

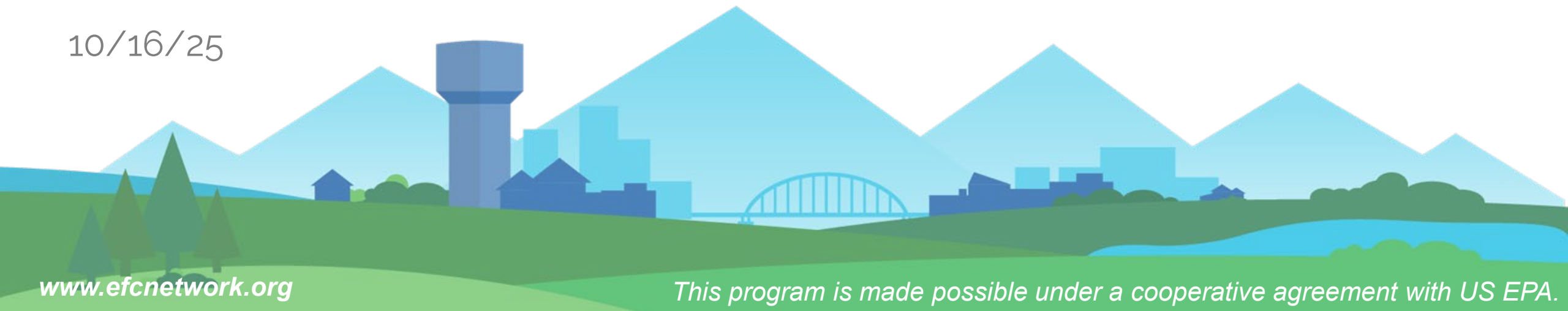


SOUTHWEST
ENVIRONMENTAL
FINANCE CENTER

US Territories Water Operator Training Series

Session 9: Chlorine Disinfection Application (part 2 of 4)

10/16/25



Your trainer for today

Matt Ziegler
Program Director



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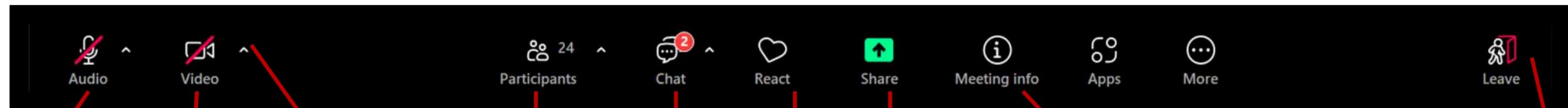
SCHOOL OF
ENGINEERING



This training series is funded by the US EPA

Attendee Meeting Controls

- Locate your control bar
- All attendees will see a black horizontal bar on their screen
- If your control bar is not visible, it may be hidden
 - Move your cursor to the screen's bottom (or top) to reveal this control bar.



1. Mute/unmute

2. Start/stop
your video

3. Enable Virtual
Background

4. View Meeting
Participants

5. Chat

6. Reactions/raise hand

7. Share
screen

8. Meeting
info

9. Leave meeting

Schedule for 2025:

Date	Topic
6/26/25	Program Overview, Test Format, Study & Test Tips
7/10/25	Drinking Water System Overview - (Source, Treatment, & Distribution)
7/24/25	Basic Operator Math (+, -, /, x, Exponents and basic algebra)
8/7/25	Applied Operator Math (e.g. Areas, Volume, Flow Rates, Detention Time, Pressure/Hydraulic Head)
8/21/25	Drinking Water Regulations
9/4/25	Source Water Characteristics
9/18/25	Surface Water Intake Components, Well Components, and O&M
10/2/25	Disinfection 1: Chloramines, UV, Chlorine Dioxide, Chlorine
10/16/25	Disinfection 2: Chlorine Disinfection Application for Sodium Hypochlorite and Gas Chlorine (including storage and safety)
10/30/25	Disinfection 3: Distribution System Application, Residual Measurement, Evaluation & Adjustment,
11/13/25	Disinfection 4: Chlorine Disinfection Math
12/4/25	Surface Water Treatment 1: Coagulation, Flocculation, Sedimentation (including chemistry, process controls, operations)
12/18/25	Surface Water Treatment 2: Filtration

Links to recordings and material are available on our website at <https://swefc.unm.edu/home/op-cert-trainings/>

Pacific Island Territories Operator Certification Trainings

This page is a repository of Wastewater and Drinking Water Operator Certification (Op Cert) Training Webinars offered by the SW EFC for systems in the Pacific Territories. Below you will find the **training webinar schedules (wastewater, then drinking water)** followed by a **training webinar recordings library**.

[Jump to Wastewater Trainings](#) [↓](#)

[Jump to Drinking Water Trainings](#) [↓](#)

Wastewater Training Schedule

Please note all times are local to CNMI and Guam. The times in American Samoa are one day earlier at 11 am.

Session	Date	Training Topic & Link to Recording (click to view)	Supporting Materials (click to download)
1	6/25/2025	Program Overview, Test Format, Study & Test Tips	PPT slides
2	7/9/2025	Treatment Overview	PPT slides
3	7/23/2025	WW Math Part 1 (Areas & Volumes)	PPT slides
4	8/6/2025	WW Math Part 2 (Flow Rates & Detention Times)	PPT slides
5	8/20/2025	Collection Systems – Gravity systems	PPT Slides

Sign in for every session to ensure you get credit for attending



US Territories Water & Wastewater Operator Certification
Virtual Training Series Group Attendance Sheet

Session Title: _____

Session Date: _____

Training Location: _____

Attendee Name	Attendee Signature	Arrival Time	Departure Time

I hereby certify that the individuals listed above attended the referenced training session.

Name: _____

Signature: _____

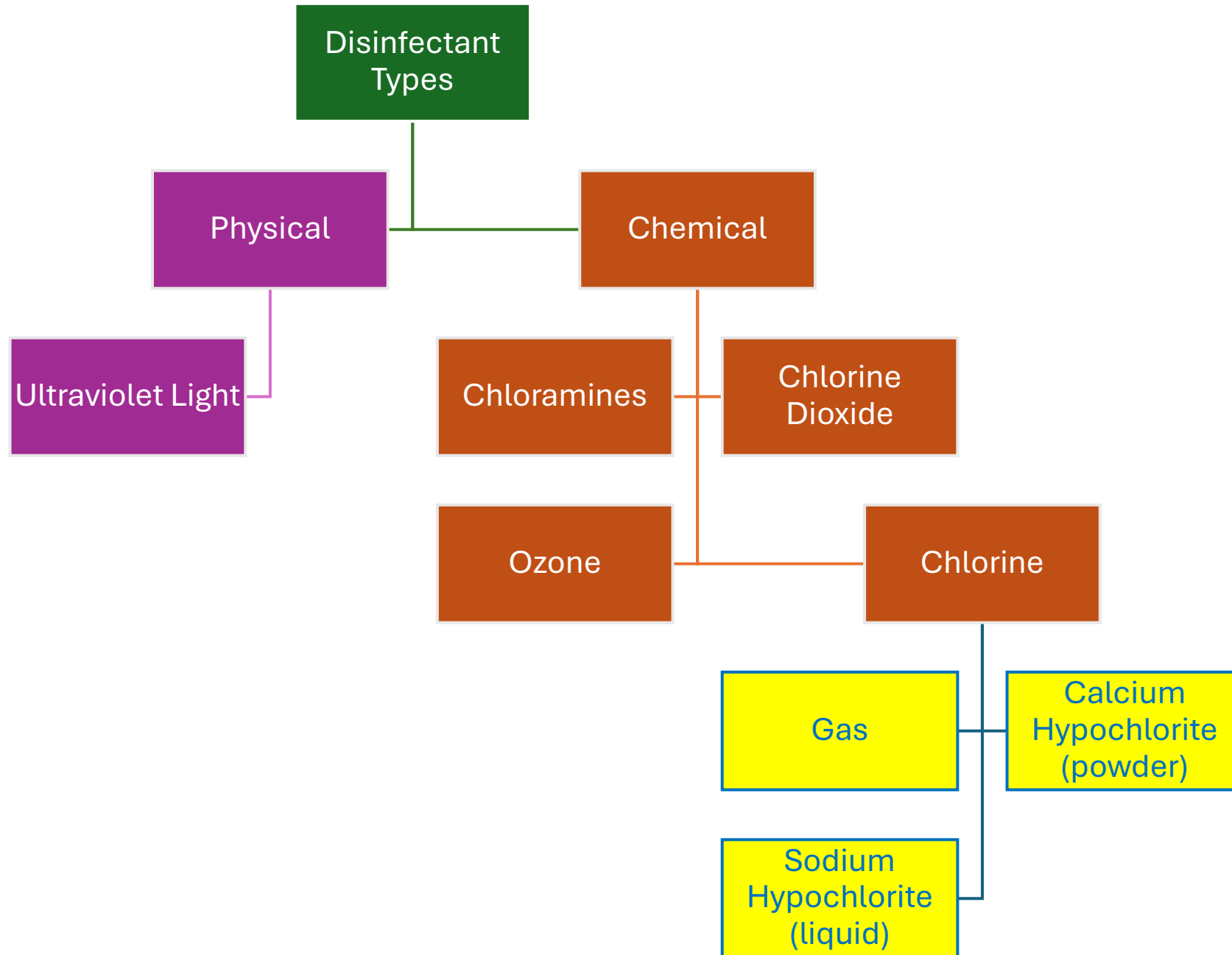
Title: _____

Date: _____

Today's Agenda

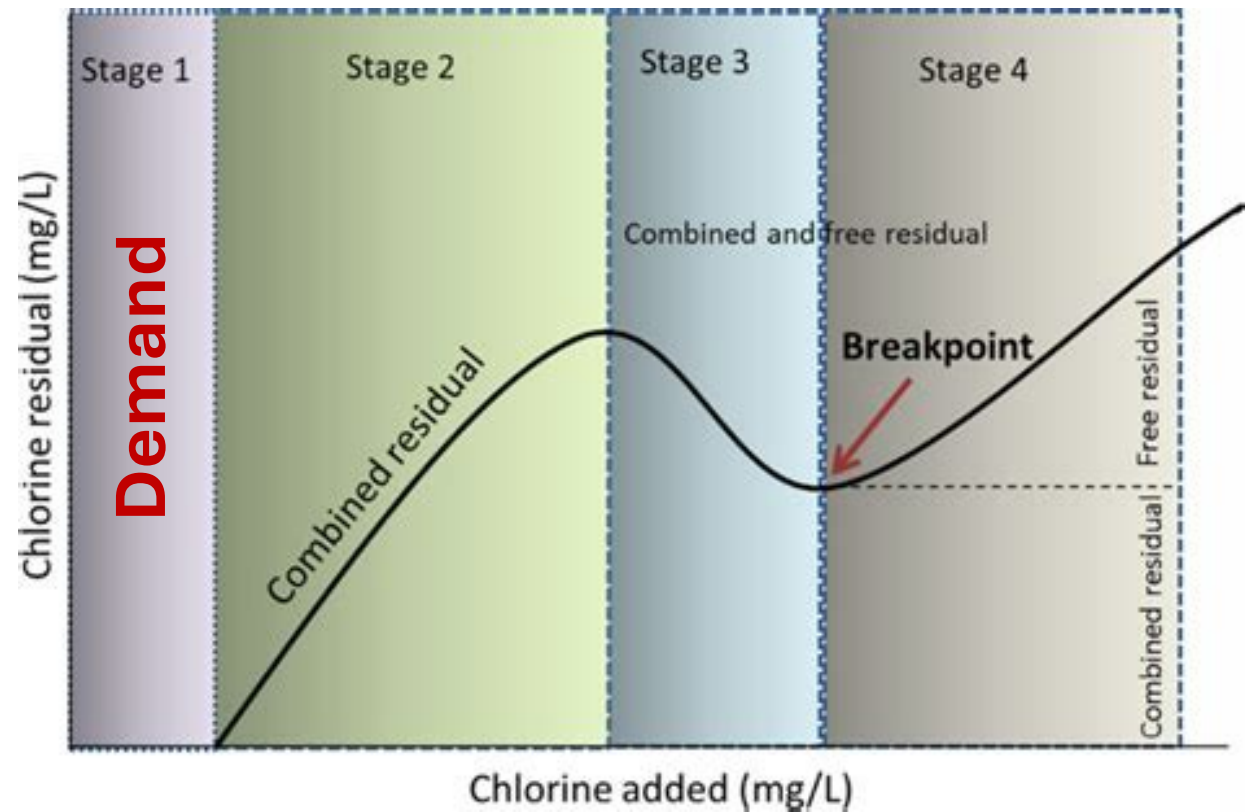
- Review of the disinfection process
- Chlorine disinfection safety
- Storing hypochlorites
- Setting up a hypochlorite disinfection system
- Chlorine gas disinfection

