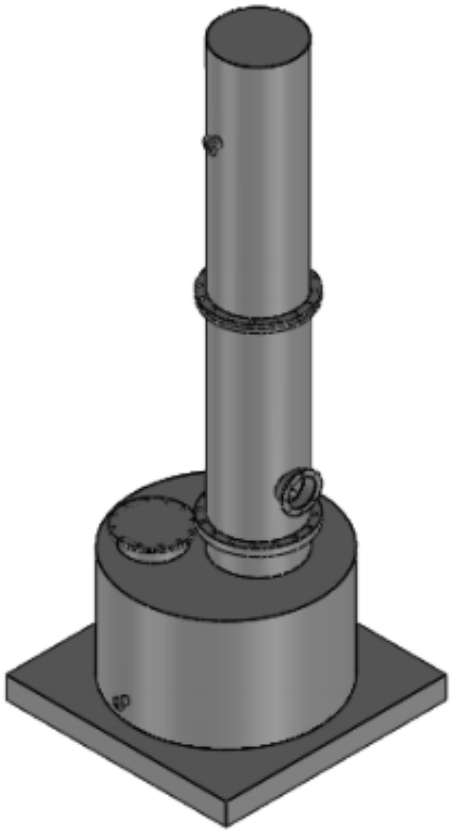
N.S 05

ChloroMaster

ECS Co. Ltd

Neutralization System

(For Cl2)



INSTRUCTION MANUAL

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1. Intended Use

The Neutralization System is designed exclusively for the safe handling of accidental chlorine gas leaks within chlorination facilities. Its primary purpose is to capture contaminated air from the leak area, transfer it through the neutralization tower, and neutralize the chlorine gas using a caustic soda (NaOH) solution before releasing clean air back into the environment.

The system ensures:

- Protection of personnel and equipment from hazardous chlorine exposure.
- Effective gas–liquid contact through neutralization media combined with a sprinkler distribution system.
- Automatic and reliable operation triggered by leak detection signals, minimizing the need for manual intervention during emergencies.

This system is intended solely for neutralizing chlorine gas in water treatment and industrial chlorination processes, and its safe performance can only be guaranteed under the operating and environmental conditions described in this manual.

2. General Safety Instructions

The Neutralization System has been designed and manufactured with strict adherence to recognized safety standards. Nevertheless, improper use, insufficient training, or negligence may still create risks to personnel, equipment, and the surrounding environment. For this reason, the following safety principles must always be observed:

1. **Authorized Personnel Only**
    - Installation, operation, and maintenance may only be carried out by trained and authorized personnel familiar with chlorine handling procedures and emergency response.
2. **Personal Protective Equipment (PPE)**
    - Operators must always use appropriate PPE when working in areas where chlorine may be present, including gas masks, gloves, and chemical-resistant clothing.
3. **System Labels and Warnings**
    - All safety signs and labels attached to the system must remain clearly visible and legible. They must never be removed, covered, or ignored.
4. **No Unauthorized Modifications**
    - The system must not be modified, extended, or altered in any way that may compromise its safety or performance without the prior written consent of the manufacturer.

5. **Electrical Safety**
    - Before performing any work on electrical components, the system must be fully switched off, isolated from the power supply, and secured against accidental reactivation.
6. **Safe Chemical Handling**
    - Caustic soda solution used in the system is corrosive. Avoid direct contact with skin or eyes and never inhale vapors. Always follow safe handling procedures for chemicals.
7. **Emergency Preparedness**
    - In the event of a chlorine leak, follow the site-specific emergency response plan immediately. Ensure that first aid equipment and safety showers are accessible and functional.
8. **System Readiness Indicator**
    - The control panel is equipped with a dedicated indicator lamp showing that the system is in standby mode and ready for operation. This lamp must always remain lit during normal conditions. If the lamp goes off, it indicates a malfunction in one or more system components. Operators must immediately investigate and restore the system to readiness, as failure to do so may prevent the unit from operating in the event of a chlorine leak.

Failure to comply with these safety instructions may result in serious injury, equipment damage, or environmental harm. The operator bears full responsibility for ensuring continuous adherence to these instructions.

