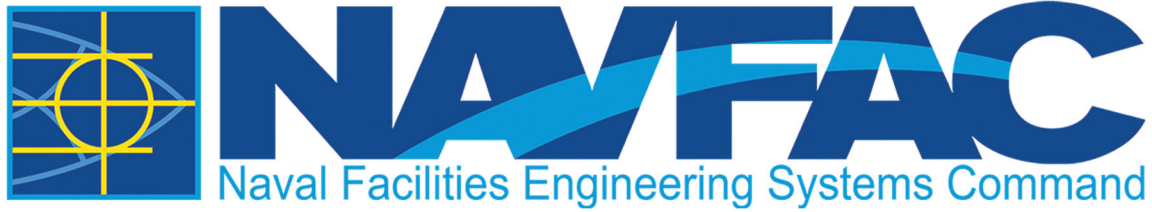


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STANDARD OPERATING PROCEDURE

SOP 4.1 Chlorine Feed System

Abstract: Feed systems are installed at the water pump stations to add sodium hypochlorite for disinfection.

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Revision Tracking Sheet

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ATTACHMENTS

1. SOP Acknowledgement and Training Form
2. Operator's Daily Log Sheet – Chlorine Feed System
3. Sodium Hypochlorite SDS and Specifications
4. (b) (3) (B) Metering Pumps Instruction Manual
5. (b) (3) (B) DC Motor Controller (b) (3) (B) Installation and Operating Manual
6. Chlorine Residual Analyzer (b) (3) (B) Fact Sheet
7. Chlorine Residual Analyzer (b) (3) (B) Reference Manual
8. (b) (3) (B) Dual Channel Transmitter Information

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1. DEFINITIONS/ACRONYMS

1.1. Definitions

- Calibration: A process that ensures the accuracy of a device or system by comparing its actual performance to a known standard.
- Calibration column: A volumetric cylinder used to check the accuracy of a chemical metering pump or feed system by measuring how much volume is dispensed. *Figure 2-4* illustrates an example.
- Chlorine residual analyzer: An instrument that automatically measures the amount of free available chlorine (FAC) in water. *Figure 2-4* illustrates an example.
- Free Available Chlorine: FAC is chlorine in water that exists as hypochlorous acid (HOCl) or the hypochlorite ion (OCl⁻).
- Injection point: The location where the saturated chlorine solution is introduced into the water supply. *Figure 2-6* illustrates an example.
- Metering pump: A device designed to deliver repeatable and adjustable volumes of liquid. The flow rate can be controlled by changing either the pump speed or the piston stroke length. *Figure 2-4* illustrates an example.
- Potable water: Water that is suitable for drinking.
- Safety Data Sheet (SDS): An Occupational Safety and Health Administration (OSHA) standardized hazard communication document detailing a chemical's properties and hazards (physical, health, and environmental); protective measures; and safety precautions for handling, storing, and transporting the chemical.
- Speed controller: A device that changes the metering pump speed. *Figure 2-4* illustrates an example.

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1.2. Acronyms and Abbreviations

- AC alternating current
- API American Petroleum Institute
- ASTM American Society of Testing and Materials
- Bldg. Building
- DSO Water System Distribution System Operator
- FAC free available chlorine
- hp horsepower
- IBC intermediate bulk container
- JBPHH Joint Base Pearl Harbor-Hickam
- mg/L milligrams per liter (equivalent to parts per million)
- mL milliliters (0.001 liter)
- N/C normally closed
- NaOCl sodium hypochlorite
- NAVFAC Naval Facilities Engineering Systems Command
- OIT Operator(s) in Training
- OSHA Occupational Safety and Health Administration
- PPE personal protective equipment
- PRP32A Utilities Division Potable Water Branch
- SAE Society of Automotive Engineers
- SCADA supervisory control and data acquisition
- SDS Safety Data Sheet
- SOP Standard Operating Procedure

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2. OVERVIEW

2.1. Scope and Purpose

This Standard Operating Procedure (SOP) covers the maintenance of chlorine feed systems, including the monitoring of chlorine levels, the maintenance and calibration of metering pumps, and the treatment of water with chlorine. In addition, this SOP addresses liquid sodium hypochlorite (NaOCl) bulk delivery and its transfer from bulk storage tanks to the feed tanks. Note chemicals, including NaOCl, added to the Joint Base Pearl Harbor-Hickam (JBPHH) water system must be NSF 60 compliant.

The Red Hill water source is currently out of service. Its chlorine system will be replaced by an on-site chlorine generation system in the future. This SOP will be updated once the Red Hill system is operational.

2.2. Operating Summary

The chlorine feed system at the Waiawa shaft consists of two (b) (3), (b) (6) gallon feed tanks; the Aiea-Halawa shaft consists of a single feed tank. Both systems utilize 12.5% sodium and positive-displacement metering pumps to inject the chemical into the water supply pump discharge pipe. There are two metering pumps at the Waiawa Shaft and one at the Aiea-Halawa Shaft. The system at Waiawa Shaft is also equipped with a pump to replenish the feed tanks from bulk containers. *Figure 2-1* provides a schematic of the Waiawa chlorine feed system, indicating valve positions during operation (N/C = normally closed).

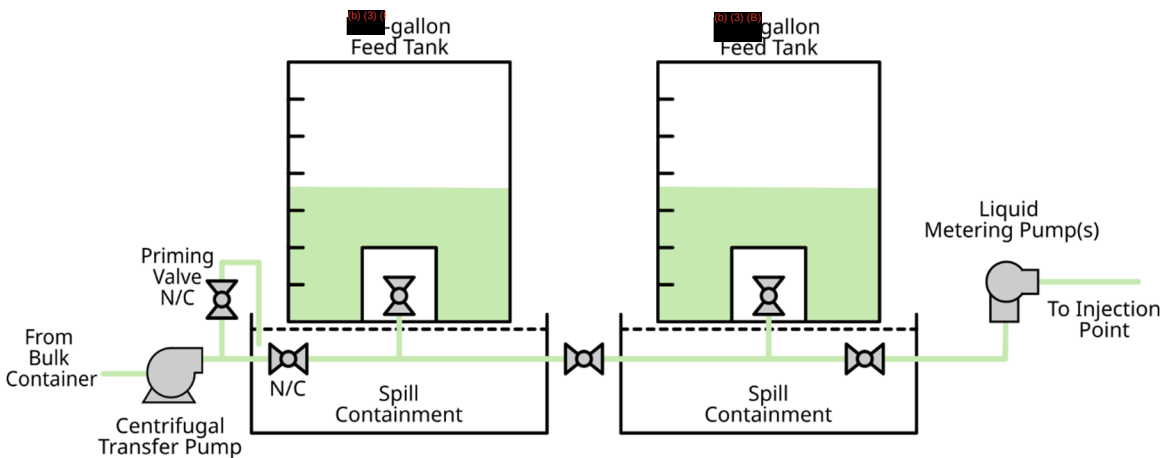


Figure 2-1 Chlorine Feed System Schematic¹

The chlorine feed equipment is located in the chemical feed building. *Table 2-1* details the list of components utilized including totes, metering pumps and controls.

