

Joint Committee on Administrative Rules
ADMINISTRATIVE CODE

TITLE 35: ENVIRONMENTAL PROTECTION
 SUBTITLE C: WATER POLLUTION
 CHAPTER II: ENVIRONMENTAL PROTECTION AGENCY
 PART 370 ILLINOIS RECOMMENDED STANDARDS FOR SEWAGE WORKS
 SECTION 370.1020 CHLORINE DISINFECTION

Section 370.1020 Chlorine Disinfection

a) Type of Feed Equipment

The types of chlorine feed equipment include:

- 1) Vacuum solution feed by gas;
- 2) Direct gas feed;
- 3) Hypochlorite solution positive displacement pump feed;
- 4) Hypochlorite tablet feed.

b) Selection of Feed Equipment

The selection of the type of chlorine feed equipment shall take into account operator safety and overall public safety relative to the proximity of the sewage treatment plant to populated areas and to the security of the gas cylinder or container storage.

c) Output Capacity of Gas Chlorine Cylinders

Delivery Rates (lbs of chlorine/day)

Ambient Temp. °F	100 pound Cylinder	150 pound Cylinder	1 Ton Container
40	6	9	100
50	14	21	240
60	23.7	35.5	385
70	32	47.5	536
80	41.2	62	700

Some types of vacuum chlorinators can deliver chlorine at rates greater than those listed above under the same conditions. When designs include rates in excess of those indicated above, manufacturer's specifications and test results shall be provided.

- d) **Standby Equipment and Spare Parts**
Standby equipment of sufficient capacity should be available to replace the largest unit during shutdowns. Spare parts shall be available for all chlorinators to replace parts which are subject to wear and breakage.
- e) **Potable Water Supply Protection**
An ample supply of water shall be available for operating the chlorinator. Where a booster pump is required, duplicate equipment should be provided and, when necessary, also standby power (refer to Section 370.550(a)(4)). Protection of a potable water supply shall conform to the requirements of Section 370.550(b)(3). In-line backflow preventers are not acceptable.
- f) **Chlorine Gas Supply**
 - 1) **Cylinders**
The use of 1-ton containers should be considered where the average daily chlorine gas consumption is over 150 pounds. All upright chlorine cylinders shall be strapped securely to prevent tipping.
 - 2) **Tank Cars**
 - A) At large installations the use of tank cars, generally accompanied by evaporators, may be considered. Areawide public safety shall be evaluated as a part of the considerations. Provision shall be made for a chlorine supply during tank car switching.
 - B) The tank car being used for the chlorine supply shall be located on a dead end, level track that is a dedicated siding. The tank car shall be protected from accidental bumping by other railway cars by a locked de-rail device, a closed lock switch, or both. The area shall be clearly posted "DANGER CHLORINE." The tank car shall be secured by adequate fencing with locked gates for personnel and rail access.
 - C) The tank car site shall be provided with an operating platform at the unloading point that allows for easy access to the protective housing on the tank car for flexible feed line connection and valve operation. Area lighting adequate for night time operation and maintenance shall be provided.
 - 3) **Scales**
 - A) Scales shall be provided for weighing cylinders and containers at all plants using chlorine gas.
 - B) At large plants, indicating and recording scales are recommended. At a minimum, a platform scale shall be provided. Scales shall be made of corrosion-resistant

material. Scales should be recessed unless hoisting equipment is provided or the scales are low enough to allow the cylinders to be rolled onto them.

- 4) **Evaporators**
Where manifolding of several cylinders or containers will be required to evaporate sufficient chlorine, consideration should be given to liquid drawoff and installation of an evaporator.

- 5) **Leak Detection and Controls**
A bottle of ammonium hydroxide solution should be available for detecting chlorine leaks. Consideration should also be given to the provision of caustic soda solution reaction tanks for absorbing the contents of leaking 1-ton containers where such containers are in use. Also, when cylinders, containers or tank cars are used, a leak repair kit approved by the Chlorine Institute shall be provided. At installations using over 150 pounds of chlorine gas per day consideration should be given to the installation of automatic gas detection and related alarm equipment.

g) **Piping and Connections**

- 1) Piping systems should be as simple as possible, and shall be specially selected and manufactured to be suitable for chlorine service, with a minimum number of joints. Piping should be well supported and protected against temperature extremes.
- 2) The chlorine system piping shall be color coded and labeled to distinguish it from sulfur dioxide and other plant piping. Where sulfur dioxide is used, the piping and fittings for chlorine and sulfur dioxide systems shall be designed so that interconnection between the two systems cannot occur.

h) **Housing**

- 1) **Container and Equipment Location**
Containers and feed equipment should be located indoors, in a suitable fire-resistant building. Gas cylinders should be protected from direct sunlight if not located indoors.
 - A) **Separation**
If gas chlorination equipment and chlorine cylinders or containers are to be housed in a building used for other purposes, the chlorine cylinders or containers and equipment shall be located in an isolated room. This room shall not contain any sulfonation equipment, sulfur dioxide cylinders or other equipment unrelated to chlorination. Common walls to other areas of the building shall be gastight. Doors to this room shall open only to the outside of the building and shall be equipped with panic hardware. Rooms shall be at ground level

and shall permit easy access to all equipment. Storage areas should be separated from the feed area.

B) Inspection Window

A clear gastight window shall be installed in the chlorinator room to permit the units to be viewed and gauges to be read without entering the room.