Disinfection Process Review



Chlorine Disinfection Objectives

- Reach breakpoint
- Minimize chloramines and combined chlorine



From Nature.com

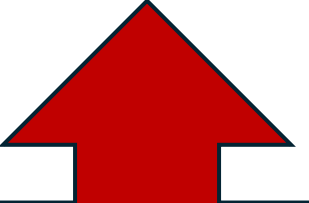
Total amount of
chlorine fed into a
volume of water
(mg/L)



Chlorine remaining
after demand is
satisfied (mg/L)
IS available for
disinfection



$$\text{DOSAGE} = \text{DEMAND} + \text{RESIDUAL}$$



Chlorine consumed by
material in the water (mg/L)
NOT available for
disinfection
NO residual chlorine

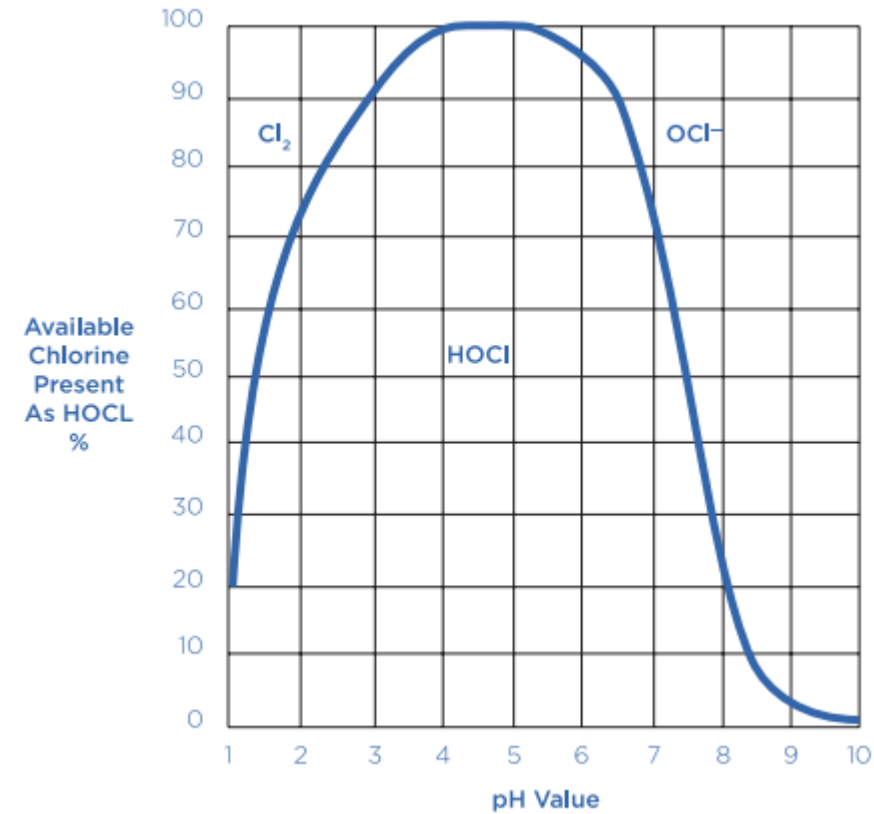
Chlorine Reactions with Water



***HOCl** is more effective as a disinfectant than **OCl-** (100-300 times greater)*

Factors that Affect Chlorine Disinfection

- pH
- Water temperature
- Type of organism
- Interfering agents
- Type of residual





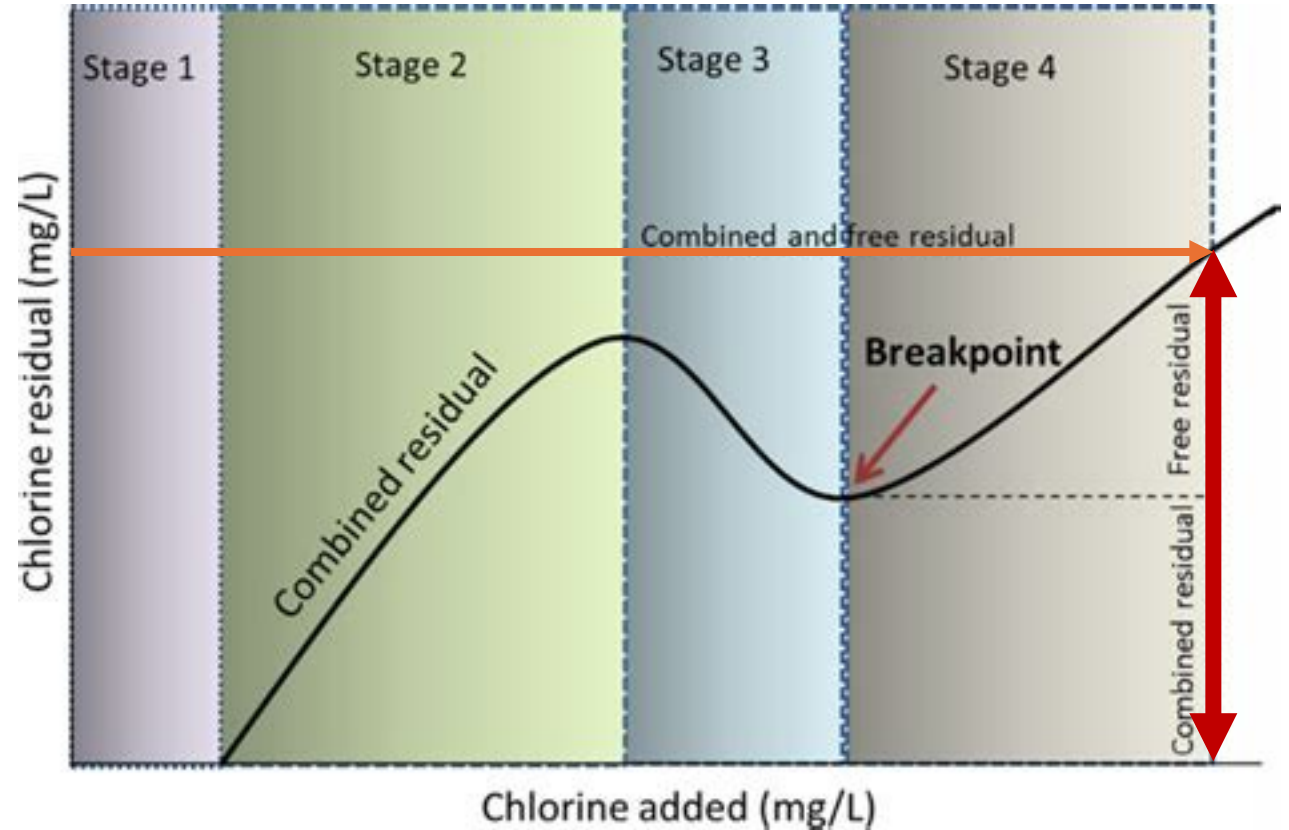
What are the three types of chlorine residual?

1. HOCl, OCl⁻, Cl₂
2. Total, Free, Combined
3. Dosage, Demand, Total
4. Dosage, Demand, Free



Three Types of Chlorine Residual

- Total
- Combined
- Free



$$\text{TOTAL} = \text{COMBINED} + \text{FREE}$$



Safety

Chlorine Disinfection

Information Gathered from:
Center for Disease Control (CDC)
www.cdc.gov



First things first, have you read the SDS?



Safety Data Sheet
SODIUM HYPOCHLORITE 12.5%

Version 1.18

Revision Date: 02/10/2022

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SODIUM HYPOCHLORITE 12.5%

Recommended use of the chemical and restrictions on use

Recommended use : Reserved for industrial and professional use.

Manufacturer or supplier's details

Company : Univar Solutions USA, Inc.
Address : 3075 Highland Pkwy Suite 200
Downers Grove, IL 60515
United States of America (USA)

Emergency telephone number:

Transport North America: CHEMTREC (1-800-424-9300)
CHEMTREC INTERNATIONAL Tel # 703-527-3887

Additional Information: : Responsible Party: Product Compliance Department
E-mail: SDSNA@univarsolutions.com
SDS Requests: 1-855-429-2661
Website: www.univarsolutions.com

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to metals : Category 1

Skin corrosion : Category 1

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**
P234 Keep only in original container.
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
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/ shower.

Safety Data Sheet

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SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

CAS-No.	Chemical name	Weight percent
7681-52-9	Sodium hypochlorite	12.5
1310-73-2	Sodium hydroxide	0 - 5

Actual concentration is withheld as a trade secret

Any Concentration shown as a range is due to batch variation.

Synonyms : Liquichlor, Bleach,

Safety Data Sheet

SECTION 4. FIRST AID MEASURES

General advice	: Show this safety data sheet to the doctor in attendance. Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance. Do not leave the victim unattended.
If inhaled	: Take victim immediately to hospital. Move to fresh air. If breathing has stopped, apply artificial respiration. If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing. If irritation develops, get medical attention. Burns must be treated by a physician.
In case of eye contact	: In case of eye contact Immediately flush eye(s) with plenty of water. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. If easy to do, remove contact lens, if worn. If eye irritation persists, consult a specialist. Take victim immediately to hospital.
If swallowed	: Take victim immediately to hospital. Do NOT induce vomiting. Rinse mouth with water. If victim is fully conscious, give a cupful of water. If a person vomits when lying on his back, place him in the recovery position.

Safety Data Sheet

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO₂)
Foam
Dry powder

Unsuitable extinguishing media : High volume water jet

Specific hazards during fire-fighting : Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous combustion products : No hazardous combustion products are known

Further information : Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary.

Safety Data Sheet

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.

Environmental precautions : Prevent product from entering drains.
Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Neutralise with acid.
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).
Keep in suitable, closed containers for disposal.

Safety Data Sheet

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion : Normal measures for preventive fire protection.

Advice on safe handling : Do not breathe vapours/dust.
Avoid contact with skin and eyes.
For personal protection see section 8.
Smoking, eating and drinking should be prohibited in the application area.
To avoid spills during handling keep bottle on a metal tray.
Dispose of rinse water in accordance with local and national regulations.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Observe label precautions.
Electrical installations / working materials must comply with the technological safety standards.

Safety Data Sheet

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

CAS-No.	Components	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
7681-52-9	Sodium hypochlorite	STEL	2 mg/m ³	US WEEL
1310-73-2	Sodium hydroxide	C	2 mg/m ³	ACGIH
		C	2 mg/m ³	NIOSH REL
		TWA	2 mg/m ³	OSHA Z-1
		C	2 mg/m ³	OSHA P0
		C	2 mg/m ³	CAL PEL

Personal protective equipment

Respiratory protection : General and local exhaust ventilation is recommended to maintain vapor exposures below recommended limits. Where concentrations are above recommended limits or are unknown, appropriate respiratory protection should be worn. Follow OSHA respirator regulations (29 CFR 1910.134) and use NIOSH/MSHA approved respirators. Protection provided by air purifying respirators against exposure to any hazardous chemical is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstance where air purifying respirators may not provide adequate protection.

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Eye wash bottle with pure water
Tightly fitting safety goggles
Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Impervious clothing
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures : When using do not eat or drink.
When using do not smoke.
Wash hands before breaks and at the end of workday.

Safety Data Sheet

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: liquid
Colour	: clear yellow
Odour	: Chlorine
Odour Threshold	: No data available
pH	: 11.5 - 13
Freezing Point (Melting point/freezing point)	: -20 - -15 °C (-4 - 5 °F)
Boiling Point ()	: 230 °F (230 °F) Decomposition: Decomposition temperature
Flash point	: Not Flammable
Evaporation rate	: No data available
Flammability (solid, gas)	: No data available
Upper explosion limit	: No data available

Safety Data Sheet

SECTION 10. STABILITY AND REACTIVITY

Reactivity : No dangerous reaction known under conditions of normal use.

Chemical stability : Stable

Possibility of hazardous reactions : No hazards to be specially mentioned.

Conditions to avoid : Keep away from heat, flame, sparks and other ignition sources.

Incompatible materials : Acids
Combustible material
Halogenated compounds
Metals
metal salts
Organic materials
organic nitro compounds
Zinc

Safety Data Sheet

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Components:

7681-52-9:

Acute oral toxicity : LD50 (Rat, male): > 2,000 mg/kg

1310-73-2:

Acute oral toxicity : LD50 (Rabbit): 325 mg/kg

Skin corrosion/irritation

Components:

7681-52-9:

Species: Rabbit

Result: Causes burns.

1310-73-2:

Species: Rabbit

Result: Causes severe burns.

Serious eye damage/eye irritation

Components:

7681-52-9:

Species: Rabbit

Result: Risk of serious damage to eyes.

1310-73-2:

Species: Rabbit

Result: Risk of serious damage to eyes.