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Table 2-1 Chlorine Feed System Components and Specifications

Component	Specifications
Sodium hypochlorite (NaOCl; 12.5%)	Manufacturer: BEI Hawaii Stock # 103-3291 Supplier Acct #: 456657 Federal Reference #: 35695162-17451469-1 See <i>Attachment 3</i> for SDS information
Chlorine feed tank	Type: intermediate bulk container (IBC) tote Capacity: (b) (3) (B) gallons
IBC tote secondary containment	Manufacturer / model: ENPAC / 54469-YE Capacity: (b) (3) (B) gallons
Metering pump	Manufacturer / Model: (b) (3) (B) (Attachment 4) Maximum feed rate: (b) (3) (B) gallons per hour Discharge pressure: (b) (3) (B) pounds per square inch
Metering pump motor	Model: (b) (3) (B) Power: 0.33 (1/3) horsepower (hp) Speed: 1750 revolutions per minute Volts / amps: 90 / 3.2 (b) (3) (B)
Motor speed controller	Manufacturer: (b) (3) (B) (Attachment 5) Model: DC Motor Speed Control, (b) (3) (B)
Chlorine system residual analyzer	Manufacturer: (b) (3) (B) (Attachment 6) Model: (b) (3) (B)
Chlorine system residual chart recorder	Manufacturer: (b) (3) (B) Model: (b) (3) (B)

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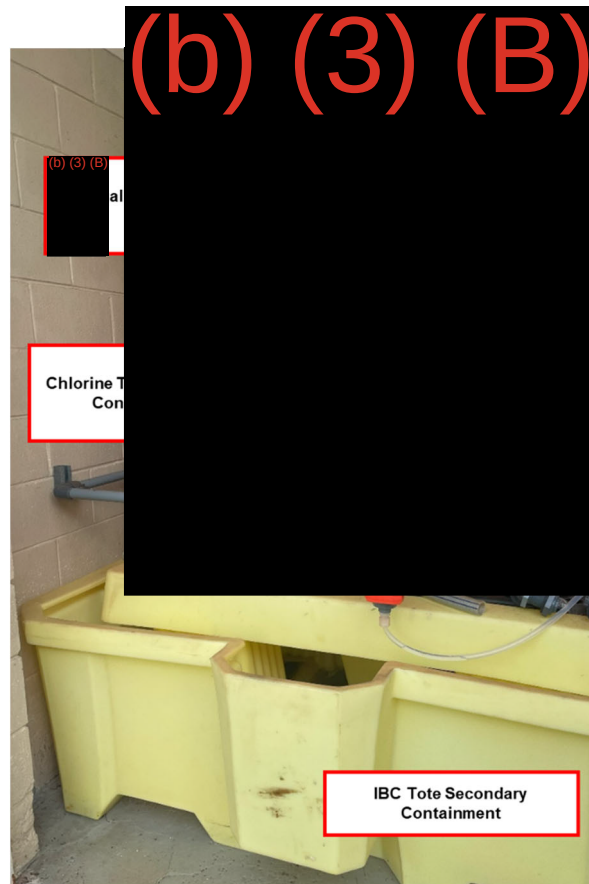


Figure 2-2 Sample Chlorine Feed Tank

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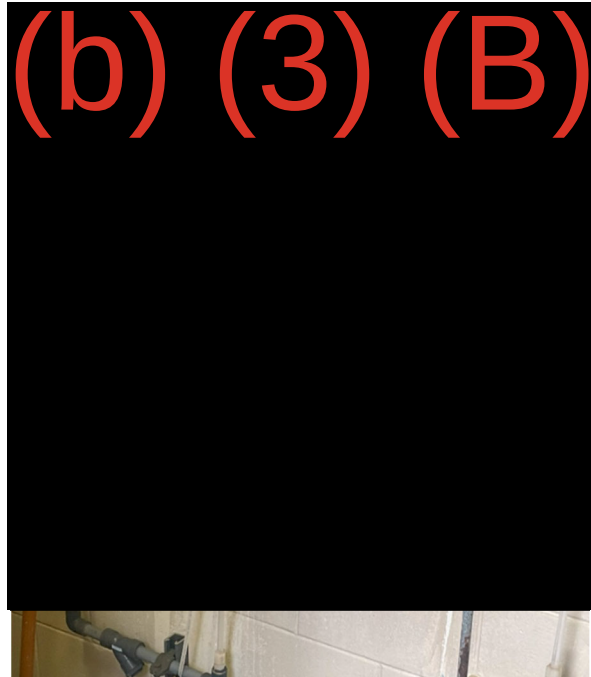


Figure 2-3 Sample Metering Pump

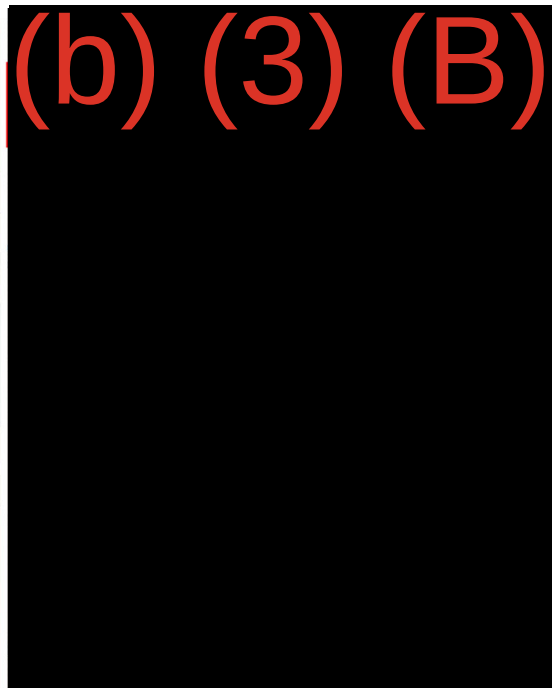


Figure 2-4 Sample Chlorine Monitoring Equipment

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2.2.1. Chlorine Residual Maintenance

The chlorine feed system maintains a target free chlorine residual concentration of 0.7 milligrams per liter (mg/L) at the entry point to the distribution system, with an acceptable range of 0.5 to 1.0 mg/L. This approach ensures a detectable residual throughout the distribution system.

To maintain the target concentration, the metering pump's stroke rate is paced based on the water supply pump station's metered flow rate via a 4 to 20 milli-Ampere signal. Online instruments continuously monitor the residual chlorine concentration, which is displayed on the chlorine residual analyzer. The data are recorded on an analog circular chart recorder and digitally in the supervisory control and data acquisition (SCADA) system.

The SCADA system has alarm setpoints to alert operators of any deviation outside the 0.5-1.0 mg/L range. Once triggered, operators must adjust the metering pump stroke length to restore the target concentration.

For verification, operators manually compare the displayed chlorine residual to the concentration measured in a grab sample, see Section 6 for details on procedures and frequency. If the manual reading is within 0.1 mg/L (5% of the analyzer's range) of the displayed reading, the displayed reading is considered accurate. For manual chlorine measurement procedures, refer to *SOP 8.2 Spot Monitoring*.

Table 2-2 presents the anticipated daily sodium hypochlorite usage and feed rates for Waiawa Shaft and Aiea-Halawa Shaft, assuming a chlorine dose of 0.7 mg/L. While the strength of the chemical is 12.5% (trade percent), the calculations assume degradation to 8.5%. Instantaneous chlorine demand upon addition is negligible. If sodium hypochlorite usage or the metering feed rates are 10 percent above or below the guideline values, refer to the Troubleshooting Guide in Section 7.

