

CHLORINATION

1. Version, Date. 1, 27 Jan 2010 (EMS)

2. Purpose. This Environmental Standard Operating Procedure (ESOP) summarizes the procedures utilized for the management of chlorine and/or chlorine containing materials at Marine Corps Base, Quantico (MCBQ) for water and wastewater treatment. Chlorine is used at MCBQ for disinfecting source, sewage, and swimming pool water. These procedures are implemented to ensure compliance with state and Federal regulations, and Marine Corps and Department of Defense (DoD) orders, as referenced in paragraph 11.

3. Applicability

a. Audience. These procedures apply to all MCBQ personnel involved in the storage, distribution, and management of chlorine and chlorinated disinfectants (i.e., sodium hypochlorite) used in water treatment.

b. Scope. This ESOP addresses chlorination operations at MCBQ involving one or more of the three methods for disinfecting water that are listed below:

(1) Chlorine gas is stored at the Mainside Water Treatment Plant (WTP) as a backup method for disinfecting source water.

(2) High Test Hypochlorite (HTH) is a solid form of chlorine used for disinfecting swimming pool water at the Marine Corps Community Services (MCCS) All Hands Pool and The Basic School's (TBS) indoor pool at Ramer Hall.

(a) The two seasonal pools, managed by Public Private Venture (PPV) housing, are not included in this ESOP as PPV housing is not included in MCB Quantico's Environmental Management System (EMS).

(b) HTH is also used as a back-up chlorination system for the Camp Upshur wastewater plant.

(3) Sodium hypochlorite is a liquid disinfectant used at the Mainside WTP as the primary method for treatment of source water and Camp Upshur drinking water wells. It is also used at Camp Upshur as the primary method for disinfection of sewage.

4. Definitions. The following definitions are provided to support this procedure:

Chlorination ESOP

a. Calcium Hypochlorite - A chemical compound with the formula $\text{Ca}(\text{ClO})_2$. It is widely used for water treatment and as a bleaching agent (bleaching powder).

b. Chlorination - The process of adding chlorine or a chlorine compound to water as a method of disinfection.

c. Chlorine - A gaseous element (Cl^2) with a pungent odor. It is commonly used as a component in bleach, an oxidizing agent, or as a disinfectant in water purification. It is often misconceived that elemental chlorine is present in chlorinated water; however, during water chlorination, while elemental chlorine gas may be added to the water, the chlorine is quickly transformed into other chemicals that disinfect the water. Hypochlorous acid and sodium hypochlorite are two of these chemicals. In sufficient concentrations the Cl^2 irritates the mucous membranes, the respiratory tract, and the eyes and can cause death due to respiratory collapse or lung failure.

d. High-Test Hypochlorite (HTH) - Typically sodium or calcium hypochlorite (see definitions in this section). HTH is a strong chlorinating agent containing greater than a 30 percent Chlorine concentration. This chemical is commonly used for disinfection in swimming pools.

e. Sodium Hypochlorite (NaClO) - Sodium hypochlorite solution, commonly known as bleach and a strong oxidizer, is frequently used as a disinfectant. Household solutions contain a 3-6% concentration, whereas formulations used in water treatment plants contain between 10-14% concentration. Sodium hypochlorite is a strong oxidizer, and sufficient contact with this solution results in extensive skin burn and eye irritation.

f. Source Water - Untreated water obtained directly from the source (i.e., wells or surface water).

5. Responsible Parties. The following parties are responsible for chlorination procedures at MCBQ:

a. Mainside Water Treatment Plant Personnel

b. Camp Upshur Sewage Treatment Plant Personnel

c. Camp Upshur Wellhead Maintenance Personnel

d. Mainside Sewage Treatment Plant Personnel

e. MCCS Pool Operators

f. G-5, Facilities and Logistics Services (FLSS), TBS Pool Operators

Chlorination ESOP

g. G-5, Natural Resources and Environmental Affairs (NREA) Branch, Environmental Compliance Section, Spill Response Coordinator and Water Program Manager.

h. G-5, FLSS, Utilities Shop (Shop 61) and Shop 32.

i. Security Battalion, MCBQ Fire and Emergency Services.

6. Procedures for Chlorination (Instructions for Operational Control). Chlorination at MCBQ involves the addition of sodium hypochlorite liquid, HTH (calcium or sodium hypochlorite) tablets, or chlorine gas to water for the purposes of disinfection. Note that chlorine gas is only used as a back-up chlorination method, should one of the primary methods fail. Given the varying properties of the different forms of chlorine, there are different procedures for each chlorination method.

a. Sodium Hypochlorite (NaClO) Requirements - NaClO is the primary form of chlorination at the WTP.