Safety Data Sheet

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

7681-52-9:

Toxicity to fish	: LC50 (Salmo gairdneri (Rainbow Fish)): 0.06 mg/l Exposure time: 96 h Test Type: flow-through test
	LC50 (Pimephales promelas (fathead minnow)): 5.9 mg/l Exposure time: 96 h Test Type: static test
Toxicity to daphnia and other aquatic invertebrates	: EC50 (Daphnia magna (Water flea)): 0.141 mg/l Exposure time: 48 h Test Type: flow-through test
	EC50 (Ceriodaphnia dubia): 0.035 mg/l Exposure time: 48 h Test Type: flow-through test
Toxicity to algae	: IC50: 0.023 mg/l Exposure time: 7 d Test Type: flow-through test
M-Factor (Acute aquatic toxicity)	: 10
Acute aquatic toxicity- Assessment	: Very toxic to aquatic life.
Chronic aquatic toxicity- Assessment	: Toxic to aquatic life with long lasting effects.

Safety Data Sheet

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

- Waste from residues : Dispose of in accordance with all applicable local, state and federal regulations.
For assistance with your waste management needs - including disposal, recycling and waste stream reduction, contact Uni-var Solutions ChemCare: 1-800-637-7922
- Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

DOT (Department of Transportation):

UN1791, Hypochlorite solutions, 8, III , Marine Pollutant (SODIUM HYPOCHLORITE)

IATA (International Air Transport Association):

UN1791, Hypochlorite solution, 8, III

IMDG (International Maritime Dangerous Goods):

UN1791, HYPOCHLORITE SOLUTION, 8, III, Marine Pollutant (SODIUM HYPOCHLORITE)

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Sodium hypochlorite	7681-52-9	100	800
Sodium hydroxide	1310-73-2	1000	20000

SARA 304 Extremely Hazardous Substances Reportable Quantity

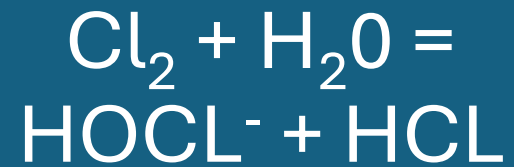
This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards : Corrosive to metals

Hypochlorite Salts (Sodium, Calcium)



Corrosive



Reactive but NOT
flammable

Toxic by mouth,
skin, or eye
exposure

Odor may not
provide adequate
warning

Hypochlorite can react explosively or form explosive compounds in the presence of:

- Ammonia
- Amines
- Charcoal
- Organic Sulfides
- Acids
- Organics (oil, brake fluid, pesticides, gas...)



Extent of Chlorine Poisoning

- **Amount** of chlorine exposure
- **Proximity** to point of exposure
- **Duration** of exposure
- **Manner** of exposure



Manner of Exposure



Skin or Eye Contact

- Spill or splash it in eyes or on skin
- High hypochlorite exposure dose released into water

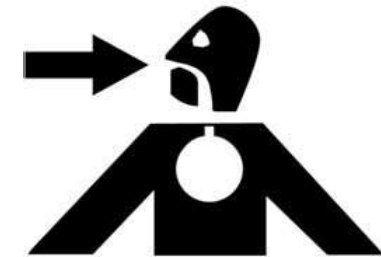


Ingestion

- Accidental exposure to food/drink

Inhalation

- Chlorine gas released into air enters lungs
- Eyes, mouth, nose contact



Chlorine Exposure Response

Skin

- Flush with plain water for ~5 minutes

Eyes

- Take out contact lenses
- Flush with plain water ~10-15 minutes



Ingestion

- Do not induce vomiting or drink fluids and seek emergency assistance

Inhalation

- Leave the area immediately
- Elevate your head – Cl_2 gas is heavier than air



Effects of Exposure to Hypochlorite Solutions

Direct contact

- Severe chemical burns on eyes, skin



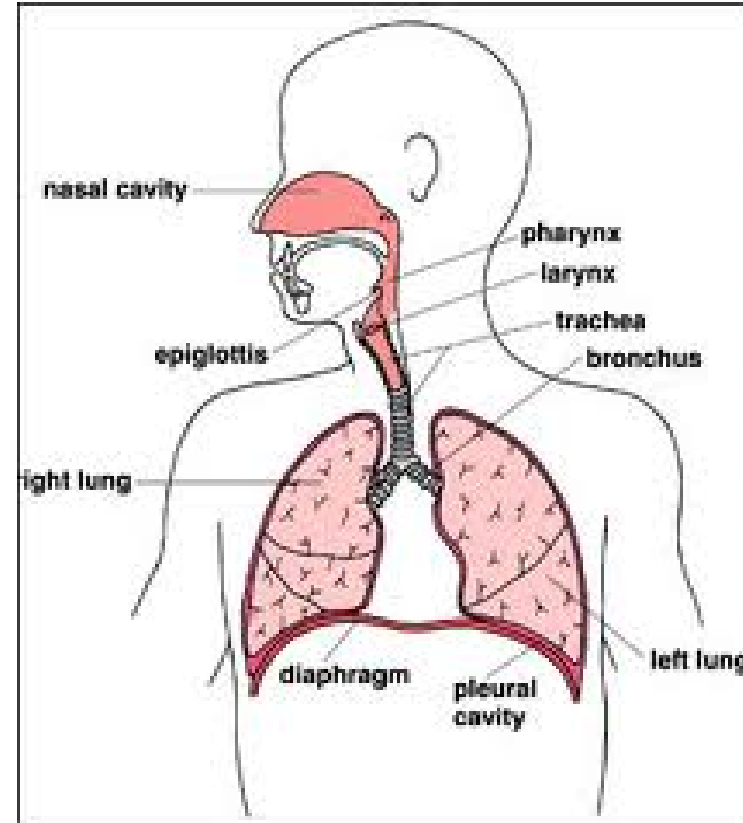
Ingestion

- Vomiting can cause corrosive injury to the gastro-intestinal tract

Effect of Exposure to Chlorine Gas

Inhalation

- Highly corrosive when it contacts moist tissues
 - Eyes
 - Nose
 - Throat
 - Lungs



Calcium Hypochlorite Safety Considerations

Explosive at $>100^{\circ}\text{F}$

When mixing, pour powder into water to minimize explosion risk

Minimize dust

Use PPE

Use corrosion resistant materials when mixing

No eating, drinking, smoking, chewing gum, when handling any type of chlorine

Chlorine Personal Protective Equipment

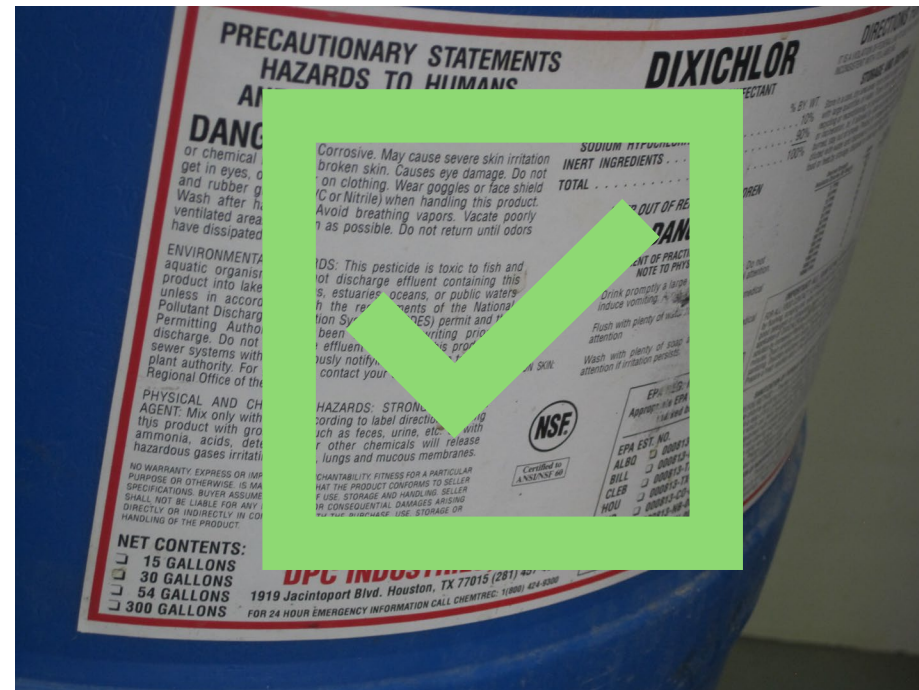
- Chemical safety goggles
- Rubberized gloves
- Apron
- Face shield
- Cover arms and legs
- Cartridge breathing apparatus
- Self contained breathing apparatus (SCBA)





Are you using safe handling practices?

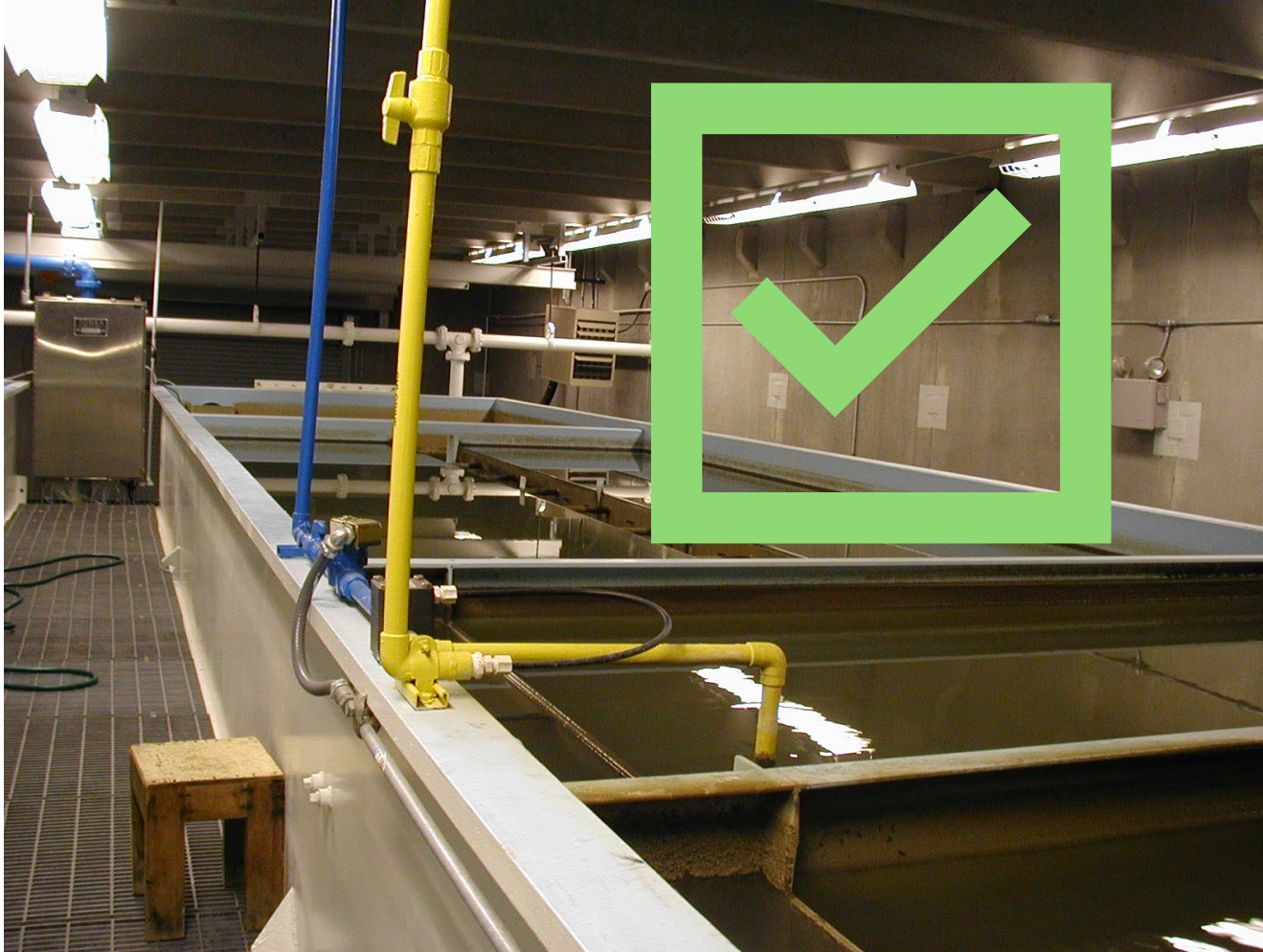
Are all your chemical containers properly labeled?