Table 2-2 Sodium Hypochlorite Usage and Dosing Guidelines

	Approximate Flow Rate (gallons per minute)	Sodium Hypochlorite Usage (gallons per day)	Metering Pump Feed Rate (milliliters[mL]/minute)
Waiawa - One Pump	(b)	(3)	(B)
Waiawa - Two Pumps			
Waiawa Average Flow (2024)			
Aiea-Halawa-One Pump			

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3. RESPONSIBILITIES AND QUALIFICATIONS

3.1. Responsibilities

The JBPHH Public Works Department owns and operates the JBPHH drinking water system. Operation and maintenance of the system is the responsibility of the Utilities Maintenance Potable Water Branch (PRP32A). Potable Water Branch Production Work Center WHHP6A performs the chlorine feed system operation and maintenance within JBPHH. Refer to *Figure 3-1* for details.

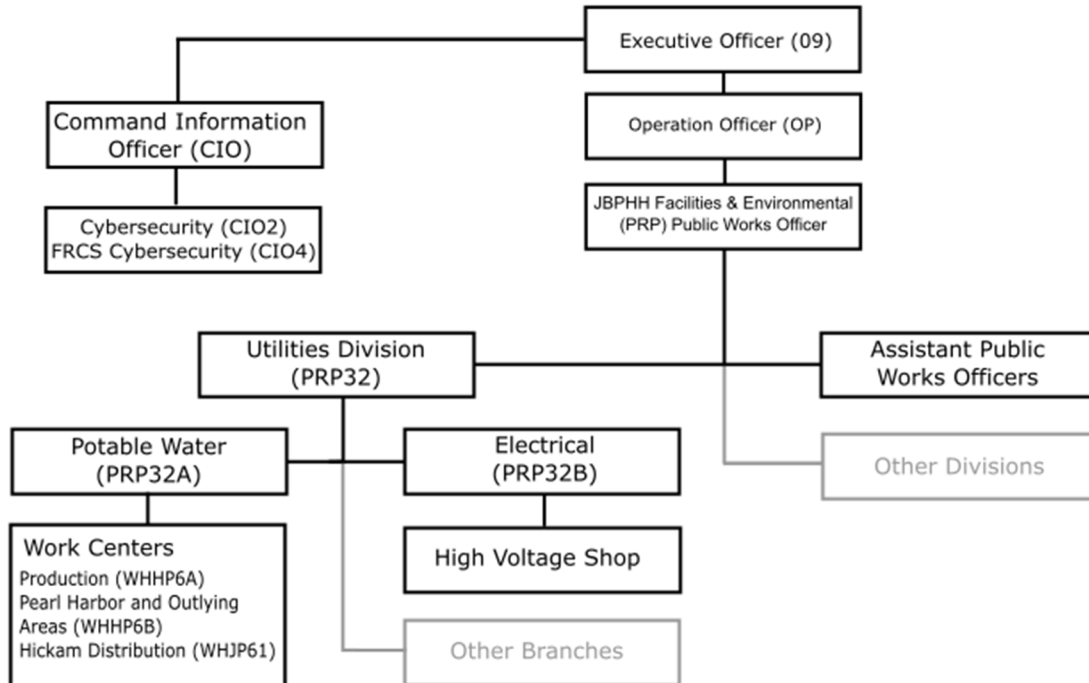


Figure 3-1 Public Works Department Organization

Lead operators and supervisors in PRP32A must ensure that the operators are trained and qualified prior to using this SOP. To support this process, a copy of this SOP should be made readily available to all users. Senior operators are required to update the SOP to reflect any changes in equipment, procedures, or regulations, and train the subordinate operators and maintenance crew(s) accordingly. It is important for senior operators to approve, coordinate, and maintain records of any major repairs on the equipment highlighted in this SOP. Training shall consist of in-depth, hands-on training for all new employees or employees new to this SOP and annual refresher meetings facilitated by the lead operator. All training should be documented using *Attachment 1 SOP Acknowledgement and Training Form*.

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3.2. Qualifications

All personnel involved in operations and maintenance activities at water chlorine feed systems must be trained and qualified to perform their assigned tasks:

- If required, personnel are responsible for obtaining and maintaining a Water Distribution System Operator (DSO) Certification, Grade 1 or higher, from the State of Hawaii, Department of Health, Safe Drinking Water Branch.
- Unlicensed and uncertified operators or Operators-in-Training (OIT) shall not make process control or system integrity decisions about water quality or quantity that affect public health.
- Follow Navy and base-specific safety regulations and directives and obtain appropriate safety training (see *Section 4*).
- Be familiar with the following:
 - Emergency protocols and communications
 - Operation of tools and equipment
 - Procedures outlined in this SOP

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4. HEALTH AND SAFETY

4.1. General Guidelines

With respect to health and safety, operators shall implement the following:

- Comply with the JBPHH Safety Manual.
- Use engineering, operational, or administrative controls or other means of performing work to eliminate or minimize health and safety hazard risk. Eliminating or minimizing health and safety hazard risk is preferred over the use of personal protective equipment (PPE). Use PPE to reduce hazard exposure when the hazard cannot be eliminated.
- Follow all OSHA requirements for work confined spaces, trenching, roadways, etc.
- Pay specific attention to the hazards outlined in *Section 4.2*.
- Be familiar with all applicable SDSs. Ensure SDSs are up to date. The SDSs displayed / available should match the chemical being used (i.e., do not use an SDS for the same chemical from another manufacturer).

4.2. Anticipated Hazards

- Skin or eye damage from splashing or spilling sodium hypochlorite
- Respiratory irritation from exposure to sodium hypochlorite mist or vapors
- Injury due to moving parts and equipment (e.g., forklift)
- Confined space
- Electricity
- Work environment (hot weather, excessive heat, sun exposure, wet or humid environment, wet slippery grounds, elevated platform, uneven/unstable ground, noise, etc.)

4.3. Personal Protective Equipment

Utilize the following PPE based on anticipated activities:

- Safety steel toe shoes with anti-slip soles
- Chemical-resistant gauntlet style gloves (natural rubber, neoprene, or nitrile rubber)
- Work gloves for non-chemical tasks
- Full face shield / eye goggles
- Chemical resistant apron or suit
- Hearing protection
- Class 2 safety vest (class 3 vest is required when visibility conditions are limited)

4.4. First Aid

Stocked first aid kits shall be kept in two primary locations: service trucks and water supply pump stations. Operators should promptly remove any expired stock from first aid kits and replace. Operators shall follow detailed instructions in the JBPHH Safety Manual and EM-385-1-1, *Section 3* regarding first aid kit requirements, documentation, and follow up procedures.

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5. EQUIPMENT AND MATERIALS

The section lists the equipment and materials that are relevant to perform this SOP. For detailed information regarding location and quantity of each item, please refer to the JBPHH inventory provided as an attachment to *SOP 1.1 Introduction and Overview*.

