ISOLATING VALVE : 3/4" B.S.P.
 DRUM ISOLATING VALVE : M24

TYPICAL CONNECTION OF CHLORINE CONTAINER(S)