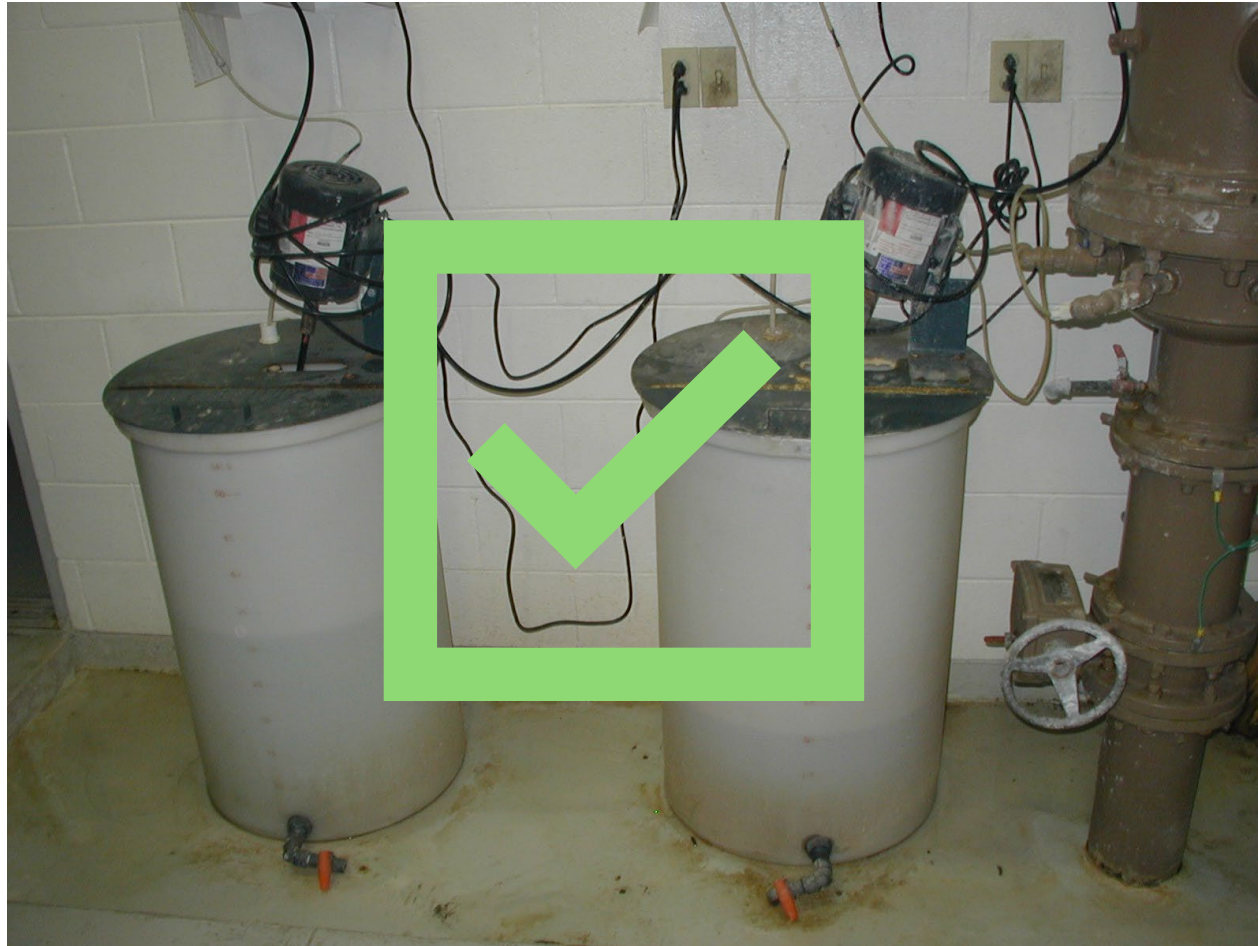
Are
incompatible
chemicals
stored
separately?



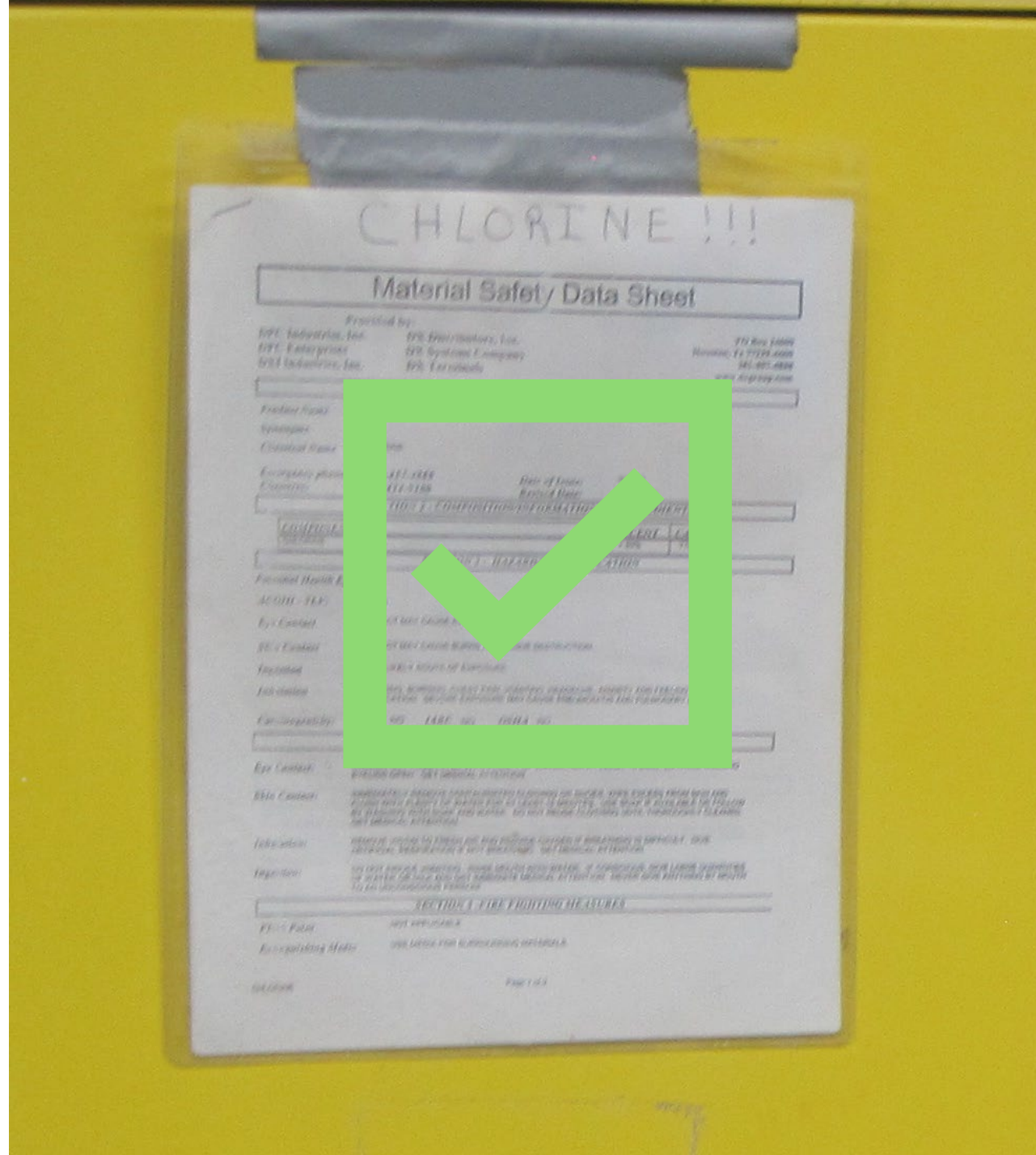
Are pumps, tubing, etc. dedicated to individual chemicals?



If containment areas are shared among chemicals, are chemicals compatible?



Are current
Safety Data
Sheets (SDS)
available for
each chemical
you use?

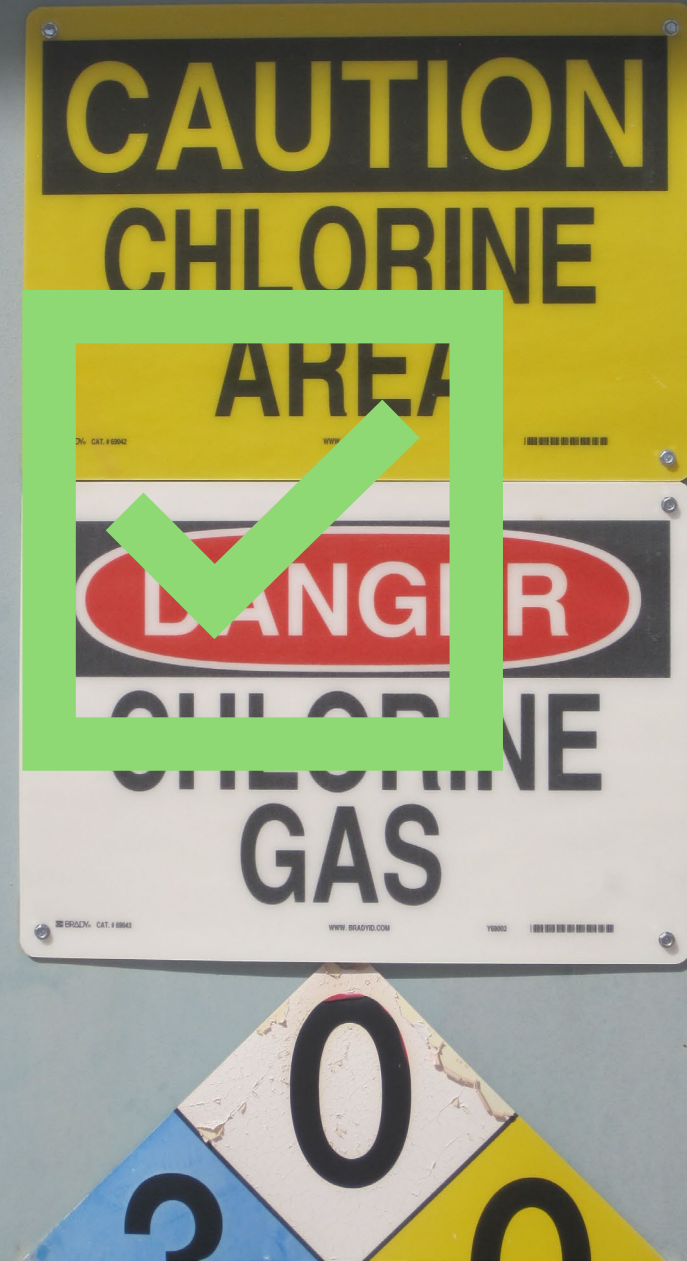


Is first-aid information available?

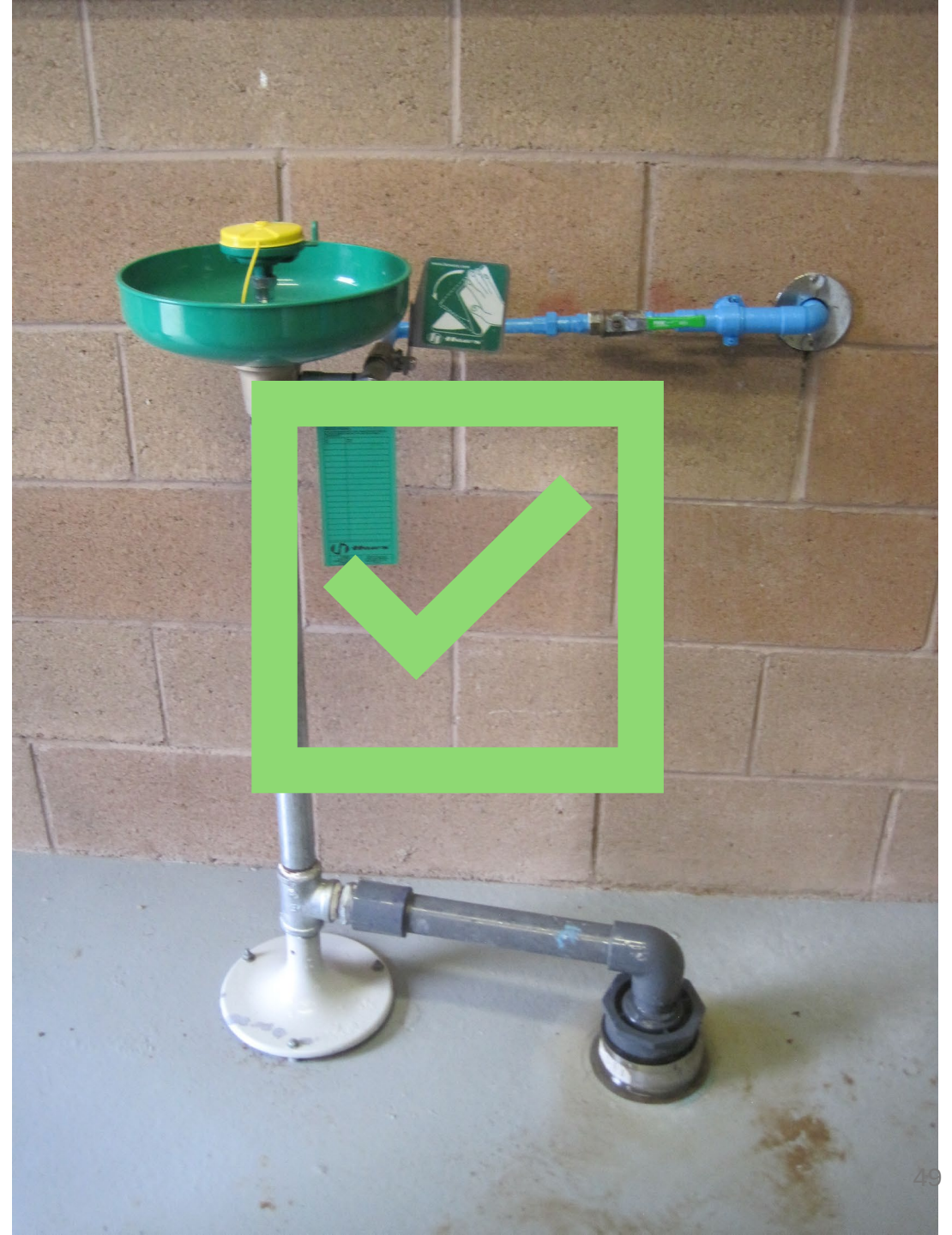
4. First-aid measures

Ingestion:	Do NOT induce vomiting. Never give liquid to an unconscious person. Get medical attention immediately.
Inhalation:	Call a physician or poison control center immediately. If breathing stops, provide artificial respiration. Move to fresh air. If breathing is difficult, give oxygen.
Skin contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Eye contact:	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