Parts:

- Spare metering pump
- Metering pump valve, valve guide, valve seat
- Metering pump O-ring and gasket
- Metering pump diaphragm
- Metering pump drive unit - 1/3-hp electric motor

Equipment:

- Access keys
- Portable transfer pump
- Safety gear and equipment
- Spill kit
- Tool kit

Consumables:

Gear Oil: Esso/Exxon GP80W-90, Shell Spirax/EP80, Mobil Pegasus Gear Oil 80 (Automobile Gear Oil Society of Automotive Engineers [SAE]-80, American Petroleum Institute [API] Grade GL-4), or Castrol Hypoy Gear Oil

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6. SCHEDULE AND PROCEDURES

6.1. Schedule

Refer to *Table 6-1* for a routine chlorine feed system operation and maintenance schedule. Detailed procedures are discussed in subsequent sections. Note: all calibration procedures provided below are conducted by the mechanist.

Table 6-1 Chlorine Feed System Schedule

Frequency	Task	Section
Daily	Perform manual residual check; site inspection; monitor chlorine tank levels	6.2
Weekly	Monitor metering pump operations; calibrate probe	6.3
Monthly	Calibrate metering pump	6.4
Semi-Annual	Conduct metering pump maintenance	6.5
Annual	Perform metering pump drive unit oil change	6.6
	Perform refresher training on this SOP	6.7

6.2. Daily Inspection and Monitoring

Visit the chemical feed rooms daily to perform the following tasks.

6.2.1. Manual Chlorine Residual Check

- Obtain a finished water sample from the appropriate sample tap, refer to *SOP 8.2 Spot Monitoring* for details.
- If the sample results differ from the online analyzer by more than 0.1 mg/L, calibrate the chlorine residual analyzer probe following manufacturers' recommendations. Refer to *Section 4.4 in Attachment 7*.
- Document results in *Attachment 2*.

6.2.2. Site Inspection and Pest Prevention

- Inspect all exterior grounds for cleanliness, orderliness, and proper storage of materials.
- Verify that stored materials do not block operator movement or access to equipment or interfere with daily operations.
- Ensure adequate lighting is provided in all areas.
- Check for any potential safety hazards, such as tripping hazards.
- Seal any openings or potential entry points to prevent pests from entering the building. If any signs of pest activity are found (droppings, nests, etc.), implement appropriate pest control measures.
- Check hoses, tubing, pipes, and fittings for cracks and leaks. Ensure that any openings to the chemical feed tanks, vents, and overflow pipes are covered with a 24-mesh corrosion resistant screen.

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6.2.3. Chlorine Feed Tank Level Monitoring

Check and record the levels of the chlorine feed tank(s). If the tank level is below (b) (5) (D) gallons (half full), refill using the following steps.

- Connect the pump suction (inlet) hose from the permanent or portable transfer pump, as appropriate, to the new bulk container valve. Connect the pump discharge (outlet) hose to the fill connection point on the feed tank.
- Turn the transfer pump on. Open the priming valve to visually verify that the transfer pump is primed. When liquid chlorine (bleach) is seen coming out of the vent tube, close the priming valve when the pump is primed and slowly open the transfer pump discharge valve to reduce surge on the chlorine feed system including the pump suction. Alternatively, use valving to isolate the first chlorine feed tank. After filling the feed tank, turn off the transfer pump and use valving to allow the two tanks to reach equilibrium. Repeat as required to fill the tanks as close to full as possible.
- Document the following in *Attachment 2*:
 - Chlorine feed tank level in gallons
 - Volume of chlorine transferred during the refill process
 - Any maintenance issues, repairs, or unusual findings, including specific issues, actions taken, and photographs for visual documentation
- Perform data analysis
 - Chlorine consumption: Subtract yesterday's reading from today's reading, to determine the volume consumed over the last day.
 - Cumulative volume pumped: Enter the total volume pumped from the water supply pump station flow meter totalizer or SCADA screen, to determine the total volume of water produced by the water supply pump station.
 - Calculate the Chlorine Usage Rate (gallons of chlorine per gallon of water produced) and compare it to historical usage rates.
 - Review daily log entries and compare current values to historical data to identify potential pump issues.

6.3. Weekly Inspections and Calibration

6.3.1. Weekly Metering Pump Inspection

Inspect the metering pumps at the chlorine injection sites at least once a week and perform the following tasks (in addition to the daily tasks):

- Confirm the lead and standby metering pumps are switching through SCADA control to ensure balanced run times and prolong pump lifespan.
- Change the circular chart recorder paper. Write the date and time of the paper change on the old and new charts.
- Perform housekeeping in the chemical feed building, including wiping surfaces, removing trash, and mopping the floors.
- Inspect metering pumps for smooth and quiet operation. Any abnormal noise, vibration, or leakage requires immediate shutdown, activation of the standby pump, and initiation of repairs. Refer to the metering pump troubleshooting section for corrective measures.
- Documentation (*Attachment 2*): Note any maintenance issues, repairs, or unusual findings, including specific issues and actions taken. Take photographs for visual documentation.

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6.3.2. Chlorine Analyzer Calibration

- Calibrate the chlorine residual analyzer probe following manufacturers' recommendations. Refer to *Section 4.4 in Attachment 7*.
- Documentation (*Attachment 2*): Note any maintenance issues, repairs, or unusual findings, including specific issues and actions taken. Take photographs for visual documentation.

6.4. Monthly Metering Pump Calibration and Inspections

In addition to the daily and weekly tasks listed above, calibrate the metering pump(s) at least monthly. *Figure 6-1* shows the process schematically. Note that there is no calibration cylinder installed at the Aiea-Halawa Shaft chlorine feed system.

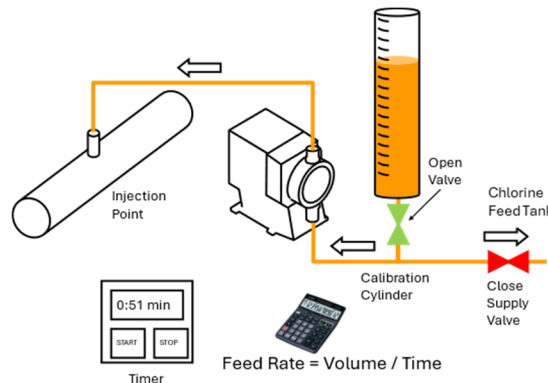


Figure 6-1 Calibration Schematic

- Coordinate metering pump calibration with pump station operation to run calibration at a minimum of two distinct operating configurations (i.e., one or two water supply pumps operating).
- Isolate the metering pump that is not in operation by closing the suction and discharge valve.
- Record the water supply pump station flow rate and numbers of pumps in service, main pump's flow signal in milliamps, and stroke length settings before calibration.
- Open the valve at the bottom of the calibration column. Fill the column to the 2-liter mark. Close the supply valve from the chlorine feed tanks, which is located in the adjacent shed. The metering pump will start withdrawing chlorine from the calibration column.
- Record the time required to withdraw 1,000 mL of liquid from the calibration column. **Be sure to not empty the column to avoid air entering the metering pump.**
- Re-open the supply valve from chlorine feed tank **before the calibration column is empty**. Then close the calibration column valve.
- Compute the flow rate for the chlorine feed pump by dividing 1,000 mL by the recorded time in seconds. Multiply that value by 60 to obtain the metering pump feed rate in mL per minute.
- Compare the calculated average metering flow rate to the anticipated value in *Table 2-2*. If there is a discrepancy of more than 10%, refer to the Troubleshooting Guide in *Section 7*.
- Documentation (*Attachment 2*): Note metering pump calibration results and any maintenance issues, repairs, or unusual findings, including specific issues and actions taken. Take photographs for visual documentation.