(1) NaClO is stored in a 1,400 gallon polypropylene storage tank, located in the control room of the Mainside WTP. This tank feeds into an automated delivery system, which controls the amount of NaClO fed to the water based on continuous monitoring of water exiting the facility.

(2) NaClO solution is used at the sewage treatment plant (STP) and is stored in a 150 gallon tank, inside a storage room with a feeder system.

(3) NaClO solution is also used for treating two drinking water wellheads at Camp Upshur. NaClO is stored within 75-gallon drums, within locked and gated sheds, that are situated adjacent to the wellheads.

(4) The effectiveness of NaClO is compromised when exposed to heat and/or sunlight and loses potency over time. Therefore, NaClO must be stored in climate controlled (below 70 degrees Fahrenheit) rooms and to the extent possible, not exposed to direct sunlight.

(5) All personnel entering NaClO storage areas must have adequate personal protective equipment (PPE) available, including either a face shield or eye protection, and gloves. Additionally, ensure that spill response equipment and an eyewash station are nearby and fully functional.

(6) Ensure that secondary containment is provided for all storage tanks of NaClO. For any release, enact appropriate spill response procedures provided in paragraph 10.

(7) Store NaClO so that it does not come into contact with other chemicals. NaClO must be stored in a well ventilated area for

Chlorination ESOP

safety purposes, as well as to reduce the corrosive nature of chlorine on metal and other apertures in the immediate area.

(8) When contractors deliver NaClO, the following established procedures must be implemented:

(a) One person must be standing at the truck offloading the product, and the other individual stationed at the tank being filled to observe.

(b) Avoid NaClO contact with any body part or clothing.

(c) PPE, including splash proof goggles, chemical resistant apron, rubber boots, and safety gloves are worn at all times. PPE is never to be removed or disabled until work is complete and the worker is away from the NaClO.

(d) Line leaks on the pressure side of pumps must be secured before investigating a problem.

(e) Leaks are to be contained as soon as possible.

(f) Areas with leaks must be ventilated.

(g) Avoid allowing any debris inside of tanks.

(h) DO NOT sign the post loading certification statement on the bill of lading until the driver fully disengages all hoses and closes all valves to ensure no spills occur.

(9) On a monthly basis, inspect the NaClO tanks, lines, and fixtures on the feeder system to ensure proper operation of the equipment, and to inspect for failing lines, pumps, or valves. If any equipment needs to be repaired or replaced, contact FLSS Shop 61 for assistance.

b. Chlorine Gas Requirements - Chlorine gas (Cl^2) is used at the Mainside WTP as a secondary method of drinking water disinfection, should the NaClO system be placed offline. Cl^2 is stored in 150-pound compressed gas cylinders, in a separate storage room from the NaClO. The facility never maintains more than six cylinders on-site at any time, including two cylinders which are connected on-line. The following are procedures to be followed for proper management of Cl^2 gas:

(1) Always store cylinders in the Cl^2 storage area, which is equipped with proper ventilation, air sensors, and an audible and visual alarm system capable of notifying people throughout the WTP.

(2) Ensure that entryways into the Cl^2 storage area have signs identifying the area as containing Cl^2 , and that doors entering into the storage area have panic bars.

Chlorination ESOP

(3) Only certified WTP personnel should handle Cl² cylinders, including the movement of cylinders, and connecting the cylinders to the backup feed system.

(4) When hooking up or disconnecting Cl² cylinders to the feeding system:

(a) Prior to entering the Cl² storage area, ensure that the air sensing equipment is functioning and Cl² has not leaked into the room.

(b) Ensure that all WTP personnel in the Cl² storage area are equipped with an emergency escape mask or hood and five (5) minute air supply while changing cylinders.

(c) Tighten the packing nut prior to opening the cylinder;

(d) Ensure the internal lead washer of the cylinder is properly fitted;

(e) Ensure that the yoke clamp is tight prior to opening the Cl² cylinder valve;

(f) Make sure all cylinders are secured with a chain; and

(g) Test all cylinders with ammonia for leaks

(5) Always have an ammonia kit available in the room where chlorine cylinders are used and stored to detect chlorine releases, and ensure that chlorine emergency kits are maintained in the storage room.

(6) Under no circumstances should Cl² cylinders be transported outside of the Cl² gas storage area. Cl² cylinders must be delivered and placed into the Cl² storage area.

(7) At a minimum of every two hours, ensure that the chlorine system, including all feeder lines and appurtenances, are inspected as part of the facility walkthrough conducted by Mainside WTP personnel (See paragraph 7, Inspections and Corrective Actions).