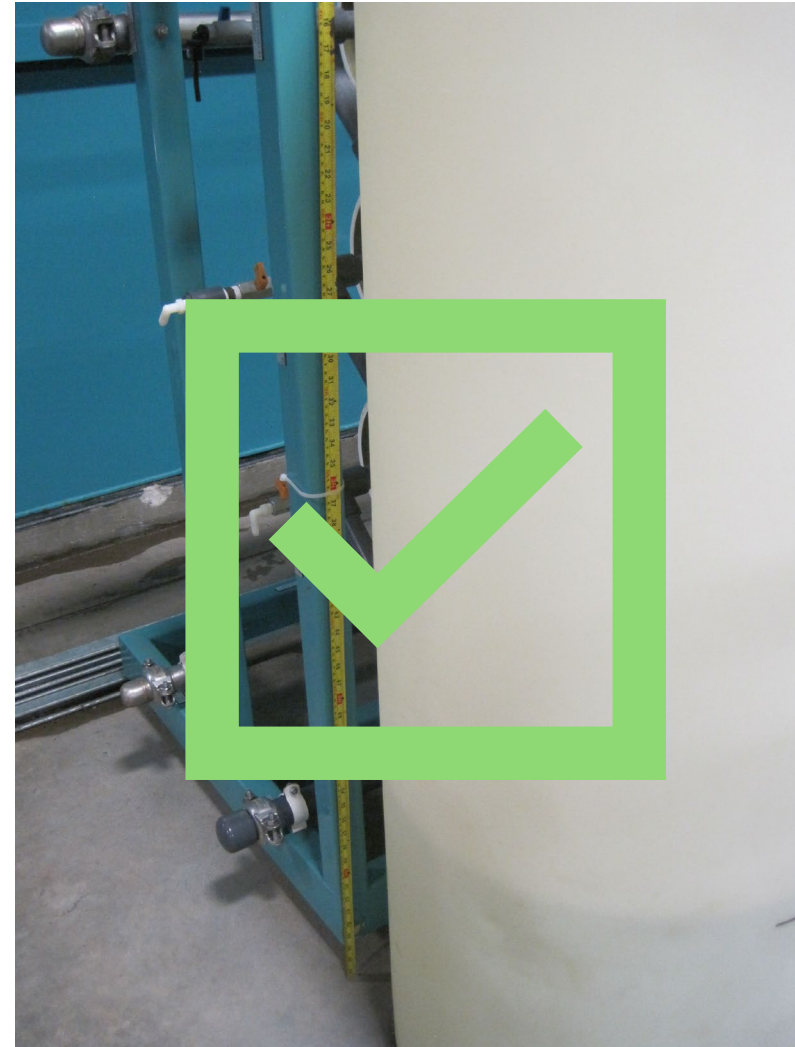
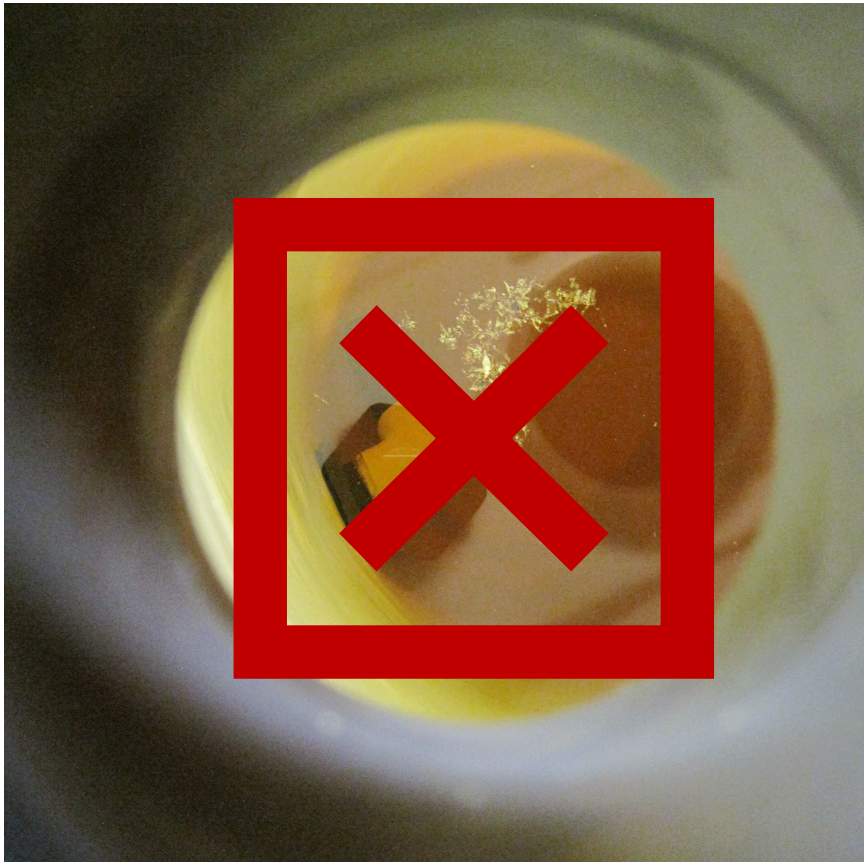
Are warning signs and safety information posted within view of chemical use?



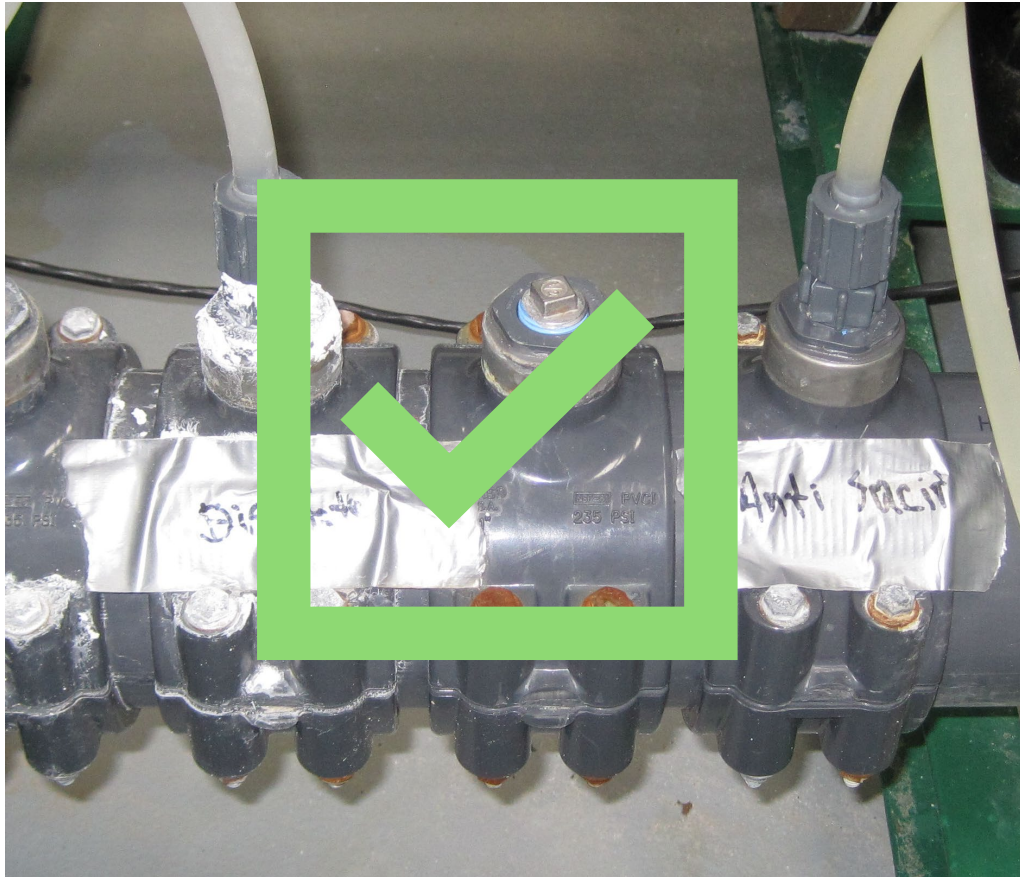
Are safety showers and eyewash stations available, accessible and inspected periodically?



Does the solution tank have a level indicator?



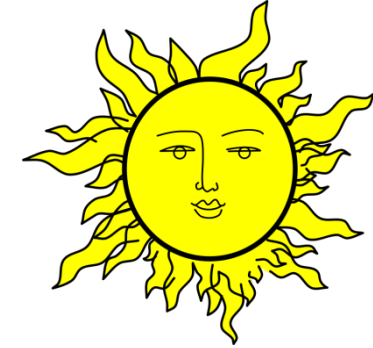
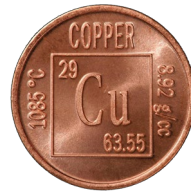
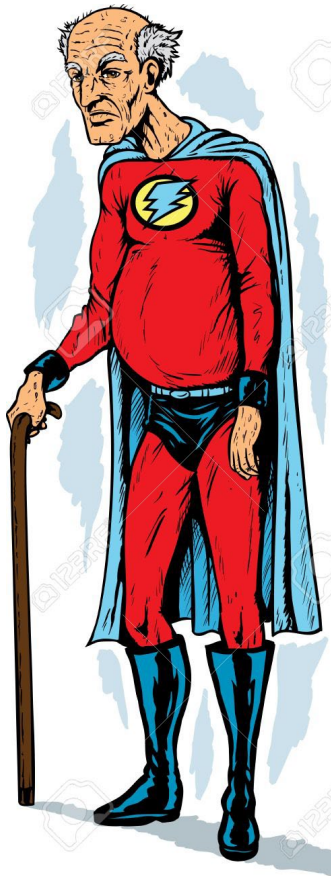
Are pipes labeled with product name and direction of flow?