3. Description

3.1 Scope of Supply

Chloromaster's scope of supply includes the design, manufacturing, and delivery of the following components:

- **Neutralization Tower with Integrated Tank**
    - GRP construction, chemical-resistant design.
    - Equipped with internal connections for media and sprinkler system.
- **Neutralization Media**
    - Chemical-resistant packing material to increase gas–liquid contact time.
- **Sprinkler System**
    - Spray headers, nozzles, and distribution piping for uniform soda solution distribution.
- **Mixer**
    - Mechanical mixer installed in the soda tank to maintain solution homogeneity.

3.2 Principle of Operation

The Neutralization System operates automatically in response to chlorine gas leaks, based on signals received from the leak detection system. The control panel sequences the operation in two stages depending on the chlorine concentration detected.

- **Stage 1 – At 2 ppm Chlorine**
  - When a chlorine concentration of **2 ppm** is detected, the **visual alarm** on the control panel is activated to alert personnel of the leak.
  - Immediately afterwards, the **compensation fans (Exhaust Fans)** start operating to renew the air inside the room and ensure continuous airflow, reducing the accumulation of chlorine gas.
  - The system remains in standby mode, ready to escalate to the next stage if the chlorine concentration increases.

- **Stage 2 – At 5 ppm Chlorine**

When the detected chlorine concentration reaches **5 ppm or higher**, the system enters full neutralization mode according to the following sequence:

Activation of visual and audible alarms:

- Sirens and flashing lights are immediately activated from the control panel to alert personnel of a serious leak.

Mixer operation:

- The mixer starts immediately and continues running throughout the process to keep the caustic soda solution homogeneous.

Caustic Soda Pump operation:

- After **30 seconds** of mixer operation, the pump starts to deliver the soda solution to the sprinkler network at the top of the tower.

ir Blower operation:

- After **20 seconds** of pump operation, the air blower starts to extract chlorine-contaminated air from the room and direct it into the neutralization tower.

Neutralization process:

- The contaminated air containing chlorine gas is extracted through the air duct connected to the air blower and delivered into the neutralization tower at the lower level beneath the neutralization media. At the same time, sprinklers located at the top of the tower spray caustic soda (NaOH) solution downward. The neutralization media increases the contact time between the leaked chlorine gas and the soda solution, ensuring complete chemical neutralization. As a result, clean and chlorine-free air is safely discharged from the tower.
- Contaminated air enters the tower from the bottom.
- Caustic soda is sprayed from the top through sprinklers.
- Neutralization media inside the tower increase the contact time between air and solution.
- The air leaving the tower is clean and free from chlorine gas.

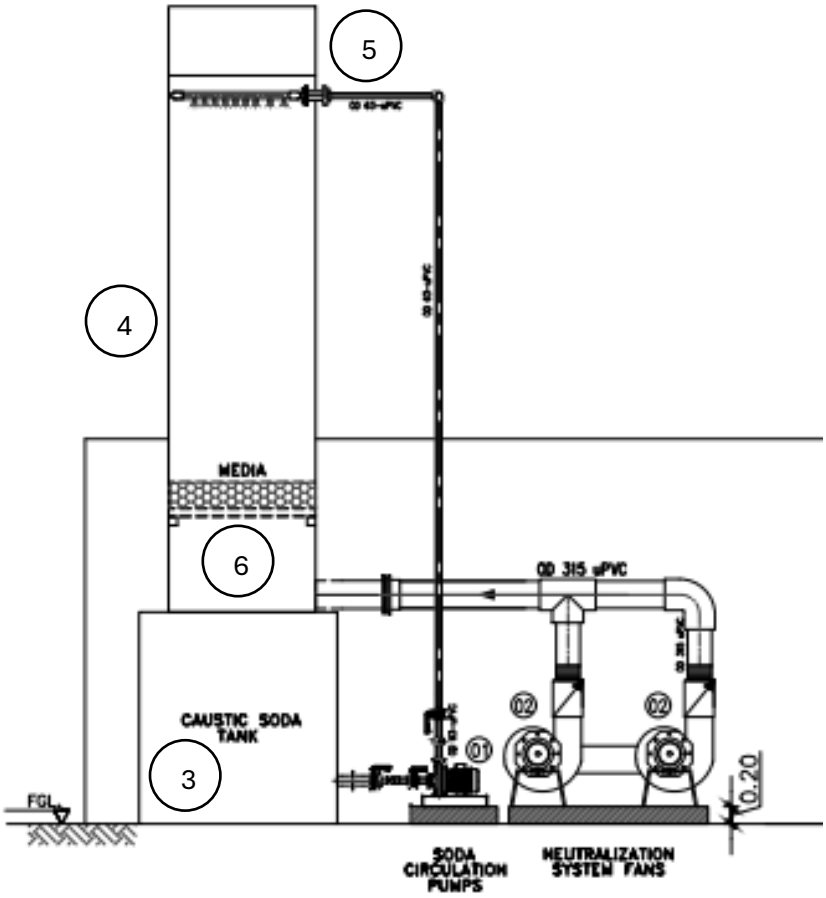
Continuous operation:

- The system continues running until the chlorine concentration in the room drops back to a safe level (below 2 ppm). The control panel continuously monitors the sequence and displays readiness or fault signals as required.

3.3 Technical Data

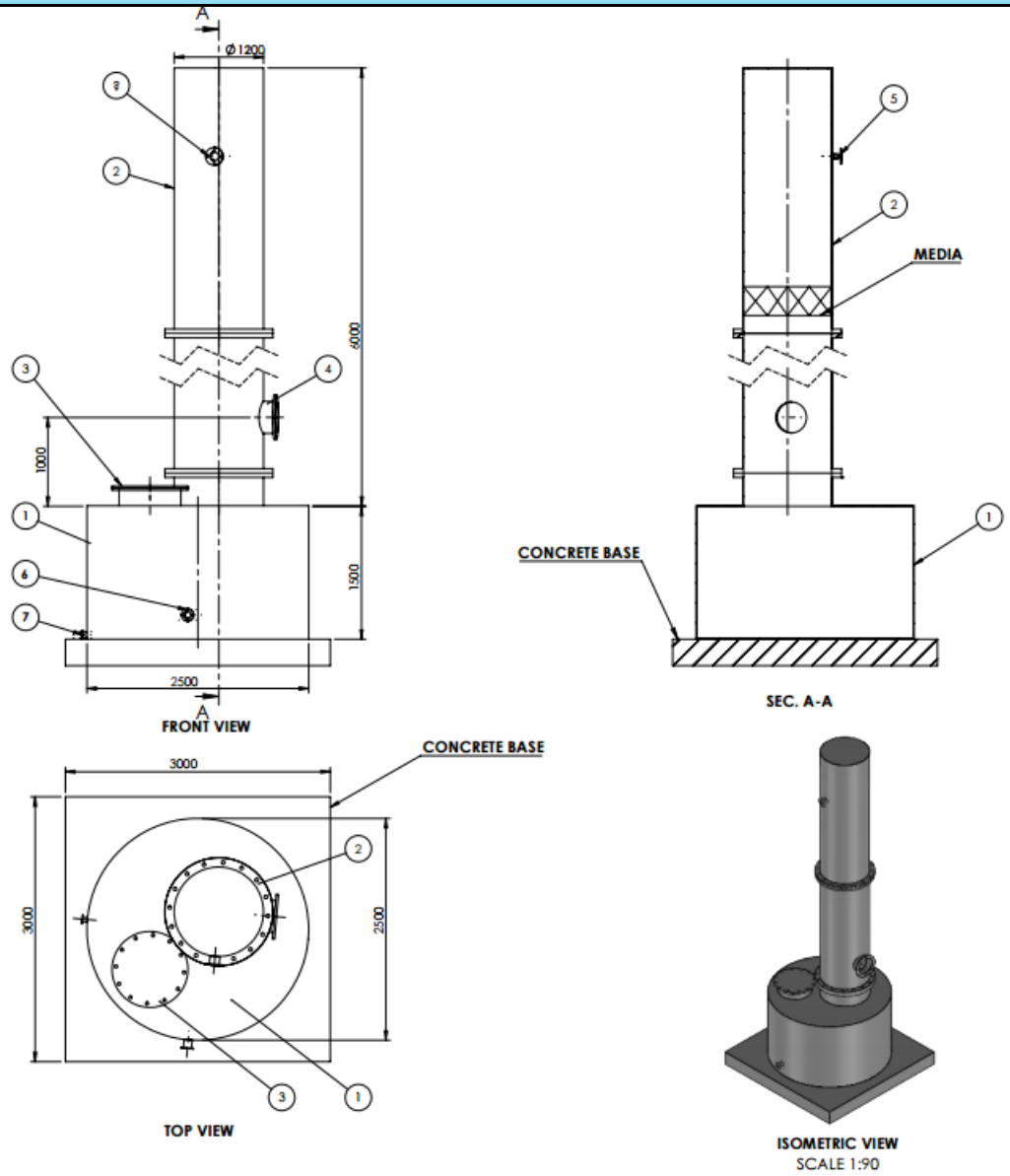
Component	Specification	Operating Conditions
Neutralization Tank	**Material**: Fiber Glass **Height**: 1500 mm **Diameter**: 2500 mm **Thickness**: 12 mm **Capacity**: 8 m^3	Storage and supply of caustic soda solution
Neutralization Tower	**Material**: Fiber Glass (FRP) **Height**: 6 m **Diameter**: 120 cm **Thickness**: 6 mm	Designed to operate under blower-induced airflow with downward NaOH spray; suitable for normal site conditions (-10°C to +50°C), non-condensing humidity.
Neutralization Media	**Material**: PVC Chemical-resistant **Height**: 300 mm	-
Sprinkler System	**Sprinkler loop Material (Piping & Fittings)**: uPVC, PN16, DIN Standard, 3 inch **Nozzles**: Stainless Steel 316	Operates under continuous caustic soda circulation for uniform spray distribution
Mixer	**Shaft & Impeller Material**: Stainless Steel 316 **Motor Power**: 1.1 kW **Motor Speed**: 140 RPM	continuous operation during neutralization process