(8) Ensure that all personnel are properly trained in evacuation procedures as listed in the MCBQ Risk Management Plan.

(9) For disposal of unusable Cl², DO NOT release to the atmosphere. Return to the vendor for proper disposal.

(10) Follow procedures listed in the Compressed Gas ESOP for additional storage, handling, and inspection procedures for compressed gas cylinders.

Chlorination ESOP

c. High-Test Hypochlorite (HTH) Requirements.

(1) HTH is used at both the MCCS All-Hands-Pool and the indoor pool at TBS's, Ramer Hall. These calcium hypochlorite tablets are released through a feeder system into the pools on an as-needed basis.

(a) Alternative chlorination methods are NOT interchangeable in these existing systems. Ignoring that or confusing one with the other can have dangerous results.

(b) The HTH chlorination system is connected to a water sensor device that detects low chlorine levels in the pool water. Once low HTH concentrations are detected, the sensor triggers a pump that activates the HTH chlorination system. Service Shop (Shop 61) at FLSS is responsible for the routine maintenance, inspection, and repair of the system.

(2) The following procedures must be followed for proper management of HTH at MCB Pools:

(a) It is recommended that HTH be stored on secondary containment pallets in the original container, segregated from other chemicals and hazardous materials.

(b) Always use the feeder system to add HTH to pool water. NEVER add HTH directly into pool water.

(c) Only trained aquatic facility operators can utilize HTH. Unauthorized personnel should never enter the pool chemical storage area.

(d) Any personnel handling HTH must wear appropriate PPE, including gloves, a face shield, and goggles.

(e) To dispose of contaminated or unusable product, dissolve HTH in water and carefully neutralize dissolved material by adding hydrogen peroxide (one pint of 35% hydrogen peroxide solution per pound of HTH to be neutralized) then dilute the neutralized material with a water and flush to the sanitary sewer.

(3) HTH is used as a backup source of disinfection at the Mainside STP, should the primary form of disinfection (UV light) go offline. The following procedures must be followed for proper management of HTH:

(a) Store HTH on secondary containment pallets in the original container, segregated from other chemicals and hazardous materials.

(b) Only trained STP operators are permitted to utilize HTH. Unauthorized personnel should never enter the chemical storage area.

Chlorination ESOP

(c) Any personnel handling HTH must wear appropriate PPE, including gloves, a face shield, and goggles.

(d) To dispose of contaminated or unusable product, dissolve HTH in water and carefully neutralize dissolved material by adding hydrogen peroxide (one pint of 35% hydrogen peroxide solution per pound of HTH to be neutralized) then dilute the neutralized material with a water and flush to the sanitary sewer.

(e) When transporting HTH from the Camp Upshur STP to the Mainside STP (if necessary), ensure that lids are closed on all HTH containers, a spill kit and PPE is available on the vehicle, and that the container is properly secured.

d. Additional Requirements - Additional requirements that are not related to individual types of chlorine include:

(1) Ensure that all direct discharge of water from any chlorination treatment process runs through a dechlorination process before exiting MCBQ.

(2) Ensure that accurate records are maintained regarding chlorine usage (all types) so that accurate Emergency Planning and Community Right to Know Act (EPCRA) reports can be prepared by the Natural Resources Environmental Affairs (NREA) Branch.

(3) Maintain Material Safety Data Sheet (MSDS) forms for all chlorine products present and make them readily available to individuals working with or near the chlorinated material.

7. Inspections and Corrective Actions

a. Daily readings are obtained to determine the NaClO concentrations at the Camp Upshur wells, identify any abnormal operating conditions, and to detect potential equipment failure. A worker from the Mainside WTP visits each well and records the data.

b. At a minimum of every two hours, Mainside WTP operators are required to conduct a facility walkthrough, which includes a visual inspection of both the NaClO system and the Cl² cylinders. Although no formal checklist is utilized during this walkthrough, items inspected include the condition of all cylinders valves, and piping, as well as ensuring meters are operating properly. Inspection results are recorded in the operator's logbook.

c. For the MCCS and TBS swimming pools, periodic inspections of the chemical storage area (where HTH is stored) are conducted by trained pool personnel to ensure no chemical spills exist, and that the chlorine feeding system is operating properly.

Chlorination ESOP

d. Inspections are performed each shift by STP operators at the Mainside and Camp Upshur STP facilities.

e. Routine preventative maintenance (PM) is conducted on the following chlorine systems:

(1) On an annual basis, contractors conduct PM on the Cl² gas feeder system at the Mainside WTP.

