THATCHER COMPANY OF CALIFORNIA, INC.
8625 Unsworth Avenue, Sacramento, CA 95828

Phone (916) 389-2517
Fax (916) 389-2516

February 14, 2024

AFFIDAVIT OF COMPLIANCE

Liquid Chlorine

This affidavit certifies and warrants the liquid chlorine to be delivered to the Bay Area Chemical Consortium Agencies by Thatcher Company of California, Inc. fully complies with A.W.W.A. Specifications and ANSI/NSF Standard 60.

Michael T. Mitchell
President

ATTACHMENT 1

General Manager:	Phillip Belden
Phone Number	(702) 219-2372
E-mail Address:	philip.belden@tchem.com

Vice President of Marketing and Customer Service:	Jayson Stenquist
Phone Number:	(801) 972-4587 ext. 1444 MT
E-mail Address:	jason.stenquist@tchem.com

NSF International
789 N. Dixboro Rd. Ann Arbor, MI 48105, USA
1-800.NSF.MARK | +1-734.769.8010 | www.nsf.org

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TEST REPORT

Send To: 07870
Mr. Matt Shewan
Chemtrade Electrochem Inc.
144 - 4th Avenue Southwest
Suite 2100
Calgary, Alberta T2P 3N4
Canada

Facility: 07871
Chemtrade Electrochem Inc.
100 Amherst Avenue
North Vancouver BC V7H 1S4
Canada

Result	**PASS**	Report Date	01-DEC-2017

Customer Name	Chemtrade Electrochem Inc.
Tested To	NSF/ANSI 60
Description	Chlorine | Liquid
Trade Designation	Chlorine
Test Type	Annual Collection
Job Number	A-00236286
Project Number	W0376532
Project Manager	Eleftheria Biers

This report documents the testing of the referenced product to the requirements of NSF/ANSI Standard 60 (Drinking Water Treatment Chemicals - Health Effects). This standard establishes minimum requirements for chemicals, the chemical contaminants, and impurities that are added to drinking water from drinking water treatment chemicals. Contaminants produced as by-products through reaction of the treatment chemical with a constituent of the drinking water are not covered by this Standard. Reference the "About the Standard" section at the end of this report for additional information about NSF/ANSI Standard 60 and the products covered under this Standard.

Thank you for having your product tested by NSF International.

Please contact your Project Manager if you have any questions or concerns pertaining to this report.

Report Authorization 
Amanda Phelka - Director, Toxicology Services

Date 01-DEC-2017

General Information

Standard: NSF/ANSI 60

Chemical Name: Chlorine
DCC Number: DA00930
Maximum Use Level: 30 mg/L
Monitor Code: A
Physical Description of Sample: Liquid
Trade Designation/Model Number: Chlorine

Sample Id: **S-0001437503**
Description: Chlorine | Liquid
Sampled Date: 16-Nov-2017
Received Date: 16-Nov-2017

Tox Normalization Information:		**Lab Normalization Information:**	
Calculated NF	0.0075	Weight of chlorine	4.1 g
Preparation method used	E	Weight of water	1026.4 g
MUL	30 mg/L		
Compound Reference Key:	SPAC		

Normalization Calculation:

Normalized Result = Test Result (ug/L) * NF Where NF = $MUL(mg/L) * \frac{\text{Weight of Water Collected (g)}}{\text{Weight of Chlorine Collected (g)}} * \frac{1\ L}{10^3 g} * \frac{1g}{10^3 mg}$

- *MUL = Maximum Use Level;*
- *Unit conversion: 10^3 g water = 1 L water, 10^3 mg = 1g;*
- *An additional factor may be used to adjust the analytical result to field use conditions to account for product carryover, flushing, or other assumptions stipulated with the use of the product. If an additional factor is used, it is included in the information above.*