C) Heat

Chlorinator housing facilities shall be provided with a means of heating so that a temperature of at least 60° F can be maintained. Where chlorine gas is to be withdrawn from cylinders or containers, the cylinders or containers shall be maintained at essentially room temperature. The room shall be protected from excessive heat. If liquid chlorine is to be withdrawn from the cylinders or containers to an evaporator unit, the feed cylinders or containers may be located in an unheated area.

3) Ventilation For Gas Chlorination Systems

A) Forced, mechanical ventilation shall be installed which will provide 1 complete air change per minute. The entrance to the air exhaust duct from the room shall be within 12 inches of the floor and the point of discharge shall be so located as not to contaminate the air in the immediate vicinity of the entrance door to the chlorinator room or ventilation inlet or window or entrance door to any buildings or inhabited areas. Where the public may be subjected to extensive exposure to chlorine in case of chlorine leaks, scrubbers may be required on the ventilation discharge.

B) The chlorination room air inlets shall be so located as to provide cross ventilation with air and at such temperature that will not adversely affect the chlorination equipment. The vent hose from the chlorinator shall discharge to the outside atmosphere above grade.

4) Electrical Controls

The controls for the fans and lights shall be provided at those locations where it is necessary to enter the chlorination room and shall automatically operate when the door is opened and continue to operate when the operator enters the room and the door is closed. Provision shall be made for manual operation of controls from the outside of the room without opening the door.

5) Outdoor Cabinet Housing

Outdoor shallow cabinet-type units, with wide opening doors, that are shallow enough not to need or require operator entry, may be used to house the containers and feed equipment. Use of such

cabinets shall be limited to small plants that provide seasonal disinfection or use less than 10 pounds of chlorine per day. Only two chlorine gas cylinders of 150 pounds or less on line may be housed in the cabinets. The following items shall be provided for in the design:

- A) The cabinet structure shall be located on and securely anchored to a concrete slab sized to allow for safe transport and handling of the cylinders. The structure and slab shall be capable of withstanding expected wind loadings on the cabinet. The design of the cabinet support slab shall take into account the effects of frost and settling due to soil stability. Flexible piping connections should be considered for lines connected to the cabinet.
 - B) The cabinet shall be protected from direct sunlight to prevent overheating of the chlorine cylinders.
 - C) The cabinet doors shall extend the full width of the long side of the cabinet structure so that the full interior of the cabinet is exposed with the door open. Provision shall be made to secure the open doors while the operator is changing cylinders and maintaining the feed equipment.
 - D) The cabinet depth shall not exceed 24 inches. The feed equipment shall be positioned to allow easy access for maintenance and to allow observation of the gauges and meters.
 - E) Provision shall be made for chains, wall mounted fastener hooks or similar means for anchoring the chlorine cylinders to prevent tipping.
 - F) The cabinet structure shall be corrosion resistant to chlorine gas.
 - G) Where electrical power is available, the cabinet should be placed in a well-lighted area.
- i) **Respiratory Protection Equipment**
Respiratory protection equipment meeting the requirements of the National Institute for Occupational Safety and Health (NIOSH) shall be available at all installations where chlorine gas is handled and shall be stored in a convenient location outside of any room where chlorine is used or stored. The respiratory protection units shall use compressed air, have at least a 30-minute capacity, and be compatible with or exactly the same as NIOSH-approved units used by the local fire department. Instructions for using, testing, and replacing mask parts shall be posted. At large installations, consideration should be given to providing acid suits and fire suits.
 - j) **Application of Chlorine**

- 1) **Contact Period**
After thorough mixing, a minimum contact period of 15 minutes at design peak hourly flow or maximum rate of pumpage shall be provided.
- 2) **Chlorinator Dosing Rate Capacity**
Chlorinators shall be designed to have a capacity adequate to produce an effluent that will meet the applicable bacterial limits. Where necessary to meet the operating ranges, multiple units shall be provided for adequate peak capacity and for a sufficiently low feed rate on turn down to allow proper chlorine residual. The chlorination system shall be designed on a rational basis and calculations justifying the equipment sizing and number of units shall be submitted for the whole operating range of flow rates, including the minimum turn down capacity for the type of control to be used. System design considerations shall include the controlling sewage flow meter (sensitivity and location), telemetering equipment and chlorinator controls. For treated normal domestic sewage the following dosing capacity, based on design average flow, is suggested (see Section 370.520(c)(1)):

Type of Treatment	Dosage (mg/l)
Primary Settled Sewerage	20
Lagoon Effluent (unfiltered)	20
Trickling Filter Plant Effluent	10
Lagoon Effluent (filtered)	10
Activated Sludge Plant Effluent	6
Activated Sludge Plants with Chemical Addition	4
Filtered Effluent Following Mechanical Biological Treatment	4

- k) **Contact Tank**
 - 1) Mechanical means of sludge removal is recommended and should be provided unless multiple chlorine tanks are provided. Portable deck-level vacuum cleaning equipment may be used for small treatment plants. Provisions for draining contact tanks not equipped with mechanical sludge removal equipment shall be provided, with the drain flow returned to process for treatment.
 - 2) Exception to the requirement of duplicate contact tanks may be granted if the contact tank follows a sand filter or if the main treatment works is a waste stabilization pond, with provisions for storing the sewage flow for several days while the contact tank is being cleaned.
 - 3) Adequate mixing during the chlorine contact period shall be insured by the installation of adequate baffling, air or other mixing equipment.

Facilities for the retention and removal of floating scum shall be provided.

(Source: Amended at 21 Ill. Reg. 12444, effective August 28, 1997)