Storing Hypochlorites

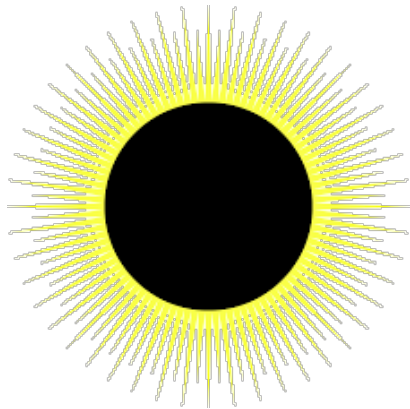
Chlorine Disinfection

**As sodium hypochlorite
decomposes, its strength
weakens**



Storing Sodium Hypochlorite

- Ideal temperature: 60°F (15.5°C)
- Away from acids, ammonia
- In well-fitted air-tight bottles/drums
- Away from sunlight



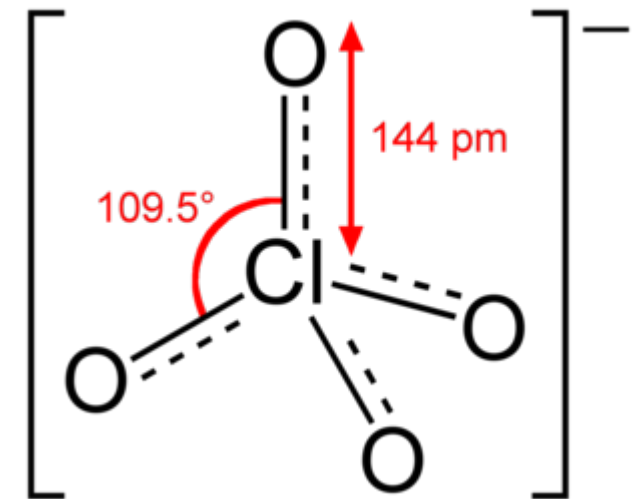
Storing Calcium Hypochlorite

- Keep cool and dry
- Label in original containers (Date Received, Date Opened)
- Store away from organic chemicals
 - Grease,
 - Oil,
 - Pesticides



Perchlorate Formation in Hypochlorite Solutions

- Perchlorate can form as a byproduct in hypochlorite solutions
- Perchlorate is commonly used in solid rocket propellants, munitions, fireworks, airbag initiators for vehicles, matches, and signal flares.
- Thyroid disease (inhibits Iodine uptake)
- Child brain development impacted



Reducing Perchlorate Formation in Hypochlorite Solutions

- Dilute stored hypochlorite solutions on delivery
- Store at lower temperatures
- Control pH range (11-13)
- Avoid extended storage times

Per AWWA's
Hypochlorite
Standard
(B300)

Setting up a Hypochlorite Disinfection System

Chlorine Disinfection



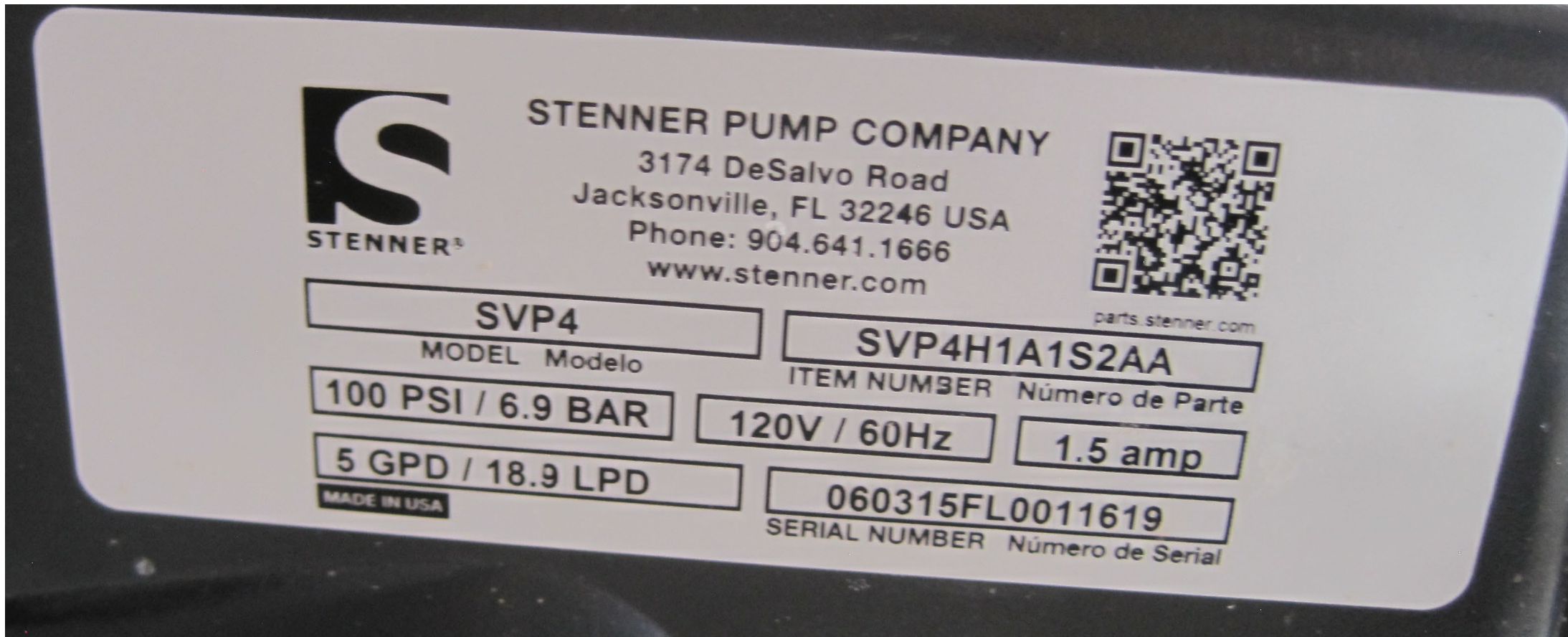






Choose the Correct Size Pump

Cl2 Pump
Installation
Best
Practices





Choose the Correct Size Pump

- What is the flow rate of the water source/s that I'm treating?
- What dosage do I want to apply?
- What is my chlorine purity?

$$\text{Feed Rate, lbs/day} = \frac{(\text{Dosage, mg/l}) \times (\text{Volume, MG}) \times (8.34 \text{ lbs/gal})}{\text{Purity, \% expressed as a decimal}}$$

- What is my system pressure at the point of chlorine application?