Testing Parameter	Units	Sample	Control	Result	Norm. Result	Acceptance Criteria(1)	Evaluation Status
Chemistry Lab							
Volatile Organic Compounds (Ref: EPA 524.2)							
Dichlorodifluoromethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
Chloromethane	ug/L	ND(50)		ND(50)	ND(0.38)	3	Pass
Vinyl Chloride	ug/L	ND(5)		ND(5)	ND(0.04)	0.2	Pass
Bromomethane	ug/L	ND(5)		ND(5)	ND(0.04)	1	Pass
Chloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.04	Pass
Trichlorofluoromethane	ug/L	ND(5)		ND(5)	ND(0.04)	50	Pass
Trichlorotrifluoroethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
Methylene Chloride	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
1,1-Dichloroethylene	ug/L	ND(5)		ND(5)	ND(0.04)	0.7	Pass
trans-1,2-Dichloroethylene	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
1,1-Dichloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
2,2-Dichloropropane	ug/L	ND(5)		ND(5)	ND(0.04)		
cis-1,2-Dichloroethylene	ug/L	ND(5)		ND(5)	ND(0.04)	7	Pass
Chloroform	ug/L	ND(5)		ND(5)	ND(0.04)	[TTHM]	
Bromochloromethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
1,1,1-Trichloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	20	Pass
1,1-Dichloropropene	ug/L	ND(5)		ND(5)	ND(0.04)		

Sample Id: **S-0001437503**

Testing Parameter	Units	Sample	Control	Result	Norm. Result	Acceptance Criteria(1)	Evaluation Status
Chemistry Lab (Continued)							
Carbon Tetrachloride	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
1,2-Dichloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
Trichloroethylene	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
1,2-Dichloropropane	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
Bromodichloromethane	ug/L	ND(5)		ND(5)	ND(0.04)	[TTHM]	
Dibromomethane	ug/L	ND(5)		ND(5)	ND(0.04)		
cis-1,3-Dichloropropene	ug/L	ND(5)		ND(5)	ND(0.04)	0.2	Pass
trans-1,3-Dichloropropene	ug/L	ND(5)		ND(5)	ND(0.04)	0.2	Pass
1,1,2-Trichloroethane	ug/L	ND(5)		ND(5)	ND(0.04)		
1,3-Dichloropropane	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
Tetrachloroethylene	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
Chlorodibromomethane	ug/L	ND(5)		ND(5)	ND(0.04)	[TTHM]	
Chlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
1,1,1,2-Tetrachloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	1	Pass
Bromoform	ug/L	ND(5)		ND(5)	ND(0.04)	[TTHM]	
1,1,2,2-Tetrachloroethane	ug/L	ND(5)		ND(5)	ND(0.04)	0.2	Pass
1,2,3-Trichloropropane	ug/L	ND(5)		ND(5)	ND(0.04)	4	Pass
1,3-Dichlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)	60	Pass
1,4-Dichlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)	7.5	Pass
1,2-Dichlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)	60	Pass
Carbon Disulfide	ug/L	ND(10)		ND(10)	ND(0.075)	70	Pass
Methyl-tert-Butyl Ether (MTBE)	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
tert-Butyl ethyl ether	ug/L	ND(5)		ND(5)	ND(0.04)	2000	Pass
Methyl Ethyl Ketone	ug/L	ND(50)		ND(50)	ND(0.38)	400	Pass
Methyl Isobutyl Ketone	ug/L	ND(50)		ND(50)	ND(0.38)	700	Pass
Toluene	ug/L	ND(5)		ND(5)	ND(0.04)	100	Pass
Ethyl Benzene	ug/L	ND(5)		ND(5)	ND(0.04)	70	Pass
m+p-Xylenes	ug/L	ND(10)		ND(10)	ND(0.075)	[Xylenes]	
o-Xylene	ug/L	ND(5)		ND(5)	ND(0.04)	[Xylenes]	
Styrene	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
Isopropylbenzene (Cumene)	ug/L	ND(5)		ND(5)	ND(0.04)	70	Pass
n-Propylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
Bromobenzene	ug/L	ND(5)		ND(5)	ND(0.04)		
2-Chlorotoluene	ug/L	ND(5)		ND(5)	ND(0.04)		
4-Chlorotoluene	ug/L	ND(5)		ND(5)	ND(0.04)		
1,3,5-Trimethylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)		
tert-Butylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
1,2,4-Trimethylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)		

