

Chlorine gas or liquid in cylinders

Chlorine is a very active chemical which combines directly with many others. Pure chlorine, both as a gas and as a liquid under pressure, reacts with only a few metals at ordinary temperatures. For this reason, chlorine may be safely stored in metal containers. Moist chlorine, however, corrodes most metals rapidly and a solution of chlorine in water has powerful oxidizing, bleaching and germicidal properties. It is therefore of the utmost importance that all containers, pipes and so on used to take chlorine from cylinders should be dry and clean. Glass, ceramics, hard rubbers and some plastics are resistant to moist chlorine.

Liquid chlorine is supplied in steel tanker lorries, cylinders containing 1 ton, and in standard cylinders containing approximately 45 kg or 70 kg at about 5 atmospheres pressure (the actual pressure varies with temperature). Small cylinders containing 5 kg or 9 kg of chlorine are also sometimes seen. Cylinders of 45 kg or 70 kg are sufficient for small water treatment plants with capacities of up to 20 litres per second (approximately 1800 m³/day). Cylinders are so filled that the liquid chlorine occupies about 80 per cent of the cylinder at 65°C. Liquid chlorine is stable and no loss of strength occurs during storage. Cylinders must be stored in a cool place.

The small amounts of impurities formed in industrial chlorine can be deposited in flow meter and control valves. Maintenance is therefore required on a regular basis.

Gas or liquid chlorine (liquid chlorine is chlorine gas compressed to a point where it liquefies) is generally suitable only for water supplies in larger communities. For smaller communities and in rural areas either bleaching powder or high-strength hypochlorite materials

are more commonly used, the choice being determined mainly by availability and costs in the particular country or area.

Installations where chlorine cylinders are stored

All installations in which chlorine cylinders are stored, handled or used should be specifically designed or adapted for this purpose. It is vital that they are well-ventilated and that air vents are included at floor level. This is because chlorine is heavier than air and sinks.

Persons entering a room in which chlorine gas has accumulated may collapse, thus exposing themselves to the high concentration of gas near the floor. For the same reason, cylinders should not be stored at low points where gas can accumulate.

Storage of chlorine in cylinders

Chemicals should be stored in accordance with manufacturers' instructions and local safety regulations. This is both to ensure the safety of the operator and to prevent the chemical from deteriorating.

When issuing chemicals from stock, a careful check must be kept of daily use to ensure that sufficient quantities are available to continue treatment until a new supply is delivered. Replacement supplies should be ordered when stocks held have fallen to pre-determined levels. Stocks should be used in rotation, with the oldest first, to avoid deterioration.

The amount of chlorine in well-constructed cylinders is carefully controlled so that even in the hottest summer conditions there will still be a gas space. If cylinders are imported, they should be checked to ensure that they comply with national standards. It is important that cylinders are not artificially warmed. Cylinders should be stored in a dry place away from combustible materials and risk of fire, if possible on the ground floor and under cover, preferably in an annex, or a separate room not in a main building and not near to an exit from a building.

The protection domes over cylinder valves should not be removed until the cylinders are to be coupled up, as they protect the valves from damage and dirt. When discharging, cylinders should be held in position with a chain. Storage of chlorine in cylinders is shown in Figure 1.

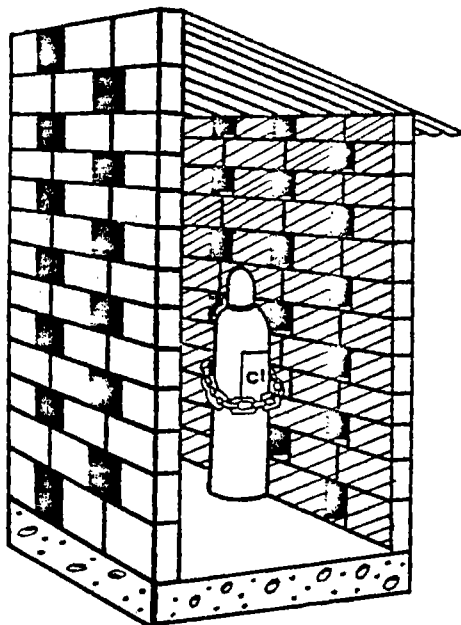


Figure 1. Storing chlorine in cylinders

Safety for operators handling chlorine

The operation and maintenance of equipment for dosing of chlorine from cylinders should only be undertaken by trained and authorized personnel.

Chlorine is a hazardous substance. In solution it is highly corrosive and splashes can cause burns and damage the eyes.

When handling concentrated chlorine solutions, appropriate precautions should be taken. Ideally, gloves and protective eye glasses should be worn. In the event of splashes, and especially splashes to the eyes, it is important immediately to rinse thoroughly with water.

All containers in which chlorine is stored should be labelled, identifying the contents, and with a hazard warning in a form which is readily understood locally.

Storage sites for chlorine in any form should be secure against unauthorized access and especially against children.

Handling chlorine cylinders

The following are procedures for safely handling chlorine cylinders. Figure 2 illustrates the safe moving of cylinders.

- Move cylinders with a properly balanced hand truck, with clamp supports that fasten at least two-thirds of the way up the cylinder.
- 45 kg or 70 kg cylinders can be rolled in a vertical position. Avoid lifting these cylinders except with appropriate equipment. Never lift with chains, ropes, slings, or magnetic hoists.
- Always replace the protective cap when moving a cylinder.
- Keep cylinders away from direct heat, for instance steam pipes or radiators.
- Store cylinders in an upright position. All empty chlorine cylinders (depressurized) should be tagged as empty.
- Remove the outlet cap from the cylinder and inspect the threads on the outlet. Cylinders having outlet threads which are corroded, worn, cross-threaded, broken, or missing should be rejected and returned to the supplier.

- Chlorine cylinders should be tested periodically. As an example the specifications and regulations of the United States Interstate Commerce Commission require that chlorine cylinders be tested at 800 psi (5516 kPa or 56.24 kg/sq cm) every five years. The date of testing is stamped on the dome of the cylinder. Cylinders which have not been tested within that period of time should be rejected and returned to the supplier.
- A respirator approved as suitable for the purpose should be worn when opening cylinder valves or other chlorine connections. Canister-type respirators are suitable when performing these routine operations and dealing with small gas leaks. When dealing with a major leak, or if lack of oxygen is suspected, self-contained breathing apparatus must be worn. All operators who may have to use this equipment must be fully trained beforehand.

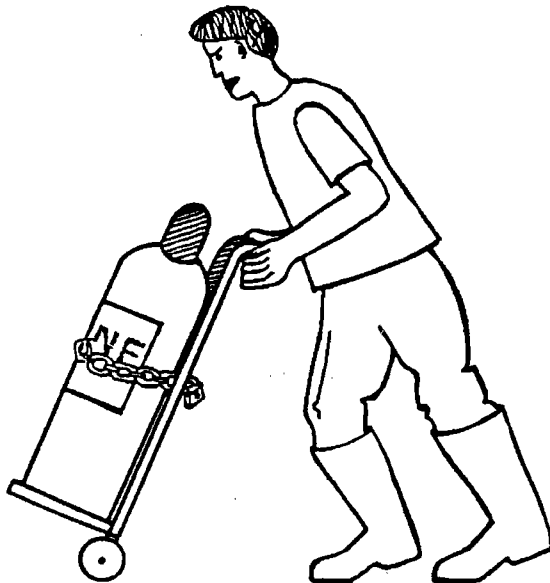


Figure 2. Handling chlorine cylinders