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6.5. Semi-Annual Metering Pump Maintenance

Conduct pump maintenance at least every 6 months per the manufacturer's guidelines in *Attachment 4*.

- Refer to manufacturer's recommended replacement intervals for components such as the diaphragm, O-Rings, and check valves.
- Documentation (*Attachment 2*): Note any maintenance issues, repairs, or unusual findings, including specific issues and actions taken. Take photographs for visual documentation

6.6. Annual Metering Pump Oil Change

Conduct an annual oil change for the metering pumps by following the steps below. For additional information refer to *Attachment 4*.

- Position funnel with hose to bucket or bucket under the drain plug. Remove the drain plug and drain the drive unit completely.
- Flush the internal components with a small amount of new oil to remove any residual contaminants.
- Reinstall the drain plug securely.
- Fill the drive unit with new SAE 80W-90 gear oil that meets or exceeds API service GL-4 specifications, up to the specified level indicated on the oil gauge. Note: using the incorrect oil can significantly shorten the lifespan of the gear unit. For the recommended oils, refer to *Section 5*.
- Document any maintenance issues, repairs, or unusual findings, including specific issues and actions taken in *Attachment 2*. Take photographs for visual documentation.

6.7. Annual SOP Refresher Training

Perform annual refresher training using the following steps:

- Schedule Training
 - Review operator schedules to identify a convenient time and date for most or all operators to attend the training session.
 - Provide Refresher Training
- Review key aspects of this SOP:
 - Hands-on metering pump calibration training
 - Hands-on chlorine feed tank filling training
 - Hands-on chlorine residual analyzer probe calibration training
 - Hands-on semi-annual pump maintenance training
 - Visual guidance on location and usage of
 - Stroke length adjustment
 - Oil drain plug
 - Operators' questions or concerns
 - Areas for improvement of the SOP
- Documentation
 - Record the date, time, and attendees of the training sessions in *Attachment 1*.
 - Note any updates or revisions made to the SOP.

6.8. Chemical Delivery

Sodium hypochlorite must be ordered well in advance of stock depletion to ensure uninterrupted operation. Sodium hypochlorite is trucked to the plant in bulk containers. Note: In case of an

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emergency spill, refer to the SDS (*Attachment 3*) and to the emergency procedure for chemical spill under the Emergency Response Plan.

Perform the following procedure during the delivery of sodium hypochlorite to the site:

- Exercise safety precautions as follows:
 - Adhere to the health and safety guidelines described in *Section 4.1*.
 - Don the appropriate PPE.
- Verify that the quantity of bulk containers and the chemical specifications match the delivery order.
- Obtain the chemical lot analysis from the vendor and keep it in file. Consider periodic testing of the chemical in accordance with American Society of Testing and Materials (ASTM) Standard D 2022-89(2016) "Standard Test Methods of Sampling and Chemical Analysis of Chlorine-Containing Bleaches." This step is a recommendation and not a requirement.
- Store the bulk containers in a storage room. If circumstances require outdoor storage, store bulk containers in a shaded area and cover with a tarp to avoid sunlight exposure.
- Documentation
 - Note the date and time of the delivery.
 - Keep a copy of the receipt.
 - Keep a copy of the chemical lot analysis (if available).
 - Note any relevant findings.

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7. TROUBLESHOOTING

Table 7-1 provides general troubleshooting guidelines. For troubleshooting the metering pump, refer to Table 7-2, and see Attachment 4 for further details. For issues with the pump motor controllers, refer to Table 7-3 and Attachment 5.

Table 7-1 General Troubleshooting Guide

Issue	Potential Cause or Related Issue	Remedy
High sodium hypochlorite consumption or metering rate.	Chlorine dose set too high	- Check the chlorine residual manually. - Calibrate chlorine probe. - Check flow pace controls
	Sodium hypochlorite has degraded to less than 8.5%	- Ensure the specified chemical has been delivered. - Ensure proper storage of the bulk containers (cool, shaded, dry). - Avoid excessive stock – order no more than a week’s supply. - Consider testing the delivered chemical, in accordance with ASTM Standard D 2022-89(2016) “Standard Test Methods of Sampling and Chemical Analysis of Chlorine-Containing Bleaches.”
Low sodium hypochlorite consumption or metering rate	Chlorine dose set too low	No action as long as chlorine is detectable throughout the system.

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Table 7-2 Metering Pump Troubleshooting Guide

Issue	Potential Cause	Remedy
No flow; discharge capacity (low, high, unstable); pump does not prime	Clogged valve ball, valve seat, suction pipe, or strainer	Disassemble and clean
	Valve seat and/or valve ball is worn	Replace according to manufacturer's instructions.
	Worn-out gaskets and O-rings	Replace worn-out gaskets and O-rings according to manufacturer's instructions.
	Damaged parts	Repair or replace damaged hydrant parts, if cracked. Severe damage may require full replacement.
	Air leak	Inspect suction tubing, piping, and connections. Retighten, replace, or repair as necessary.
	Wrong stroke length	Readjust dial to the right length.
Excessive vibration and loud noise	Clogged suction pipe or strainer	Disassemble and clean
	Defective motor	Replace according to manufacturer's instructions.
Excessive motor amperage	Wrong wiring or defective contact	Check wiring and replace switch if necessary.
Oil leak	Defective oil seal or O-ring	Replace seal or O-ring according to manufacturer's instructions.
High gearbox temperature	Incorrect lubricating oil	Check oil type, quantity, and level; replenish/replace as needed.
	Overload (excessive discharge pressure)	Check discharge line and lower pressure.

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Table 7-3 Motor Controller Troubleshooting Guide

Issue	Potential Cause	Remedy
Not running, "stop" light on	Start/Stop switch in stop position	Move switch to start position.
	Main speed potentiometer set to zero	Set potentiometer to desired speed.
	Open connections in main speed potentiometer, signal input, or motor	Verify connections and signal input.
	Inhibit asserted or enable open	Remove inhibit signal or enable drive.
Motor runs then stops/drive trips (thermostatically controlled load [TCL] Fault)	Drive overload	Restart drive by cycling alternating current (AC) power; reduce load.
Overload Light On	Motor overload	Check motor amps (direct current ammeter in series with armature); correct problem (check shunt type field if applicable).
	Motor shorts or grounds	Check motor; replace if defective.
	Current limit trimmer potentiometer set too low	Adjust current limit trimmer potentiometer.
	No AC power	Correct AC input power problem. Replace fuse or reset breaker.

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8. REFERENCES

- Unified Facility Criteria 3-230-02 Operation and Maintenance: Water Supply Systems. 1 November 2023.
- JBPHH Safety Manual
- EM-385-1-1 Safety and Occupational Health (SOH) Requirements Manual. 15 March 2024.
- OPNAV M-5100.23: Navy Safety and Occupational Health Manual. 5 June 2020.