Sample Id: **S-0001437503**

Testing Parameter	Units	Sample	Control	Result	Norm. Result	Acceptance Criteria(1)	Evaluation Status
Chemistry Lab (Continued)							
sec-Butylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)		
p-Isopropyltoluene (Cymene)	ug/L	ND(5)		ND(5)	ND(0.04)		
1,2,3-Trimethylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)		
n-Butylbenzene	ug/L	ND(5)		ND(5)	ND(0.04)	0.3	Pass
1,2,4-Trichlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)	7	Pass
Hexachlorobutadiene	ug/L	ND(5)		ND(5)	ND(0.04)	0.4	Pass
1,2,3-Trichlorobenzene	ug/L	ND(5)		ND(5)	ND(0.04)		
Naphthalene	ug/L	ND(5)		ND(5)	ND(0.04)	10	Pass
Benzene	ug/L	ND(5)		ND(5)	ND(0.04)	0.5	Pass
Total Trihalomethanes	ug/L	ND(0.5)		ND(0.5)	ND(0.004)	8	Pass
Total Xylenes	ug/L	ND(0.5)		ND(0.5)	ND(0.004)	1000	Pass

1 - If the acceptance criteria is blank and the evaluation status is "Fail", then the criteria used will be noted on the letter accompanying these results.

[Xylenes] - Acceptance based on Total Xylenes

[TTHM] - Acceptance based on Total Trihalomethanes

Common Terms and Acronyms Used:

Sample.....	Test result on the submitted product sample after prepared or exposed in accordance with the standard.
Control.....	Test result on a laboratory blank sample analyzed in parallel with the sample.
Result.....	Sample test result minus the Control test result.
Normalized Result...	Result normalized in accordance with the test standard to reflect potential at-the-tap concentrations
ND().....	Result is below the detection level of the analytical procedure as identified in the parenthesis.
DCC Number.....	NSF document control code of the registered formulation of the product tested
ug/L.....	Microgram per liter = 0.001 milligram per liter (mg/L)
SPAC.....	Acceptance criteria of the standard (Single Product Allowable Concentration)

References to Testing Procedures:

NSF Reference	Parameter / Test Description
C4662	Volatile Organic Compounds (Ref: EPA 524.2)

Test descriptions preceded by an asterisk "*" indicate that testing has been performed per NSF International requirements but is not within its scope of accreditation.

Testing Laboratories:

	Id	Address
All work performed at: →	NSF_AA	NSF International 789 N. Dixboro Road Ann Arbor MI 48105

About the Standard:

NSF/ANSI Standard 60: Drinking Water Treatment Chemicals - Health Effects

NSF/ANSI 60 establishes minimum health effects requirements for the chemicals, the chemical contaminants, and the impurities that are directly added to drinking water from drinking water treatment chemicals. It does not establish performance or taste and odor requirements. The standard contains requirements for chemicals that are directly added to water and are intended to be present in the finished water as well as other chemical products that are added to water but are not intended to be present in the finished water. Chemicals covered by this Standard include, but are not limited to, coagulation and flocculation chemicals, softening, precipitation, sequestering, pH adjustment, and corrosion/scale control chemicals, disinfection and oxidation chemicals, miscellaneous treatment chemicals, and miscellaneous water supply chemicals.

The testing performed to this standard is done to estimate the level of contaminants or impurities added to drinking water when the chemical is used at the "Maximum Use Level" under attestment. Prior to testing, information is obtained on the formulation and sources of supply used to manufacture the chemical. This information is then reviewed along with the minimum requirements of the standard to establish the potential contaminants of concern. A representative sample of chemical is obtained for testing. The chemical sample is prepared for analysis through specific methods established in the standard based on the type of chemical and then is analyzed for potential contaminants determined during the formulation review. The laboratory results are normalized to represent potential at-the-tap values and then compared to the "single product allowable concentration" (SPAC) established by the standard. The product is found in compliance with the standard if the normalized value is less than or equal to the allowable concentration.

1-16-24

CHEMTRADE Certificate Of Analysis

Chemtrade Electrochem Inc.
North Vancouver Plant
100 Amherst Avenue
North Vancouver BC V7H 1S4
T 604-929-1107 F 604-929-7600

To:
THATCHER COMPANY OF CALIFORNIA INC
8625 Unsworth Avenue
SACRAMENTO CA 95828
USA

B/L Number	:81900635
Carrier	:Union Pacific Railroad
Our Order	:2929730
Date Shipped	:Jan 06,2024
Vehicle	:TILX600207
Customer P.O..	:2251002898
Seal Numbers	:14860
Quantity Shipped	: 81.646 Tonne
Equivalent Qty	: 179,996.772 LBS

Material: Liquid Chlorine

NSF Certified to NSF/ANSI/CAN 60 Maximum Use Level 30 mg/L

The material furnished under this Certificate of Analysis conforms to the specification below as determined by historical data. The most recent complete liquid chlorine railcar analysis result is also provided as per the customer's request.