Flooded Suction

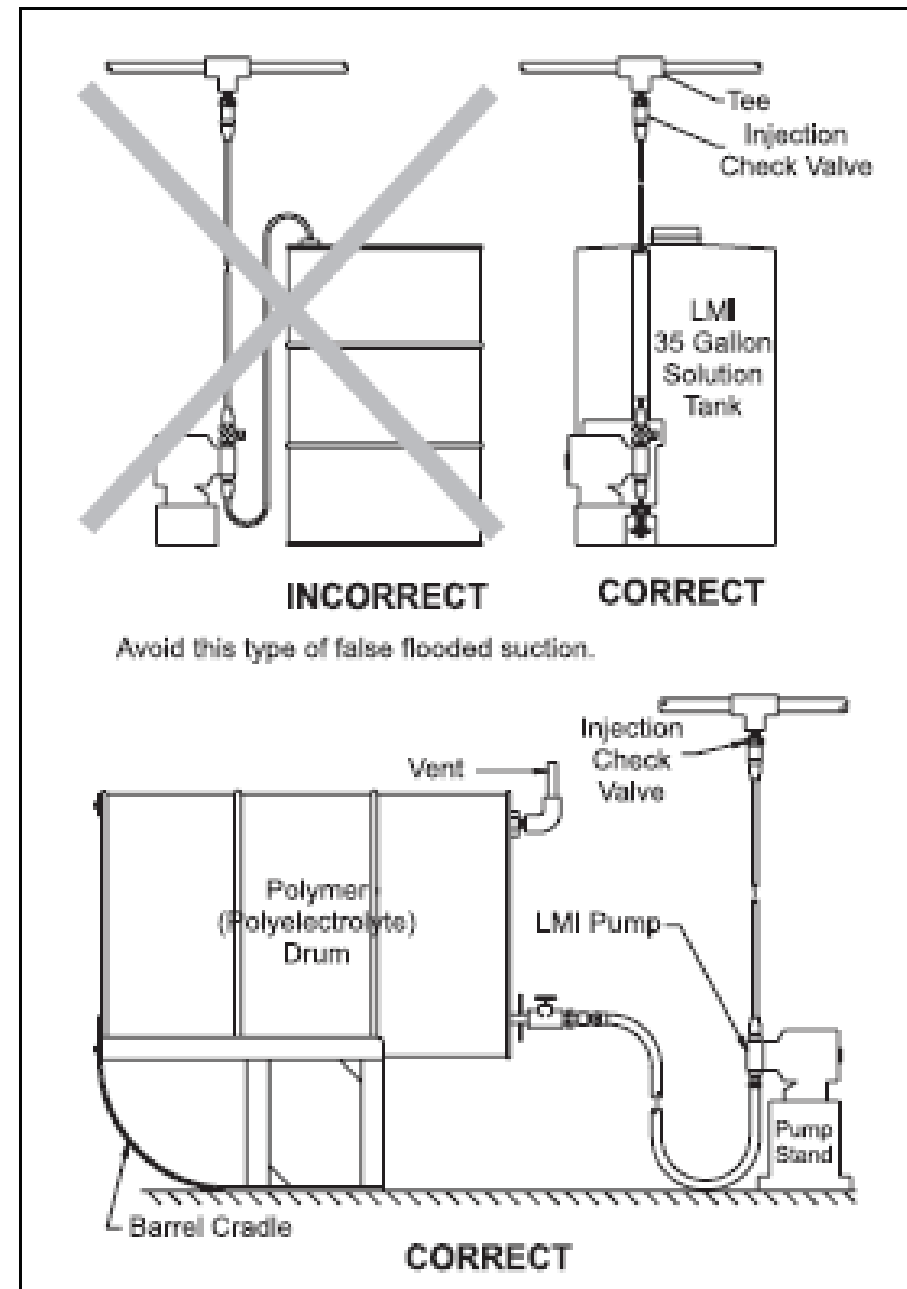


Figure 3. Flooded Suction

Tank Mount

Cl₂ Pump Installation Tips

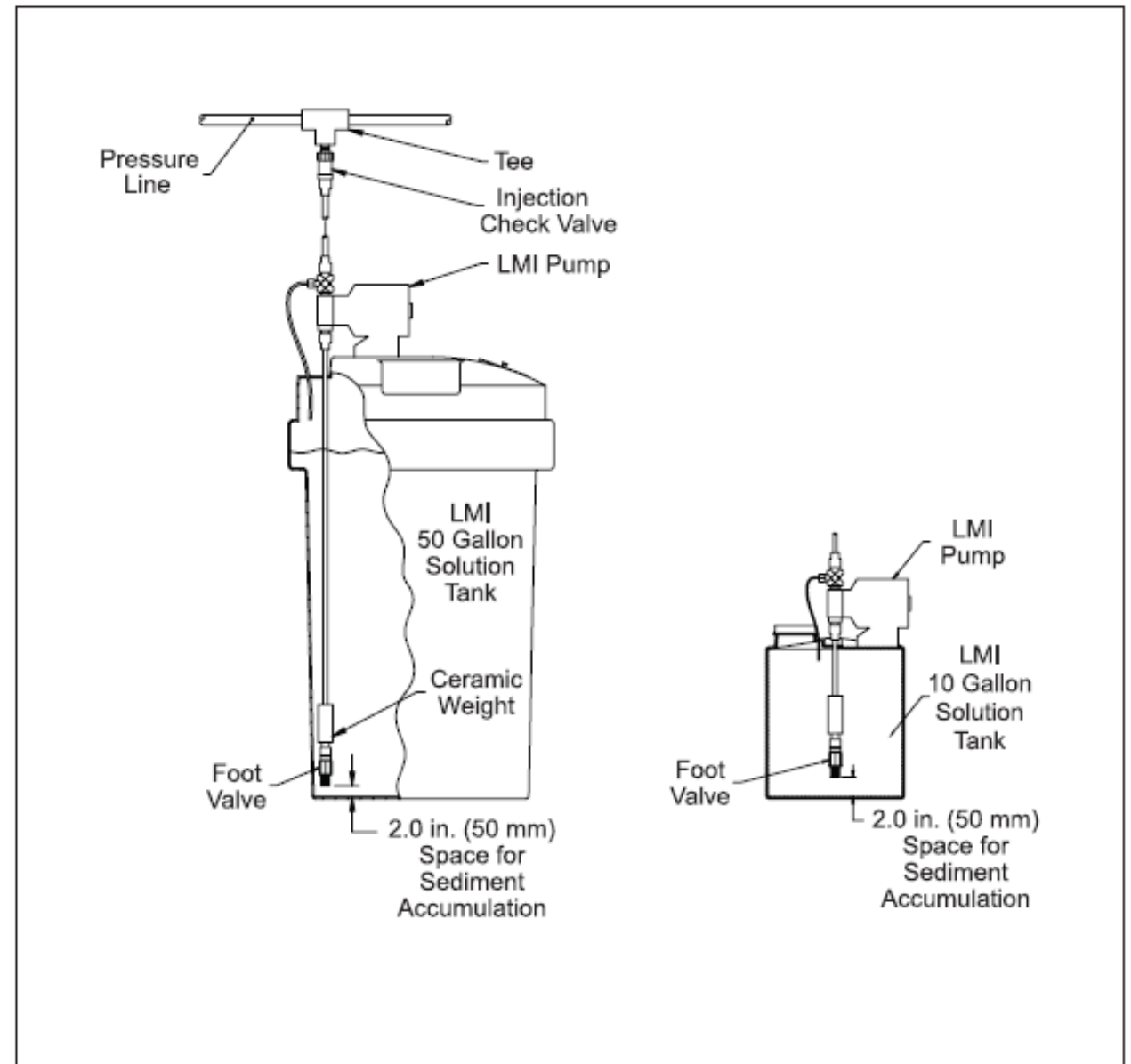


Figure 5. Suction Lift - Tank Mount

Shelf Mount

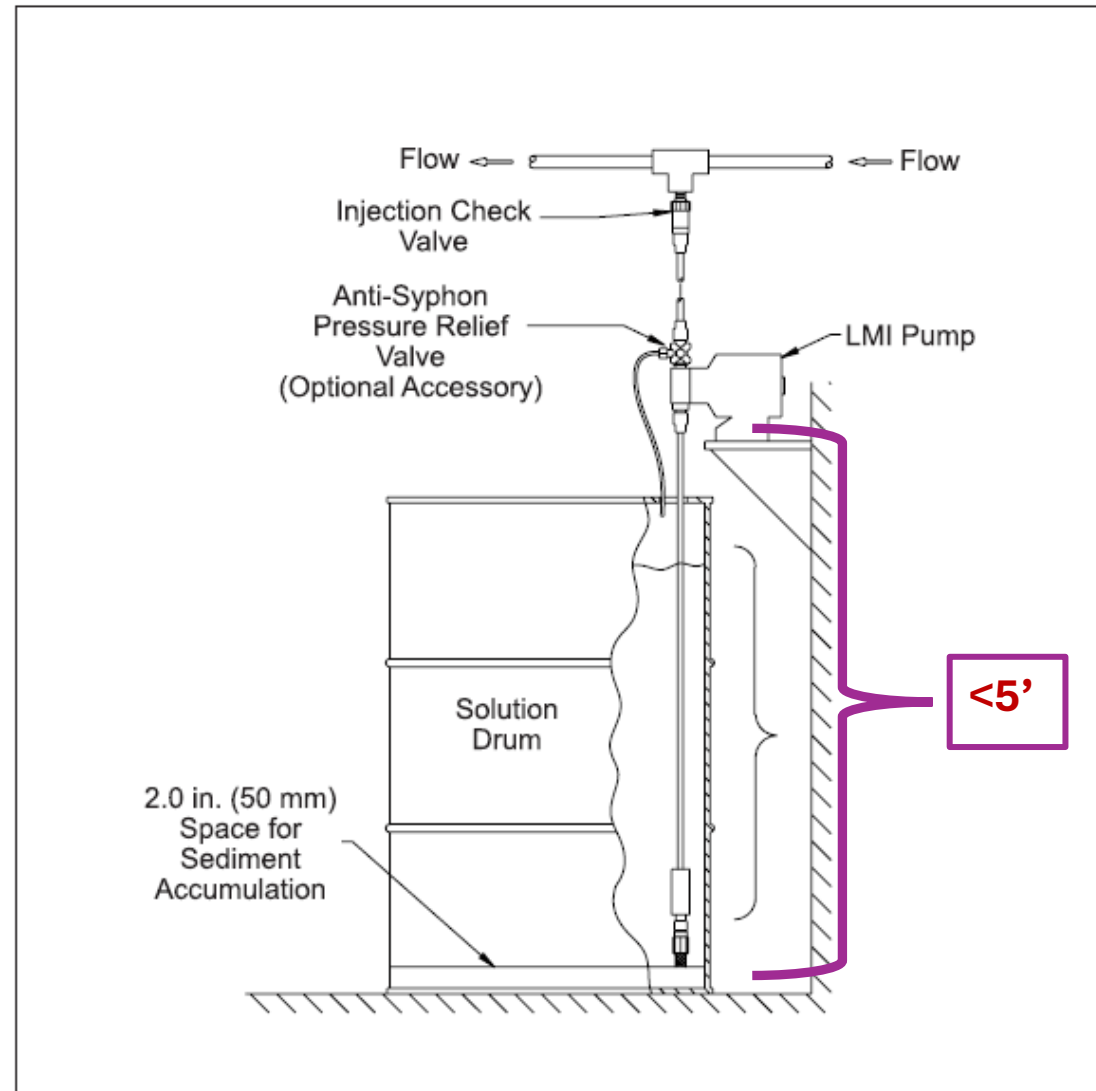
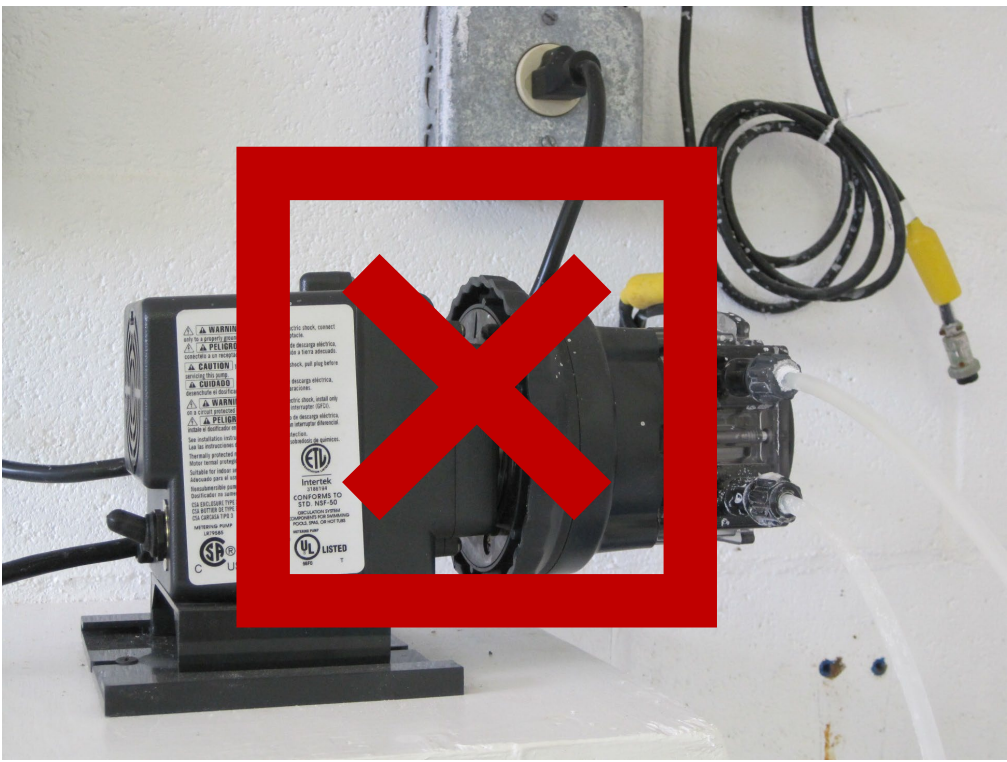


Figure 6. Suction Lift - Shelf Mount

Chlorine Pump Must be Tied to Flow



Adequate Spill Containment

Cl₂ Pump
Installation
Best
Practices



Treated Water Sampling Tap

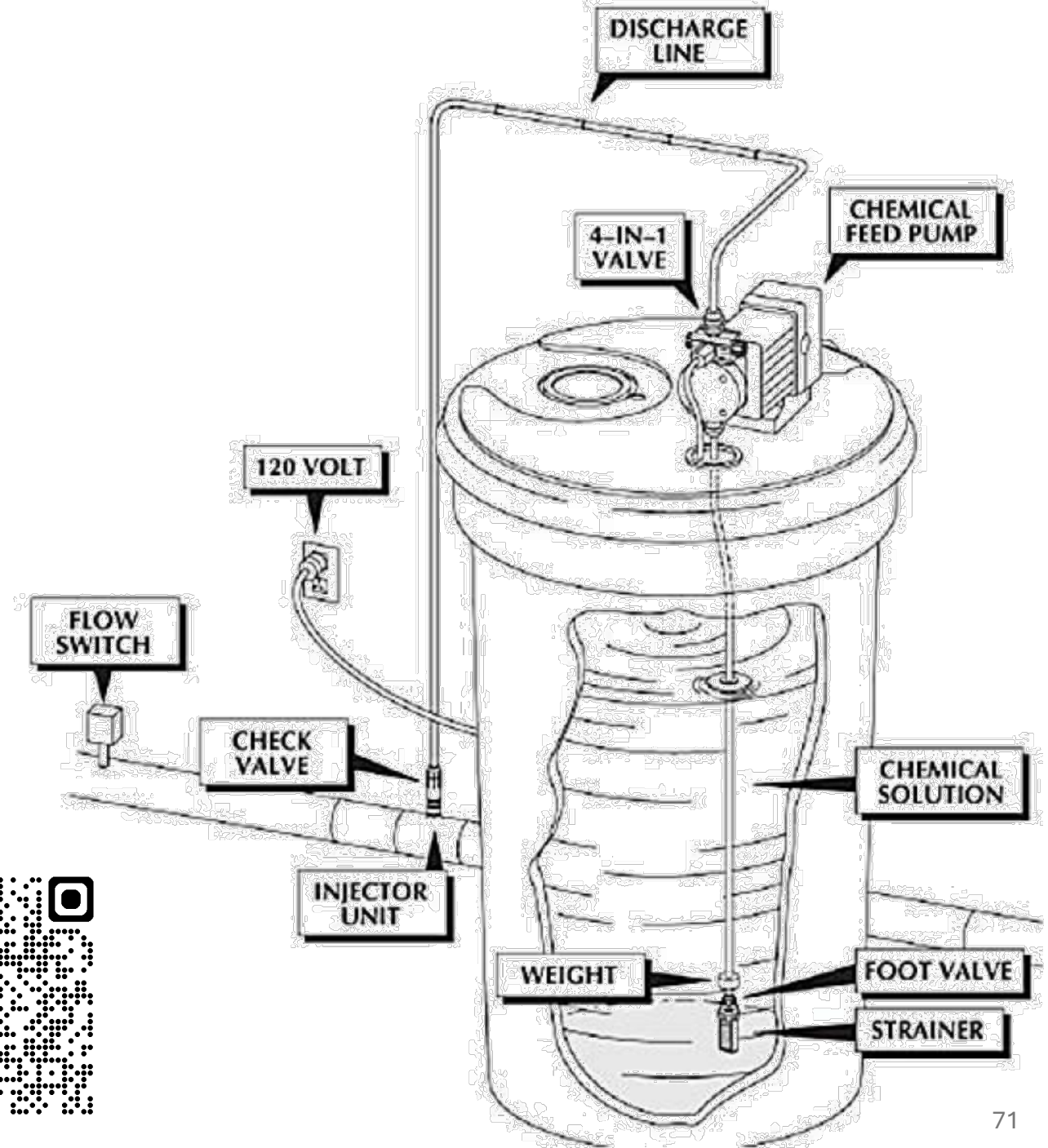
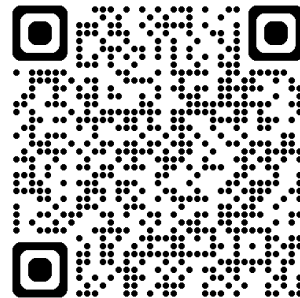
Cl₂ Pump
Installation
Best
Practices



Hypochlorinator/ Chemical Feed Pump

Watch our pump setup
video on YouTube

[https://www.youtube.com
/watch?v=EFhnBdlf8_Q](https://www.youtube.com/watch?v=EFhnBdlf8_Q)