Notes: _____

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9. ATTACHMENTS

- Attachment 1: SOP Acknowledgement and Training Form
- Attachment 2: Operator's Daily Log Sheet – Chlorine Feed System
- Attachment 3: Sodium Hypochlorite SDS and Specifications
- Attachment 4: (b) (3) (B) Metering Pumps Instruction Manual
- Attachment 5: (b) (3) (B) DC Motor Controller (b) (3) (B) Installation and Operating Manual
- Attachment 6: Chlorine Residual Analyzer (b) (3) (B) Fact Sheet
- Attachment 7: Chlorine Residual Analyzer (b) (3) (B) Reference Manual
- Attachment 8: (b) (3) (B) Dual Channel Transmitter Information

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Attachment 1:
SOP Acknowledgement and Training Form

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SOP ACKNOWLEDGEMENT AND TRAINING FORM

This SOP must be read and signed each time training is provided, or modifications are made to the SOP. This form should accompany the current SOP version.

Document Title:	Chlorine Feed System
Document Revision Number:	
Document Revision Date:	

Please sign below in accordance with the following statement: "I have read and understood the above referenced document. I agree to perform the procedures described in this SOP in accordance with the document until such time that it is superseded by a more recent, approved revision."

Print Name	Signature	Date

Notes: _____

SOP Acknowledgement and Training Form (continued)

Trainee:

Sign below to acknowledge that training on this SOP was received, understood, and all questions/concerns were addressed by the trainer.

Trainer:

Sign below to acknowledge that training on this SOP was completed for the individual listed and that the trainee is competent to perform the procedures described within.

Date of Training [mm/dd/yyyy]	Trainee Print Name	Trainee Signature	Trainer Print Name	Trainer Signature

Notes: _____

Attachment 2:
Operator's Daily Log Sheet – Chlorine Feed
System

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Attachment 3:
Sodium Hypochlorite SDS and
Specifications

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Safety Data Sheet

Revision date: Initial version
Date of issue: June 24, 2018
Page 1 of 10

Hypochlor NaOCl

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product Identifier

Product Name: Hypochlor NaOCl

Other means of identification:

Synonyms: Sodium Hypochlorite Solution
Liquid Bleach
Bleach
Hypochlorite

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use: Disinfectant
Recommended restrictions: Uses other than those identified above.

1.3 Details of the supplier of the safety data sheet

Manufacturer/Importer/Supplier/Distributor information

Company Name: BEI Hawaii
Company Address: 311 Pacific Street
Honolulu, HI 96817
USA

Company Telephone Number: 808-532-7400

Hours of Operation:

Company Email: info@beihawaii.com
Company Website: beihawaii.com

Company Contact: Regulatory Compliance Officer
Company Contact Phone Number: 808-532-7400
Company Contact Email: info@beihawaii.com

Emergency Phone Number: Chemtrec (24 hours)
+1-800-424-9300

2. Hazard(s) identification

Classification of the chemical in accordance with the OSHA Hazard Communication Standard (HAZCOM) 2012.

Classification of the Substance or Mixture

Physical hazards:

H290: Corrosive to metals – Category 1

Health hazards:

H314: Skin corrosion – Category 1B

H318: Eye damage – Category 1

H335: Specific Target Organ Toxicity (Single Exposure) – Category 3 (respiratory tract irritation)

Environmental hazards:

Not adopted under OSHA paragraph (d) of §1910.1200.

Hazard(s) not otherwise classified (HNOC):

Contact with acid liberates toxic chlorine gas.

Hypochlor NAOCI

Label Elements:

Pictograms:



Signal Word:

DANGER

Hazard Phrases:

H290 – May be corrosive to metals.
H314 – Causes severe skin burns and eye damage.
H318 – Causes serious eye damage.
H335 – May cause respiratory irritation.

Precautionary Phrases:

Prevention:

P234 – Keep only in original container.
P260 – Do not breathe dust/fume/gas/mist/vapors/spray).
P264 – Wash thoroughly after handling.
P271 – Use only outdoors or in a well-ventilated area.
P280 – Wear protective gloves/ protective clothing/ eye protection.

Response:

P390 – Absorb spillage to prevent material damage.
P301+P330+P331 – IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 – IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse SKIN with water or [shower].
P363 – Wash contaminated clothing before reuse.
P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P321 – Specific treatment (see sections 4-8 of this SDS and any additional information on the label.
P305+P351+P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.
P310 – Immediately call a POISON CENTER or doctor/physician.

Storage:

P403+P233 – Store in a well-ventilated place. Keep container tightly closed.
P404 – Store in a closed container.
P405 – Store locked up.

Disposal:

P501 – Dispose of contents/container to a suitable disposal site, in accordance with applicable local/regional/national and international regulations.

3. Composition/information on ingredients

Mixture:

Ingredient	CAS Number	Concentration Wt. %*
Sodium Hypochlorite	7681-52-9	12.5%
Sodium Hydroxide	1310-73-2	1%
Sodium Chloride	7647-14-5	0-10%
Water	7732-14-5	76.5-86.5%

*The exact chemical identity and/or the specific concentration is being withheld as "trade secret" in accordance with 29 CFR 1910.1200(i).

4. First-aid measures

4.1 Description of necessary measures

General advice:

In the event of an exposure or if poisoning is suspected, do not wait for symptoms to occur. Immediately initiate the recommended procedure(s) from the following paragraph(s). Simultaneously contact a poison control center, a physician or the nearest hospital. Inform the contact of the type and extent of exposure, the victim's symptoms and follow the advice given.

Inhalation:

Remove victim to fresh air and keep at rest in a position comfortable for breathing. If breathing stops, provide artificial respiration. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If breathing is difficult, trained personnel should give oxygen. Call a physician or poison control center immediately.

Skin contact:

Immediately flush skin with running water for at least 20 minutes. Take off immediately all contaminated clothing and shoes. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Do not try to neutralize with chemical agents. Wash contaminated clothing before reuse. Cover wounds with sterile dressing. Do not rub area of contact.

Eye contact:

Immediately flush eyes with plenty of water for at least 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical attention from a doctor/physician/ophthalmologist. Take care not to rinse contaminated water into the unaffected eye or onto the face. Do not attempt to neutralize with chemical agents.

Ingestion:

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Get immediate medical attention. Never give anything by mouth to a victim who is unconscious or is having convulsions. If victim is conscious: immediately give large quantities of water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

4.2 Most important symptoms/effects, acute and delayed

This product is corrosive through all routes of exposure: Skin, Eyes, Ingestion and Inhalation. Causes severe skin burns, deep ulcerations and possibly permanent scarring. Corrosive to the eyes and may cause severe damage including blindness. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Can cause severe respiratory irritation. Symptoms may include coughing, choking and wheezing. Inhalation could result in pulmonary edema (fluid accumulation). Symptoms of pulmonary edema (chest pain, shortness of breath) may be delayed. If ingested: May cause severe irritation and corrosive damage in the mouth, throat and stomach. Symptoms may include abdominal pain, vomiting, burns, perforations, bleeding and eventually death.

4.3 Indication of any immediate medical attention and special treatment needed

Exposure by any route (skin, eyes, inhalation and ingestion) require immediate medical treatment. This is a corrosive substance and will cause chemical burns.