Batch: 0000384392 / Quantity: 81.646 TM

Parameter	Unit	Test Result	Specification Min	Specification Max	
Chlorine (Cl2)	%	99.5900	99.5000		I
Moisture	PPM	22.0000		50.0000	I
Chloroform (CHCl3)	PPM	< 0.5000		50.0000	I
Carbon Tetrachloride (CCl4)	PPM	< 0.5000		15.0000	I
Non Volatile Residue	PPM	< 10.0000		50.0000	I
Bromine (Br)	PPM	< 2.0000		25.0000	I
Nitrogen Trichloride (NCl3)	PPM	0.8800		5.0000	I
NSF Certified -	NSF® - 60 (MUL 30 MG/L)				

ppm is equivalent to mg/Kg
% is equivalent to % by Volume unless otherwise noted

Q Analysis Based on Shipment/Batch Sample
A Calculated Value
I Most Recent Analysis Prior to Shipment
Values with "<" indicate less than method detection limit.

Approved By: Bert Weger, Senior Process Engineer

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PRD Jan 06,2024 16:26 SYSTEM_CSR
Profile: CHLORINE-001

LIQUID CHLORINE
General Sales Specification

Parameters	Units	Specification
Chlorine	Volume %	99.5 Min.
Moisture	ppm	50 Max.
Non-Volatile Residue	ppm	50 Max.
Carbon Tetrachloride	ppm	15 Max.
Chloroform	ppm	50 Max.
Bromine	ppm	25 Max.
Nitrogen Trichloride	ppm	5 Max.

NOTES:

- Meets the properties in AWWA Standard B301-10
- Meets the properties in the latest edition of the Food Chemicals Codex (FCC) Cl_2 Monograph.
- Certified by NSF International to NSF/ANSI Standard 60 Drinking Water Treatment Chemicals for use at a maximum level of 30 mg/L.

IMPORTANT:

The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. No warranty or guarantee, expressed or implied, is made regarding performance, stability or otherwise. This information is not intended to be all- inclusive as the manner and conditions of use, handling, storage and other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State, Provincial and local laws.

Date Approved: October 2017
Revision Number: 2017-001

File ID: LPSC/PSCR/Chlorine-10002017

Chemtrade Electrochem Inc.
Customer Service Group
155 Gordon Baker Road
Toronto, Ontario
M2H 3N5
Phone: 1-866-640-1593/1-866-330-3772
Fax: (514) 640-4858

Certified to NSF/ANSI Standard 60

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The Public Health and Safety Organization

NSF Product and Service Listings

These NSF Official Listings are current as of **Tuesday, February 20, 2024** at 12:15 a.m. Eastern Time. Please contact NSF to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information: http://info.nsf.org/Certified/PwsChemicals/Listings.asp?CompanyName=Chemtrade+Electrochem&ChemicalName=Chlorine&PlantCountry=CANADA&

NSF/ANSI/CAN 60
Drinking Water Treatment Chemicals - Health Effects

Chemtrade Electrochem Inc.
155 Gordon Baker Road
Suite 300
Toronto, ON M2H 3N5
Canada
1-866-887-8805
416-496-5856
Visit this company's website (http://www.chemtradelogistics.com)

Facility : No. Vancouver, British Columbia, Canada

Chlorine[CL]

