

GENERAL GAS CHLORINE DESIGN

The design of gas chlorine facilities should consider operator and public safety as well as maintaining long-term plant reliability and operation. Chlorination facilities shall be designed such that chlorine gas can be contained in the chlorine storage room. Doors and windows should be gas-tight to minimize escape of gaseous chlorine to the exterior atmosphere or building interior. In general, the following can be considered to be acceptable design:

1. All chlorine cylinders shall be contained in the chlorine storage room. Vacuum regulators should be located on individual chlorine cylinders in service. The use of pressurized chlorine gas lines and manifolds is strongly discouraged and, if utilized, must be contained in the chlorine storage room.
2. All chlorine cylinders shall be adequately restrained.
3. Chlorinators should be housed in a room separate from but adjacent to the chlorine storage room. This is to minimize the need to enter the storage room to adjust feed rates and to minimize the potential for equipment damage caused by chlorine leaks. A gas-tight shatter resistant window shall be present for viewing the storage and chlorinator rooms from an interior wall of the plant.
4. The chlorine storage room shall only be accessible from the outside. The exterior access door for the chlorine storage area must open outward, being equipped with panic bar hardware on the interior. A small viewing window should be present in the door or adjacent to the door in the exterior wall to allow operator examination of the room before entry. Loading dock doors shall also open outward and be equipped with the appropriate moldings, gaskets, and weather stripping to minimize gas leakage to the exterior. Inside access to the chlorinator room shall be acceptable if chlorine gas is supplied under vacuum.
5. All access doors should be properly labeled with appropriate warning signs.
6. Chlorinator room temperature should be maintained at 60 degrees Fahrenheit and protected from excessive heat. The chlorine storage room shall be maintained at a temperature 5 to 10 degrees Fahrenheit cooler than the chlorinator room to minimize the potential for re-liquification of the gas.
7. A pressure relief valve shall be located on the chlorine vacuum line within the vacuum regulator to prevent gas pressurization of the chlorinator. This valve should be vented to the chlorine storage room or to the outside if appropriate.
8. All openings between the chlorine storage room and other parts of the building shall be sealed such that chlorine leaks can be contained within the storage room.

9. There shall be no exterior windows to chlorine storage rooms other than the small viewing window at the entrance. (This is to minimize the potential for heat build-up from the sun and to minimize vandalism.)
10. Scales shall be constructed of durable material to withstand the aggressive environment and situated such that they can be easily and accurately read through a viewing window or use of a remote readout. This type of design will minimize the need to enter the chlorine storage area to take readings.
11. Separate light and ventilation switches shall be located outside of the chlorine storage room near the entrance door and interior viewing window. Lighting fixtures within the chlorine storage area shall be suitable for use in an aggressive environment and, if possible, designed to operate during a chlorine gas release.
12. Electrical components within the chlorine storage area should be minimized. Motors for louvers, cylinder cranes, and ventilation equipment shall be suitable for use in an aggressive environment. Convenience electrical components, such as outlets, should be avoided. All electrical systems for the chlorine storage area shall be on dedicated circuits.
13. The chlorine storage room shall be equipped with ventilation equipment capable of one complete air exchange per minute. This equipment shall be located such that it will draw suction near the floor as far away as practical from the entrance door and air inlet. Exhaust shall be located away from the door and other air intakes. Exhaust discharge shall be located as not to contaminate other air inlets to any rooms or structures. Air intakes should be through louvers near the ceiling. Louvers for intakes and exhaust shall facilitate airtight closure.
14. Chemical scrubbing systems should be considered for treating the exhaust from a chlorine release where such exhaust may otherwise represent a health or environmental hazard to the surrounding area.
15. All ventilation and duct work within a chlorine storage room shall be separated from domestic building ventilation systems. All chlorine room duct work should be gas tight and not pass through other rooms or areas of the building.
16. Leak detectors shall be located 1 foot above the floor of the chlorine storage room and shall activate an alarm when a chlorine leak occurs. It is preferable that the detector be capable of differentiating between two or more chlorine concentrations to alert personnel of the severity of the release. This would help determine the appropriate procedure for entrance to the room, ventilation, or other solutions.
17. Self contained breathing apparatus (SCBA) shall not be located within the chlorine storage room. It is preferable that this equipment be located in a convenient location where personnel can easily access it in the event of an emergency.

18. Service water to operator injectors/eductors shall be of adequate supply and pressure to operate feed equipment within the needed chlorine dosage range for the proposed system. All service water shall be properly protected by the appropriate cross connection control device.
19. Placement of injectors/eductors should be carefully evaluated. Current system operation and chlorination practices should also be reviewed before design. In some cases, it may be appropriate to locate the injector/eductor in the chlorinator room with distribution of highly chlorinated water to the point of application. In other situations, it may be best to locate the eductor/injector can at the point of application with distribution of chlorine gas through plastic tubing under vacuum to the point of application.
20. A chlorine cylinder repair kit with leak detection bottle should be supplied within each chlorine storage room.
21. Floor drains should not be designed within the chlorine storage area.
22. Combustible materials should not be stored in chlorine rooms.
23. Fire sprinkling systems should not be installed in chlorine rooms.
24. Chlorine room location should be on the prevailing downwind side of the building, away from entrances, windows, louvers, walkways, etc.
25. Ammonia storage shall be in rooms separate from the chlorine storage room.

REFERENCE TEN STATES STANDARDS*

*These sheets provide general information on the design and construction of some of the physical requirements for gas chlorine facilities. More information can be obtained by referencing the latest edition of Recommended Standards for Water Works construction. In addition, regulations such as: EPA - Risk Management, OSHA - Process Safety Management, Clean Air Act and Uniform Fire Code should be thoroughly reviewed for additional requirements.

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