(2) Quarterly, FLSS Shop 61 conducts PM on the NaClO feeder system.

(3) Every three months, contractors conduct PM on the chlorine analyzers at the Mainside WTP and on the wellheads at Camp Upshur.

(4) On a weekly basis, FLSS Shop 61 conducts a routine inspection and test of the HTH system at the MCCA (when in season) and TBS (indoor) swimming pools.

(5) An inspection checklist for compressed Cl² cylinders is included as attachment 22-1. For additional guidance on compressed gas cylinders, refer to ESOP 21, Compressed Gas Cylinders.

8. Internal Communication

a. As stated in paragraph 6.d.(2), ensure accurate records are maintained on all chlorination systems, including the amount of material used. Records must be maintained for a year, at minimum, and be made available upon request to the NREA for Annual EPCRA Reporting.

b. In the event of an emergency, the communications described in paragraph 10 shall be implemented.

c. In the event that a chlorination system requires service, notify the applicable responsible party as described in paragraph 6.

9. Training/Awareness. Practice owners are responsible for maintaining training records of personnel as required and applicable per chlorination method. Additionally, per Marine Corps Order P5090.2A, Table 2-1, the practice owners will maintain this ESOP and ensure it is addressed in new and annual employee training.

a. Hazard Communication (HAZCOM) training provides workers awareness training relevant to the properties and potential health and safety hazards associated with the materials they are exposed to in the workplace. All individuals working with compressed gas cylinders as part of their normal duties should receive appropriate HAZCOM training.

b. As required by Virginia regulations (Virginia Code, Title 54.1-2302 and 18 VAC 160-20-74), MCBQ employs Certified Water and Wastewater Treatment Operators with working knowledge of Federal,

Chlorination ESOP

state, and plant operating requirements. To receive certification, operators must pass a Virginia certification test which includes demonstrating knowledge of safe handling and management of chlorine products.

c. All lifeguards and aquatic managers at the MCCS and TBS swimming pools are encouraged to be certified as Aquatic Facility Operators (via the National Recreation and Parks Association) and certified pool operators (via the State of Virginia). Both these certifications require successful completion of a training program which includes safe handling and management of pool chemicals including HTH.

10. Emergency Preparedness and Response. There are specific emergency preparedness and response procedures established for MCB Quantico based upon the type of chlorine product spilled or released to the environment.

a. In the event of a release from a chlorine gas cylinder at the Mainside WTP, MCO 10330.2D and the Base Risk Management Plan require the following activities:

(1) In the event of a release from a chlorine gas cylinder, personnel not equipped and trained to use a self-contained breathing apparatus (SCBA) and full protective clothing will be excluded from the area until the leak has stopped and the air quality is safe..

(2) There are two chlorine emergency kits in the Chlorine Room. They are located adjacent to the chlorine cylinders that are connected for back-up use.

(3) All chlorine gas leaks will be handled by the fire department. Utilities personnel are not to try to use the emergency kits for leaking cylinder repairs. If a leak occurs, evacuate all personnel and alert the Fire Department at 911 (specify the location as MCB Quantico). The evacuation route for personnel at the Mainside WTP is to head uphill from the plant, towards Russell Road.

(4) Note that based on the wind direction and speed and the volume of chlorine gas released, it is possible that a chlorine gas plume could migrate and impact areas off-base. MCB Quantico personnel responding to the release must coordinate with off-base first responders as needed to notify them of the release and to coordinate response efforts.

(5) Any Cl² gas release of 10 pounds or more within a 24 hour period is considered a reportable release which requires immediate notification to the National Response Center at 1-800-424-8802.

b. In the event of a spill of NaClO, the following procedures must be followed:

Chlorination ESOP

(1) Cease all operations, turn off the power supply if applicable, and close appropriate valves to stop the flow of product (if applicable).

(2) Evacuate the area of all unnecessary personnel.

(3) If practical, contain the spill and protect all storm drains or inlets with appropriate spill response equipment. *** Note that the Mainside WTP has a secondary containment system with pumps that capture spilled/leaking NaClO. As long as: the spill/leak did not occur outside of the containment area; the pump has functioned; and the area is safe to work in (e.g., no air quality issues); personnel can skip steps identified in paragraphs 10.b.(4) through(6). Otherwise, continue on with those response procedures listed below.

(4) Call the MCBQ Fire Department at 911. Inform the Fire Department of the location and type and estimate of product spilled.

(5) Contact the NREA Branch, Environmental Compliance Section, Spill Response Coordinator, 703-784-4030, to report the incident, provide additional information and obtain further guidance. If an incident occurs outside of normal business hours, the Quantico Fire Department will notify the appropriate NREA Branch personnel.