Notes to Physician:

This material is corrosive by all routes of exposure: Skin, Eyes, Inhalation and Ingestion. Take precautions to protect yourself while treating the patient. Treat symptomatically. Probable mucosal damage may contraindicate the use of gastric lavage.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media:

Water fog. Foam. Dry chemical powder. Carbon dioxide (CO₂). Use media suitable to the surrounding fire such as water fog or fine spray, alcohol foams, carbon dioxide. Use water with caution. Contact with water will generate considerable heat.

Unsuitable extinguishing media:

Do not use water jet as an extinguisher, as this will spread the fire. Do not use dry chemical extinguishing agents that contain ammonium compounds. Use chemical extinguishing agents with caution. Some chemical extinguishing agents may react with this material.

5.2 Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products)

Unusual Fire Hazards:

Not considered flammable. Vapors are heavier than air and may spread along floors. Contact with most metals will generate flammable hydrogen gas. Contact with water will generate considerable heat. Reacts violently with a wide variety of organic and inorganic chemicals including alcohol, carbides, chlorates, picrates, nitrates and metals. Toxic fumes, gases or vapors may evolve on burning.

Hazardous Combustion Products:

Hydrogen gas. Hydrogen chloride. Chlorine. Oxygen. Sodium oxides.

5.3 Fire Fighting Instructions

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. A full-body chemical resistant suit should be worn. Fight fire with normal precautions from a reasonable distance. Evacuate the area promptly. Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers. Do not allow run-off from fire fighting to enter drains or water courses. Dike for water control. Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

6.2 Environmental precautions

Contact local authorities in case of spillage to drain/aquatic environment. Avoid discharge into drains, water courses or onto the ground.

6.3 Methods and material for containment for cleaning up

Ventilate the area. Remove sources of ignition. Stop leak if you can do so without risk. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Use water spray to reduce vapors or divert vapor cloud drift. Prevent entry into waterways, sewers, basements or confined areas. Remove with vacuum trucks or pump to storage/salvage vessels. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand). Small spills can be neutralized by covering with a reducing agent, such as Sodium thiosulfate or Sodium sulphite. If not recoverable, dilute with water or flush to holding area and neutralize.

Never return spills to original containers for re-use. Contact the proper local authorities. Contaminated absorbent may pose the same hazards as the spilled product. For waste disposal, see Section 13.

7. Handling and storage

7.1 Precautions for safe handling

Keep only in original container. Do not breathe dust/fume/gas/mist/vapors/spray). Avoid contact with skin, eyes and clothing. Do not taste or swallow. Wash thoroughly after handling. Ensure adequate ventilation. Wash thoroughly after handling. Keep container closed when not in use. Mixing this product with acid or ammonia will release chlorine gas. protective gloves/clothing and eye/face protection (See section 8 for recommended personal protective equipment). Label containers appropriately. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Store locked up. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Avoid ultraviolet (UV) light sources. Inspect periodically for damage or leaks. Store in corrosive resistant container with a resistant inner liner. Store in original tightly closed container. Store in a well-ventilated place. Store away from and do not mix with incompatible materials such as acids, oxidizers, organics, reducing agents and all metals except titanium. Keep away from food, drink and animal feed-stuffs.

8. Exposure controls / personal protection equipment

8.1 Control parameters

Occupational Exposure Limits		
Ingredient	Value	Type
Sodium hypochlorite (CAS 7681-52-9)	2mg/m ³	US. Workplace Environmental Exposure Level (WEEL Guides) STEL
Sodium hydroxide (CAS 1310-73-2)	2 mg/m ³	US. OSHA PEL
	2 mg/m ³	US. ACGIH TLV
	2 mg/m ³	US. NIOSH CEILING

8.2 Engineering Controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

8.3 Individual protection measure, such as personal protective equipment

Respiratory Protection:

Chemical respirator with organic vapor cartridge and full facepiece. A NIOSH/MSHA approved air-purifying respirator with the appropriate chemical cartridges or a positive-pressure, air-supplied respirator may be used to reduce exposure. Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134). Advice should be sought from respiratory protection specialists.

Skin Protection:

Hand Protection:

Wear appropriate chemical-impermeable gloves. Advice should be sought from glove suppliers. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection:

Where contact is likely, wear chemical-resistant gloves, a chemical suit, rubber boots, and chemical safety goggles plus a face shield. Use of an impervious apron is recommended.

Eye Protection:

Chemical goggles and face shield are recommended. Eye wash facilities and emergency shower must be available when handling this product. Contact lenses should never be worn when handling this product.

General hygiene considerations:

When using, do not eat, drink or smoke. Do not breathe mist. Avoid contact with eyes, skin and clothing. Upon completion of work, wash hands before eating, drinking, smoking or use of toilet facilities. Remove soiled clothing and wash it thoroughly before reuse.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance:	Light greenish-yellow liquid
Color:	Greenish-yellow
Odor:	Chlorine
Odor threshold:	Not determined
pH:	11 @ 68°F
Melting point:	-8 °F
Freezing point:	Not available
Initial boiling point:	Decomposes upon heating
Flash point:	Not applicable
Evaporation rate:	Not available
Flammability (solid, gas):	Not applicable
Upper flammability limits:	Not applicable
Lower flammability limits:	Not applicable
Upper explosive limits:	Not applicable
Lower explosive limits:	Not applicable
Specific gravity:	1.22 (10.2 lb./gal) @ 77 °F (Water = 1)
Vapor pressure:	125 mm Hg @ 140°F
Vapor density:	<1 (Air=1)
Solubility(ies):	Completely soluble in water
Partition coefficient:	Not available
Viscosity dynamic:	Not available
Ignition temperature:	Not applicable
Decomposition temperature:	Not available
Explosive properties:	None anticipated based on structural properties.
Oxidizing properties:	None anticipated based on structural properties.

9.2 Other information

No additional information.

10. Stability and reactivity

Reactivity

Contact with acids or ammonia will release poisonous chlorine gas. Contact with most metals will generate flammable hydrogen gas. Contact with water will generate considerable heat. Reacts with amines and ammonia compounds to form explosively unstable compounds. May be corrosive to metals. May be corrosive to: Aluminum, stainless steel, carbon steel, copper, bronze.

Chemical Stability

This product is stable under recommended storage and handling conditions.

Possibility of Hazardous Reactions

reactions

Reacts vigorously or violently with many organic and inorganic chemicals such as: acids, acrolein, acrylonitrile, chlorinated hydrocarbons (e.g. 1,2 dichloroethylene), chlorine dioxide, maleic anhydride, nitroethane, nitroparaffins, 2-nitrophenol, nitropropane, phosphorus, potassium persulfate, and tetrahydrofuran (containing peroxides).

Conditions to Avoid

Direct sources of heat. Avoid high temperatures. Direct sunlight. Avoid contact with incompatible materials. Do not use in areas without adequate ventilation. Do not allow evaporation to dryness.

Incompatibility

Metals. Strong oxidizing agents. Acids. Amines. Ammonia. Reducing agents. Nitrites. Organic compounds.

Hazardous decomposition products

Thermal decomposition products include: Hydrogen gas. Hydrogen chloride. Chlorine. Oxygen. Sodium oxides.

11. Toxicological information

11.1 Information on likely routes of exposure

Inhalation:	Expected to be a route of entry.
Ingestion:	Expected to be a route of entry.
Skin:	Expected to be a route of entry.
Eyes:	Expected to be a route of entry.