Gas Chlorine Disinfection

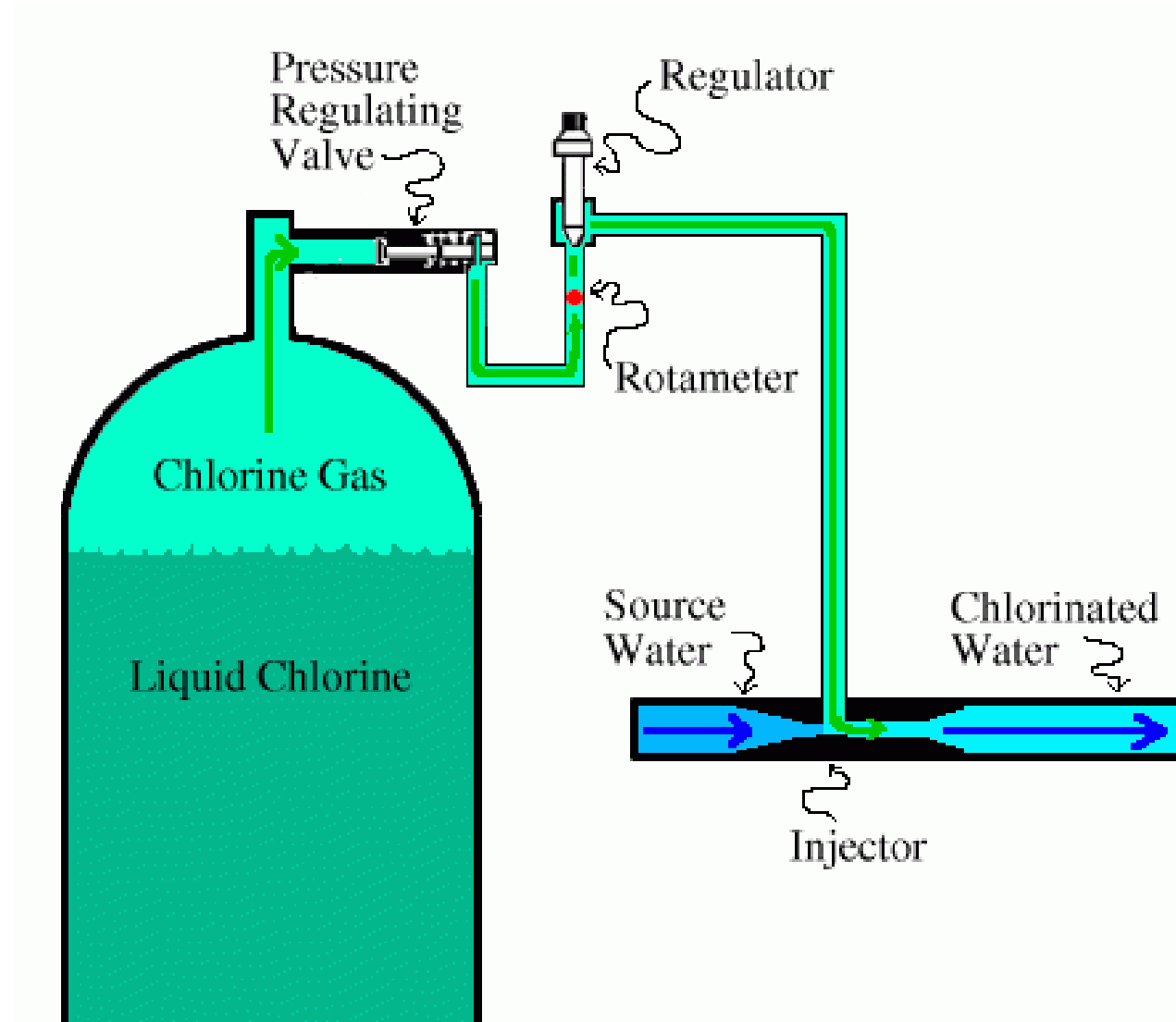
Chlorine Disinfection

Gas Chlorine

- Greenish-yellow gas
- 2.5 times heavier than air
- Turns into hydrochloric acid when it contacts moisture
- Decreases the pH of the water it is added to
- Does not support combustion
- Comes in cylinders of 100 or 150 pounds; 1 ton; or rail cars from 16 to 90 tons
- Filled as liquid 85% full; turns to gas at room temperature



Gas Chlorination System



Gas Chlorination System



A blue cylindrical chlorine ejector is shown, featuring a red label with the text "CHLORINE EJECTOR" in white capital letters. The device is connected to various pipes and valves, including a prominent valve with a "FORD" brand mark at the top. The main body of the ejector is blue with a textured surface, while the connecting pipes and valves are made of brown metal.

CHLORINE EJECTOR

Chlorine Cylinder Scale



Gas Chlorination System



Gas Chlorine Cylinders Fusible Plug

- Fusible plug melts or softens at 158° to 165° F and releases the gas to prevent build up of excessive pressures and possibility of catastrophic rupture due to fire or high temperatures
- 100 lb and 150 lb cylinders have one plug, ton cylinders have 6 plugs

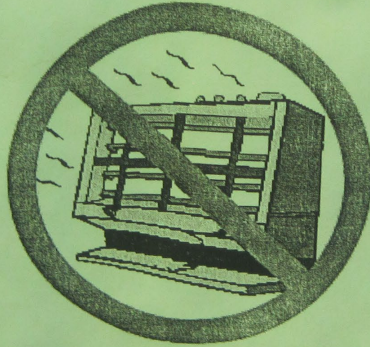


Fusible Plugs & Space Heaters

Product Information Bulletin

CHLORINE - HEATER HAZARD - CHLORINE

Space heaters are a HAZARD to chlorine cylinder fuse plugs!



HEATER

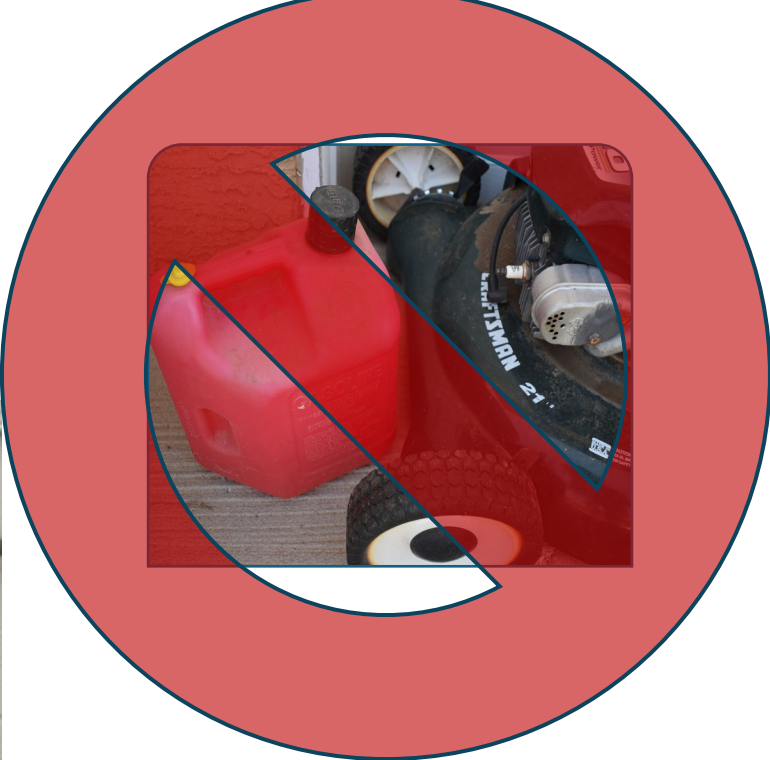
Did you know that a 1500 watt electric heater can melt the fuse plug in a 150 # chlorine cylinder?

Theoretical calculations show that when a heater is placed within 12-24 inches from the base of a cylinder, the fuse plug on the valve of the cylinder will melt and release the chlorine. Actual experiments (done unintentionally) by numerous chlorine users across the nation have proved the calculations correct by melting the fuse plug and releasing the chlorine.

This is true on a full or empty cylinder, or any level in between. Fuse plugs are designed to melt at 158° -165° F. The heater at the base of the cylinder puts enough heat into the chlorine in the bottom of the cylinder to transfer the heat to the top of the cylinder and melt the fuse plug.

Room heaters have also caused this to happen when the temperature control failed to shut the heater down. Steam heaters

Gas Chlorine Storage



Chlorine Gas Alarm



Chlorine Gas Room Ventilation

- Light switch and vent switch outside chlorine room
- Fresh air from the ceiling or high up discharged air within 12 inches of the floor
- If chlorine leak occurs, must be able to direct the chlorine containing air to a treatment system



Chlorine Vapor Scrubber



Standby Power



Chlorine Gas PPE

- SCBAs must be located near to but outside the chlorination room



Chlorine Gas Safety

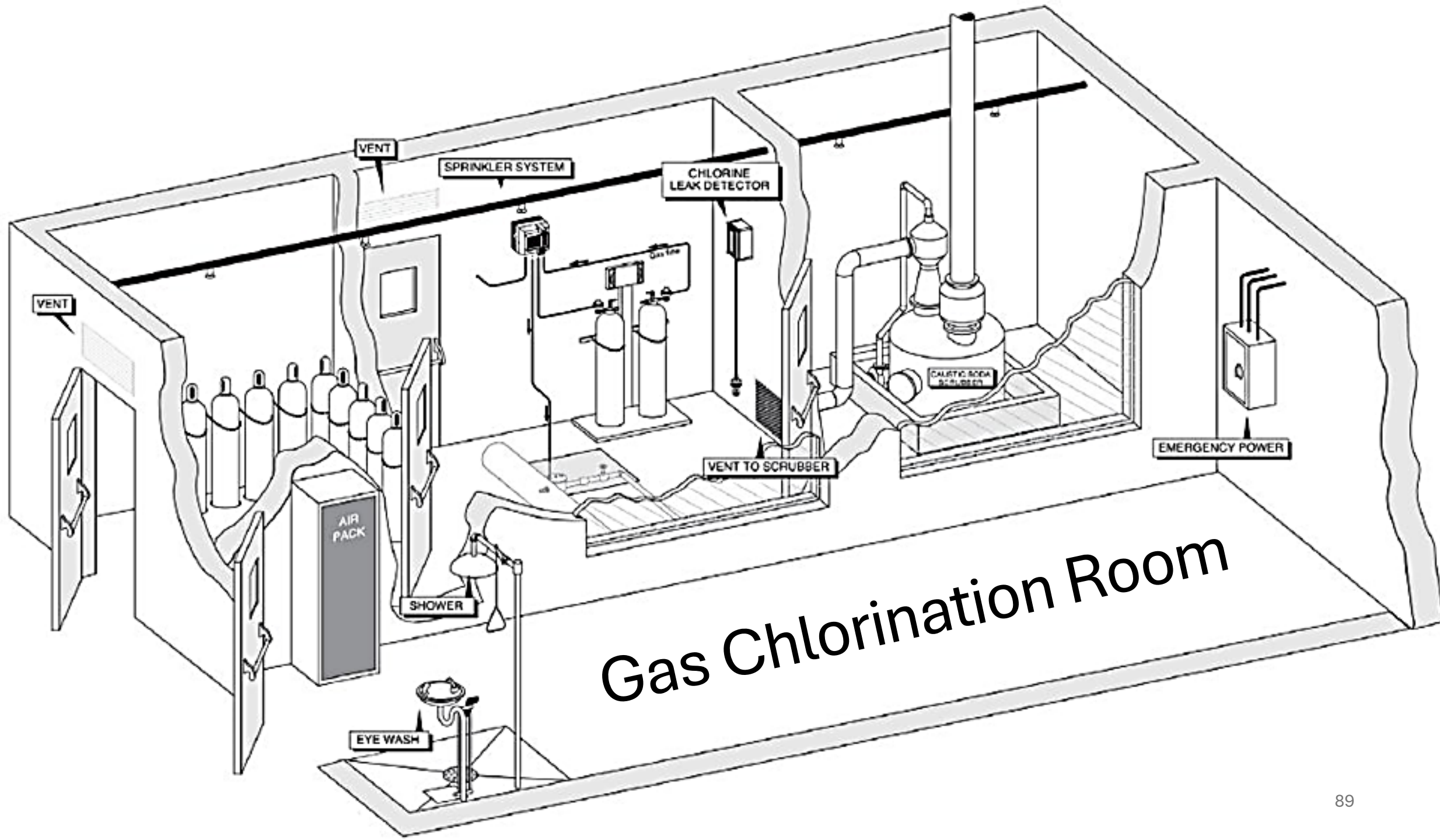
- Limit exposure – only authorized personnel
- Post clear, visible warning signs



Chlorine Gas Leaks

- Check for leaks with 28% to 30% ammonia solution
- If a leak is detected immediately put on SCBA and turn off chlorine valve
- When taking a gas chlorinator out of service the operator should shut the chlorine supply off at the tank and then evacuate the lines before turning off the water.
- Find leak and repair





Chlorine Gas Emergencies

- If chlorine is detected from an alarm NEVER enter room without SCBA
- If room needs to be evacuated, stand tall and hurry out
- Evacuate up wind and to highest point
- If chlorine vapors escape building, notify emergency personnel (fire, police)

Chlorine Gas Exposure

- Remove and dispose of clothing
- Take a shower
- Do not induce vomiting or drink fluids
- Dial 911



Next time:

Date	Topic
6/26/25	Program Overview, Test Format, Study & Test Tips
7/10/25	Drinking Water System Overview - (Source, Treatment, & Distribution)
7/24/25	Basic Operator Math (+, -, /, x, Exponents and basic algebra)
8/7/25	Applied Operator Math (e.g. Areas, Volume, Flow Rates, Detention Time, Pressure/Hydraulic Head)
8/21/25	Drinking Water Regulations
9/4/25	Source Water Characteristics
9/18/25	Surface Water Intake Components, Well Components, and O&M
10/2/25	Disinfection 1: Chloramines, UV, Chlorine Dioxide, Chlorine
10/16/25	Disinfection 2: Chlorine Disinfection Application for Sodium Hypochlorite and Gas Chlorine (including storage and safety)
10/30/25	Disinfection 3: Distribution System Application, Residual Measurement, Evaluation & Adjustment,
11/13/25	Disinfection 4: Chlorine Disinfection Math
12/4/25	Surface Water Treatment 1: Coagulation, Flocculation, Sedimentation (including chemistry, process controls, operations)
12/18/25	Surface Water Treatment 2: Filtration

Links to recordings and material are available on our website at <https://swefc.unm.edu/home/op-cert-trainings/>

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