(6) Submit a completed Spill Report (see Attachment 22-2) and provide a copy to the NREA Branch, Environmental Compliance Section, Spill Response Coordinator.

(7) When the area is safe, implement site cleanup operations in coordination with NREA Branch, Environmental Compliance Section, as well as repair the leaking equipment, as applicable.

c. In the event of an accidental release of HTH, the following procedures must be followed:

(1) Keep the product away from liquids where the tablets or sticks can dissolve. If the product has already dissolved, follow the procedures for a sodium hypochlorite release above.

(2) If the tablet has not come into contact with any liquid and dissolved, pick up the tablet and place it back in the container. Ensure that proper PPE is worn when handling tablets.

11. References and Related Documents. The following references are relevant to this procedure:

a. 29 CFR 1910.101, Occupational Safety and Health Standards, Compressed Gases.

b. 49 CFR 177.834, Department of Transportation, Loading and Unloading.

Chlorination ESOP

- c. MCBQ ESOP #22, Compressed Gas Storage.
- d. MCBQ Risk Management Plan/Program.
- e. MCO 10330.2D, Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders.
- f. MCO 4450.12, Storage and Handling of Hazardous Materials.
- g. MCO P5090.2A, Environmental Compliance and Protection Manual.
- h. MCBO 6280.1B, Handling, Transfer, and Disposal of Hazardous Materials and Hazardous Waste. September 2007.
- i. MCBO 6240.3B, Swimming Pool Water Treatment Plants. October 1997.
- j. 18 VAC 160-20-74

12. Document Revision History. The following provides a history of revisions of this ESOP:

Revision Number	Date	Revision Made By	Section	Page	Summary of Change and Reason	Signature

13. Document Owner. This document has been reviewed and approved by the practice owners. Should the practice change, resulting in a need to modify this ESOP, practice owners will notify the NREA Branch, EMS Section at 703-432-0536. .

- a. Document Owner. NREA Branch, Environmental Compliance Section.
- b. Document Approval. Chair, EMS Core Team, NREA Branch.

**Material Handling and Storage (Compressed Gas)
Inspection Checklist**

Date:	Time:
Unit/Bldg #:	Work Center:
Inspector's Rank/Name:	Signature:

Inspection Items	Yes	No	Comments
1. Is cap placed on cylinder when not in use?			
2. Are full cylinders separated from empty ones?			
3. Are cylinders secured with chains or other restraints?			
4. Are cylinders in an upright (vertical) position?			
5. Are cylinders kept away from high traffic areas?			
6. Are cylinders kept away from heat or direct sunlight?			
7. Are cylinders returned when empty?			
8. Are cylinders clearly labeled with contents?			
9. Are cylinders stored 50 feet from buildings?			
10. Are cylinders not subjected to freezing temperatures?			
11. Are cylinders kept in an approved storage area?			
12. Are cylinders kept away from heat sources such as furnaces, radiators, and flames?			
13. Are exhaust/ventilation fans and air monitor equipment (if applicable) fully functional?			
14. Are all personnel training requirements up to date and records maintained?			
15. Are applicable MSDS sheets maintained and available onsite?			
16. Is a serviced emergency wash station nearby?			



UNITED STATES MARINE CORPS
MARINE CORPS BASE
QUANTICO, VIRGINIA 22134-5000

IN REPLY REFER TO:

Date

From: _____
Command, Subcommand

To: Natural Resources and Environmental Affairs (NREA) Branch, Facilities Division

Via: _____
Unit Environmental Coordinator

**Subj: HAZARDOUS MATERIAL/HAZARDOUS WASTE/PETROLEUM, OIL,
LUBRICANT SPILL REPORT**

Ref: MCBO 6280.1B

1. The following report of a hazardous substance spill is made, in compliance with the reference:

a. Spill date: _____ Time of spill: _____

b. Person reporting spill: Name: _____

Contact Number: _____ Grade/Position: _____

c. Location of spill: _____

d. Hazardous substance spilled: _____

e. Quantity spilled (gallons): _____

2. Immediate containment actions taken: _____

3. Fire Department Response: Supervisor: _____

4. Notification:

a. Fire Department Dispatcher: YES _____ NO _____

b. NREA Spill Program Manager: (703) 784-4030 (working hours only)

c. Bulk Fuel Farm Supervisor(if fuel): (703) 432-0044 (working hours only)

5. Follow on actions required: _____

6. Additional Comments (cause of spill and description of environmental impact/physical damages): _____

7. Submitted by: _____

* This form may be faxed to NREA, Spill Program Manager at (703) 784 4953.*