Target Organs: Skin, eyes, respiratory system

11.2 Symptoms related to the physical, chemical, and toxicological characteristics

Ingestion:

Causes digestive tract burns. Ingestion may cause severe irritation of the mouth, the esophagus and the gastrointestinal tract. Symptoms may include abdominal pain, vomiting, burns, perforations, bleeding and eventually death.

Inhalation:

Can cause severe respiratory irritation. Symptoms may include coughing, choking and wheezing. Inhalation could result in pulmonary edema (fluid accumulation). Symptoms of pulmonary edema (chest pain, shortness of breath) may be delayed.

Skin Contact:

Causes severe skin burns, deep ulcerations and possibly permanent scarring.

Eye Contact:

Corrosive to the eyes and may cause severe damage including blindness. Symptoms may include stinging, tearing, redness, swelling and blurred vision.

Delayed and immediate effects and chronic effects from short or long-term exposure

Skin Irritation and Corrosion:

Causes severe skin burns. Hazard Classification – Skin Corrosion, Category 1.

Serious Eye Damage/ Eye Irritation:

Causes serious eye damage. Hazard Classification – Eye Damage, Category 1.

Respiratory Sensitization:

Does not meet the criteria for classification based on information on the product and its ingredients.

Skin Sensitization:

Does not meet the criteria for classification based on information on the product and its ingredients. However, may cause an allergic skin reaction (skin sensitization) in some hypersensitive individuals.

Germ Cell Mutagenicity:

Does not meet the criteria for classification based on information on the product and its ingredients.

Carcinogenicity:

Does not meet the criteria for classification based on information on the product and its ingredients. None of the ingredients in this product is listed as a carcinogen by ACGIH, IARC or NTP.

Reproductive Toxicity:

Does not meet the criteria for classification based on information on the product and its ingredients.

Specific Target-Organ Toxicity – Single Exposure:

May cause respiratory irritation after a single exposure. Hazard Classification – STOT SE, Category 3 (Respiratory Irritation).

Hypochlor NAOCI

Specific Target-Organ Toxicity – Repeated Exposure:

Does not meet the criteria for classification based on information on the product and its ingredients.

Aspiration Hazard:

Does not meet the criteria for classification.

Toxicity Data (Numerical Values such as Acute Toxicity Data) where available:

Chemical Name	LC50 (4 hour) Inhalation	LD50	
		Oral	Dermal
Sodium Hypochlorite (CAS# 7681-52-9)	No data available	6,200 mg/kg	>3,000 mg/kg
Sodium Hydroxide (CAS# 1310-73-2)	No data available	140-340 mg/kg	1,359 mg/kg

12. Ecological information

Ecotoxicity (aquatic and terrestrial, where available):

Because of the pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.

INGREDIENT	SPECIES	DATA
Sodium Hypochlorite (CAS# 7681-52-9)	Crustacea	
	Daphnia magna (Water flea)	EC50 – 0.169 mg/L (48 hr.)
	Fish	
	Lepomis macrochirus (Bluegill)	LC50 - 0.58 MG/l (96 hr.)
Sodium Hydroxide (CAS# 1310-73-2)	Crustacea	
	Ceriodaphnia dubia (Water flea)	EC50 – 40 mg/L (48 hr.)
	Fish	
	Gambusia affinis (Western mosquitofish)	LC50 – 125 mg/L (96 hr.)

Persistence and degradability:

Biodegradation is not applicable to inorganic substances.

Bioaccumulation potential:

No accumulation in living organisms is expected due to high solubility and dissociation properties.

Mobility in soil:

High water solubility indicates a high mobility in soil.

Other adverse effects:

None known

13. Disposal considerations

Handling for Disposal

Handle in accordance with good industrial hygiene and safety practice. Refer to protective measures listed in sections 7 and 8.

Methods of Disposal:

Dispose of in a licensed facility. Do not discharge into drains/surface waters or ground waters.
Dispose in accordance with all applicable federal, state, provincial and local regulations.

Empty Container Warning

Empty containers may contain product residue. Follow label warning even after container is emptied.

14. Transportation information

US 49CFR/DOT:

UN Number: UN1791
Proper Shipping Name HYPOCHLORITE SOLUTION (RQ: 110 Lbs.)
Transport Hazard Class(es): 8
Subsidiary Risk: -
Labels: 8 (Corrosive Liquid)
Packing Group: III

CANADA/TDG:

UN Number: UN1791
Proper Shipping Name HYPOCHLORITE SOLUTION (RQ: 110 Lbs.)
Transport Hazard Class(es): 8
Subsidiary Risk: -
Labels: 8 (Corrosive Liquid)
Packing Group: III

IMDG:

UN Number: UN1791
Proper Shipping Name HYPOCHLORITE SOLUTION (RQ: 110 Lbs.)
Transport Hazard Class(es): 8
Subsidiary Risk: -
Labels: 8 (Corrosive Liquid)
Packing Group: III
EmS: F-A, S-B

ICAO/IATA:

UN Number: UN1791
Proper Shipping Name HYPOCHLORITE SOLUTION (RQ: 110 Lbs.)
Transport Hazard Class(es): 8
Subsidiary Risk: -
Labels: 8 (Corrosive Liquid)
Packing Group: III

14.5 Environmental hazards

Marine Pollutant: NO

14.6 Special precautions for users

No additional information

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not Applicable

15. Regulatory information

Not meant to be all inclusive

US Federal Regulations:

TSCA:

All components of this product are listed or excluded from listing on the United States Environmental protection Agency Toxic Substances Control Act (TSCA) inventory.

Hypochlor NAOCI

CERCLA Hazardous Substance List (40 CFR 302.4):

Sodium hydroxide (CAS 1310-73-2) – 1000 LBS.

Sodium Hypochlorite (CAS 7681-52-9) -100 LBS.

EPCRA 311/312 Chemicals and RQs (lbs.) (>0.1%):

(No Product Ingredients Listed)

EPCRA 302 Extremely Hazardous (>.1%):

(No Product Ingredients Listed)

EPCRA 313 Toxic Chemicals (>.1%):

(No Product Ingredients Listed)

US State Regulations:

California Proposition 65 (California Safe Drinking Water and Toxic Enforcement Act of 1986):

(No Product Ingredients Listed)

Massachusetts Right to Know:

Sodium hydroxide (CAS 1310-73-2)

Sodium Hypochlorite (CAS 7681-52-9)

New Jersey Right to Know:

Sodium hydroxide (CAS 1310-73-2)

Sodium Hypochlorite (CAS 7681-52-9)

Pennsylvania Right to Know:

Sodium hydroxide (CAS 1310-73-2)

Sodium Hypochlorite (CAS 7681-52-9)

15.2 Chemical Safety Assessment

No chemical safety assessment has been carried out.

16. Other information

Revision Date: June 24, 2018

DISCLAIMER OF LIABILITY

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Attachment 4:

(b) (3) (B)

Metering Pumps
Instruction Manual

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Attachment 5:
(b) (3) (B) DC Motor Controller **(b) (3) (B)**
Installation and Operating Manual

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Attachment 6:
Chlorine Residual Analyzer (b) (3) (B)
Fact Sheet

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Attachment 7:
Chlorine Residual Analyzer (b) (3) (B)
Reference Manual

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Attachment 8:

(b) (3) (B) Dual Channel
Transmitter Information

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