Trade Designation	*Product Function*	*Max Use*
Chlorine	Disinfection & Oxidation	30mg/L

```
[CL] The residual levels of chlorine (hypochlorite ion and hypochlorous acid), chlorine
     dioxide, chlorate ion, chloramine and disinfection by-products shall be monitored in the
     finished drinking water to ensure compliance to all applicable regulations.
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Number of matching Manufacturers is 1

Number of matching Products is 1

Processing time was 0 seconds

CHEMTRADE

SAFETY DATA SHEET

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Our commitment to sustainability.

Chlorine

Section 1. Identification

GHS product identifier : Chlorine

Chemical name : Chlorine

Code : 0007

Other means of identification : Not available.

Product type : Liquid.

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

Identified uses : Pulp bleaching, water treatment, manufacture of plastics, organic and inorganic chlorides, refrigerants and pharmaceuticals.

Supplier's details :

Chemtrade Electrochem Inc.
100 Amherst Ave
North Vancouver, British Columbia
V7H 1S4, CA
Emergency #: (604)-929-3441
Toll free: 1-800-699-6924

Chemtrade Logistics Inc.
Suite 300, 155 Gordon Baker Road
Toronto, Ontario
M2H 3N5, CA
Phone: (416)-496-5856

Emergency telephone number (with hours of operation) : CANUTEC: +1-613-996-6666 or *666 (cellular)
2-C-0808
CHEMTREC, U.S.: 1-800-424-9300 International: +1-703-527-3887
CCN 15610

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : OXIDIZING GASES - Category 1
GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 3
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1
AQUATIC HAZARD (LONG-TERM) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : H270 - May cause or intensify fire; oxidizer.
H280 - Contains gas under pressure; may explode if heated.
H331 - Toxic if inhaled.
H319 - Causes serious eye irritation.
H315 - Causes skin irritation.
H335 - May cause respiratory irritation.
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : P280 - Wear protective gloves. Wear eye or face protection.
P284 - Wear respiratory protection.
P220 - Keep away from clothing, incompatible materials and combustible materials.
P244 - Keep reduction valves free from grease and oil.
P271 - Use only outdoors or in a well-ventilated area.
P273 - Avoid release to the environment.
P260 - Do not breathe vapor.
P264 - Wash hands thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.

Response : P391 - Collect spillage.
P370 + P376 - In case of fire: Stop leak if safe to do so.
P304 + P340 + P310 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician.
P302 + P352 + P362-2 + P363 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse.
P332 + P313 - If skin irritation occurs: Get medical attention.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313 - If eye irritation persists: Get medical attention.
P301 + P330 - if swallowed rinse mouth
P331 - Do not induce vomiting. Seek medical advice.

Storage : P405 - Store locked up.
P410 - Protect from sunlight.
P403 - Store in a well-ventilated place.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Other hazards which do not result in classification/ HHNOC/PHNOC : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Chlorine

Other means of identification : Not available.

CAS number/other identifiers

CAS number : 7782-50-5

Product code : 0007

Ingredient name	%	CAS number
Chlorine	>99	7782-50-5

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Section 3. Composition/information on ingredients

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of lukewarm water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 30 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of lukewarm water. Continue to rinse for at least 30 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Fatal if inhaled. May cause respiratory irritation. May cause lung edema. Symptoms can be delayed.
Immediately dangerous to life or health: 10ppm.

Skin contact : Causes skin irritation.

Ingestion : Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
unconsciousness
shortness of breath
headache
nausea or vomiting
may cause lung damage
Fatal if inhaled.

Section 4. First aid measures

Irritation threshold: approximately 0.5 ppm
Immediately dangerous to life or health: 10 ppm

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : Not the normal route of exposure, causes digestive tract burns.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : Direct water spray. Reacts with water. No water should be sprayed onto a leaking cylinder as spraying of water onto it promotes corrosion at the point of leakage as well as increasing the evaporation rate of chlorine.

Specific hazards arising from the chemical : Oxidizing material. This material increases the risk of fire and may aid combustion. Contact with combustible material may cause fire. This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain. Contact with reactive metals e.g. aluminum, zinc and tin may result in the generation of flammable hydrogen. Water used for fire extinquishing, which has been in contact with the product, maybe corrosive. Water spray on active leak may promote accelerated corrosion of container and accelerate leakage. Risk of fire and explosion when in contact with combustible substances, ammonia and finely divided metals.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
halogenated compounds