4. Installation



Pos	Qty.	Description
1	2	Caustic soda pump
2	2	Air blower
3		Neutralization Tank
4		Neutralization Tower
5	1	Sprinkler System
6	1	Neutralization Media

5. Drawings and parts lists



Item No.	Description	Dimension / Size	Purpose / Function
1	Neutralization Tank	Ø 2500 mm × H 1500 mm	Storage of caustic soda solution
2	Neutralization Tower	Ø 1200 mm × H 6000 mm	Contact chamber for chlorine neutralization
3	Manhole	DN 700	Access for inspection and maintenance
4	Air Blower Discharge	DN 300	Transfers contaminated air into the tower

5	Caustic Soda Pump Discharge	DN 100	Delivers caustic soda to sprinkler system
6	Caustic Soda Pump Suction	DN 80	Draws caustic soda from the tank
7	Drain Opening	DN 50	Drains residual liquid for cleaning/emptying

Installation – Safety Notes

- Ensure all installation work is carried out by **qualified technicians** familiar with chlorine systems.
- Before starting, verify that the **area is well ventilated** and free of chlorine gas.
- Always wear appropriate **PPE**: chemical-resistant gloves, goggles, and a gas mask.
- Do not perform any hot work (welding, grinding, cutting) near the system.
- Check that all **flanges, gaskets, and seals** are clean and properly aligned before tightening.
- Use only **approved lifting equipment** when handling heavy components such as the neutralization tank or tower.
- Ensure all **electrical connections** (mixer, pumps, blower) are done by a certified electrician according to the wiring diagram.
- After installation, perform a **leak test** with clean air before introducing caustic soda solution or chlorine-contaminated air.

Final Notes

This manual provides the necessary information for the safe installation, operation, and maintenance of the unit. The operator must ensure that all safety instructions are followed and that only authorized personnel carry out work on the system. For spare parts, service, or further technical assistance, please contact [ChloroMaster].