Special protective actions for fire-fighters : Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Evacuate area, In case of fire or explosion do not breathe fumes. Cylinders can burst violently when heated, due to excess pressure build up.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Additional protective clothing must be worn to prevent personal contact with this material. Those items include but are not limited to: boots, gloves, hard hat, splash-proof goggles, full face shield and impervious clothing (i.e. chemically impermeable suit).

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. Ventilate enclosed areas to prevent formation of toxic, flammable or oxygen deficient atmospheres. Many gases are heavier than air and will spread along ground and collect in low or confined areas (basements, sewers, tanks).

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel". For response to chlorine gas it is recommended to use as a minimum level "B" protection that is compatible to chlorine. For liquid spills it is recommended to utilize as a minimum enhanced level "B" (Enhanced Level "B" is the addition of a splash hood)/ Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing. Responders can reference Chlorine Institute pamphlet #65 on PPE.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage. Neutralize spilled material and collect spillage.

Methods and materials for containment and cleaning up

Spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves free from grease and oil. Empty containers retain product residue and can be hazardous. Do not reuse container. Use only chlorine-compatible lubricants. Use in a sealed system and/or a well-ventilated area. Observe good hygiene practices.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures. Remove contaminated clothing and protective equipment before entering eating areas.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Protect from sunlight. Store locked up. Separate from reducing agents and combustible materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Contents under pressure. Store at temperatures not exceeding 51°C/123.8°F

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Chlorine	**ACGIH TLV (United States, 3/2016).** TWA: 0.5 ppm 8 hours. TWA: 1.5 mg/m³ 8 hours. STEL: 1 ppm 15 minutes. STEL: 2.9 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2013).** CEIL: 0.5 ppm 15 minutes. CEIL: 1.45 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** CEIL: 1 ppm CEIL: 3 mg/m³

Canada

Occupational exposure limits

Ingredient name	Exposure limits
Chlorine	**CA Alberta Provincial (Canada, 4/2009).** 15 min OEL: 2.9 mg/m³ 15 minutes. 8 hrs OEL: 1.5 mg/m³ 8 hours. 8 hrs OEL: 0.5 ppm 8 hours. 15 min OEL: 1 ppm 15 minutes. **CA British Columbia Provincial (Canada, 5/2015).** TWA: 0.5 ppm 8 hours. STEL: 1 ppm 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** TWA: 0.5 ppm 8 hours. STEL: 1 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 0.5 ppm 8 hours. TWAEV: 1.5 mg/m³ 8 hours. STEV: 1 ppm 15 minutes. STEV: 2.9 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1 ppm 15 minutes. TWA: 0.5 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Eyewash facilities and emergency shower must be available when handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: Chemical goggles/face shield are recommended.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Wear appropriate chemical resistant clothing.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Wear appropriate thermal protective clothing when necessary.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Compressed gas.]

Color : Amber liquid or greenish-yellow gas.

Odor : Pungent.

Odor threshold : <1 ppm

pH : Reacts with water to product acidic solutions.

Melting point : -101°C (-149.8°F)

Boiling point : -34°C(-29.2°F)

Flash point : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not applicable.

Lower and upper explosive (flammable) limits : Not applicable.

Vapor pressure : 638.4 kPa (4788.4 mm Hg) [room temperature]

Vapor density : 2.5 [Air = 1]

Relative density : 2.5

Solubility : Not available.

Solubility in water : 7.41 g/l

Section 9. Physical and chemical properties

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

Viscosity : Dynamic (room temperature): 0.01 mPa·s (0.01 cP)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients. Contact with combustible material may cause fire.

Chemical stability : This product is stable under normal conditions.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Keep away from heat, sparks and open flame. Heat may cause the cylinders to explode.

Incompatible materials : Reacts violently with many organic compounds, ammonia, hydrogen and finely divided metals causing fire and explosion hazard. Attacks many metals in presence of water. Attacks plastic, rubber and coatings. Chlorine is corrosive to most metals in the presence of moisture (>150 ppm water) or at high temperature. Combines with water to produce hydrochloric and hypochlorous acid. Chlorine reacts with carbon monoxide to produce toxic phosgene, and sulphur dioxide to produce sulfuryl chloride.

Hazardous decomposition products : Hydrogen Chloride, Hydrochloric Acids, Hypochlorous Acid.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Chlorine	LC50 Inhalation Gas.	Rat	293 ppm	1 hours

Irritation/Corrosion

There is no data available.

Sensitization

There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

Classification

Product/ingredient name	OSHA	IARC	NTP	ACGIH	EPA	NIOSH
Chlorine	-	-	-	A4	-	-

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Section 11. Toxicological information

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Chlorine	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Fatal if inhaled. May cause respiratory irritation. May cause lung edema. Symptoms can be delayed.
Immediately dangerous to life or health: 10ppm.

Skin contact : Causes skin irritation.

Ingestion : Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
unconsciousness
shortness of breath
headache
nausea or vomiting
may cause lung damage
Fatal if inhaled.
Irritation threshold: approximately 0.5 ppm
Immediately dangerous to life or health: 10 ppm

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : Not the normal route of exposure, causes digestive tract burns.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Coughing, shortness of breath, headache, nausea or vomitting.

Potential delayed effects : Symptoms of Pulmonary edema may be delayed.

Long term exposure

Potential immediate effects : Shortness of breath, coughing

Section 11. Toxicological information

Potential delayed effects : May cause damage to organs (lungs) through prolonged or repeated exposure. Repeated exposures at low levels may cause pulmonary impairment. May also increase the likelihood of respiratory disorders.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Chlorine	Acute EC50 5.1 ppm Marine water Acute EC50 930000 µg/L Fresh water Acute LC50 2.03 µg/L Fresh water Acute LC50 30 µg/L Fresh water Acute LC50 14 µg/L Fresh water	Algae - Macrocystis pyrifera - Young Aquatic plants - Lemna minor Crustaceans - Asellus racovitzai Daphnia - Daphnia pulex Fish - Oncorhynchus mykiss	4 days 4 days 2 days 48 hours 96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not applicable.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Follow label warnings even after cylinder is emptied.

Section 13. Disposal considerations

Section 14. Transport information

	DOT	TDG	IMDG	IATA
UN number	UN1017	UN1017	UN1017	UN1017
UN proper shipping name	CHLORINE. Marine pollutant (Chlorine) RQ	CHLORINE. Marine pollutant (Chlorine)	CHLORINE. Marine pollutant (Chlorine)	CHLORINE
Transport hazard class(es)	2.3 (5.1, 8) 	2.3 (5.1, 8) 	2.3 (5.1, 8) 	2.3 (5.1, 8) 
Packing group	-	-	-	-
Environmental hazards	Yes.	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.
Additional information	Toxic - Inhalation hazard Zone B This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173. 24 and 173.24a. **Reportable quantity** 10 lbs / 4.54 kg [0.47974 gal / 1.816 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 2, B9, B14, T50, TP19	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.23-2.25 (Class 5), 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark). The marine pollutant mark is not required when transported by road or rail. **Special provisions** 102	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.	The environmentally hazardous substance mark may appear if required by other transportation regulations. **Passenger and Cargo Aircraft** Quantity limitation: Forbidden **Cargo Aircraft Only** Quantity limitation: Forbidden

AERG : 124

Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **United States inventory (TSCA 8b)**: This material is listed or exempted.

Clean Water Act (CWA) 311: Chlorine

Clean Air Act (CAA) 112 regulated toxic substances: Chlorine

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

Name	EHS	SARA 302 TPQ		SARA 304 RQ	
		(lbs)	(gallons)	(lbs)	(gallons)
Chlorine	Yes.	100	-	10	-

SARA 304 RQ : 10 lbs / 4.5 kg [0.48 gal / 1.8 L]

SARA 311/312

Classification : Sudden release of pressure
Immediate (acute) health hazard

Composition/information on ingredients

Name	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Chlorine	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number
Form R - Reporting requirements	Chlorine	7782-50-5
Supplier notification	Chlorine	7782-50-5

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

Section 15. Regulatory information

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

No products were found.

This product has been certified to NSF/ANSI 60 (certificate number 07871-01) for a Maximum Use Level (MUL) of 30 mg/L.

Canada

Canadian lists

Canadian NPRI : This material is listed.

CEPA Toxic substances : This material is not listed.

Canada inventory : This material is listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health : 4 * **Flammability :** 0 **Physical hazards :** 1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Health : 4 **Flammability :** 0 **Instability :** 1 **Special :** OX

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Procedure used to derive the classification

Classification	Justification
OXIDIZING GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Compressed gas	According to package
ACUTE TOXICITY (inhalation) - Category 3	On basis of test data
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2A	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Expert judgment
AQUATIC HAZARD (ACUTE) - Category 1	Expert judgment
AQUATIC HAZARD (LONG-TERM) - Category 1	Expert judgment

History

Section 16. Other information

Date of issue mm/dd/yyyy	:	03/30/2017
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Version	:	2
Prepared by	:	

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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