372 Bay Street
Suite 901
Toronto, Ontario
M5H 2W9
416-628-0216

April 18, 2014

Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU
X0E 1J0
(867) 360-6338

Re: 2AM-DOH1323 – Updated Wastewater Treatment Management Plan

Dear Ms. Beaulieu,

Please find enclosed with this letter the updated Doris North Wastewater Treatment Management Plan as per Part G Item 4 of licence 2AM-DOH1323. Also included with this package is a CD of the plan. This update addresses the transfer of ownership from Hope Bay Mining Ltd. to TMAC Resources Inc. and the requirements of Part G Item 4.

Should you have any questions regarding this submission, please do not hesitate to contact me at lea-marie.bowes-lyon@tmacresources.com.

Sincerely,

Léa-Marie Bowes-Lyon
Tenure and Permitting Manager
Hope Bay Project

Doris North Wastewater Treatment Management Plan

Prepared for

TMAC Resources Inc.

Prepared by

SRK Consulting (Canada) Inc.
1CT022.001
March 2014

Doris North Wastewater Treatment Management Plan

March 2014

Prepared for

TMAC Resources Inc.
372 Bay Street, Suite 901
Toronto, ON M5H 2W9
Canada

Tel: +1 416 628 0216
Web: www.tmacresources.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel: +1 604 681 4196
Web: www.srk.com

Project No: 1CT022.001

File Name: Doris North Wastewater Treatment Management Plan 1CT022_001 20140324_FNL.docx

srk consulting

Table of Contents

List of Figures

List of Tables

Appendicies

1 Introduction

The Hope Bay Project is owned and operated by TMAC Resources Inc. Operation of a wastewater treatment plant (WTP) at the site is an integral part of the activities associated with the continued exploration, mining, and infrastructure development of the project. The plant is designed to remove contaminants from the wastewater produced at the Doris North Camp (Figure 1).

This plan, submitted by TMAC, presents the management and monitoring obligations for the plant. It also demonstrates how these obligations will be met in accordance with the existing Type A Water Licence (No. 2AM-DOH1323) issued by the Nunavut Water Board.

1.1 Background

The project is located on Inuit owned land administered by the Kitikmeot Inuit Association (KIA), in the West Kitikmeot region of Nunavut, approximately 125 km southwest of Cambridge Bay.

Prior to this plan, a number of amendments and modifications to the original Type A Water Licence (No. 2AM-DOH0713) and Type B Water Licence (No. 2BE HOP0712) were submitted to the Nunavut Water Board (NWB) for review and approval. These amendments and modifications also required revisions to the wastewater treatment plan. A chronological account of these revisions is provided in Table 1.

Table 1: Doris North Wastewater Treatment Plan Revision History

Document Title	Author	Release Date	Key Changes
Doris North Sewage Management Plan (Rev 0)	Newmont, Hope Bay Mining Company Ltd. (SRK)	July 2008	Initial version of plan submitted in accordance with Type A Water Licence 2AM-DOH0713 and Type B Water Licence 2BE-HOP0712
Doris North Infrastructure Project Sewage Management Plan (Rev 1)	Newmont, Hope Bay Mining Company Ltd. (SRK)	March 2009	Submitted in accordance with Type A Water Licence 2AM-DOH0713 and Type B Water Licence 2BE-HOP0712
Waste Water Treatment Management Plan (Rev 2)	Newmont, Hope Bay Mining Company Ltd.	March 2012	Updated for Doris North, added Sanitherm® system, removed Matrix Camp and submitted in accordance with Type A Water Licence 2AM-DOH0713

Document Title	Author	Release Date	Key Changes
Waste Water Treatment Management Plan (Rev 3)	Newmont, Hope Bay Mining Company Ltd.	October 2012	Included use of old discharge point, discharge to overburden pile as per approvals from AANDC and submitted in accordance with Type A Water Licence 2AM-DOH0713
Doris North Wastewater Treatment Management Plan (Rev 4)	TMAC Resources Inc. (SRK)	March 2014	Transfer of ownership and re-activation of construction activities. Revised plan in accordance with Type A Water Licence 2AM-DOH1323

1.2 Water Licence Requirements and Regulations

The Doris North Camp and adjacent facilities (Figure 1) are operated in accordance with the Water Licence (No. 2AM-DOH1323). Table 2 provides a summary of the requirements for the operation of the Doris North Wastewater Treatment Plant as set forth in the Water Licence and where in this plan each of these requirements are addressed.

Table 2: Table of Concordance with Type A Water Licence (No. 2AM-DOH1323)

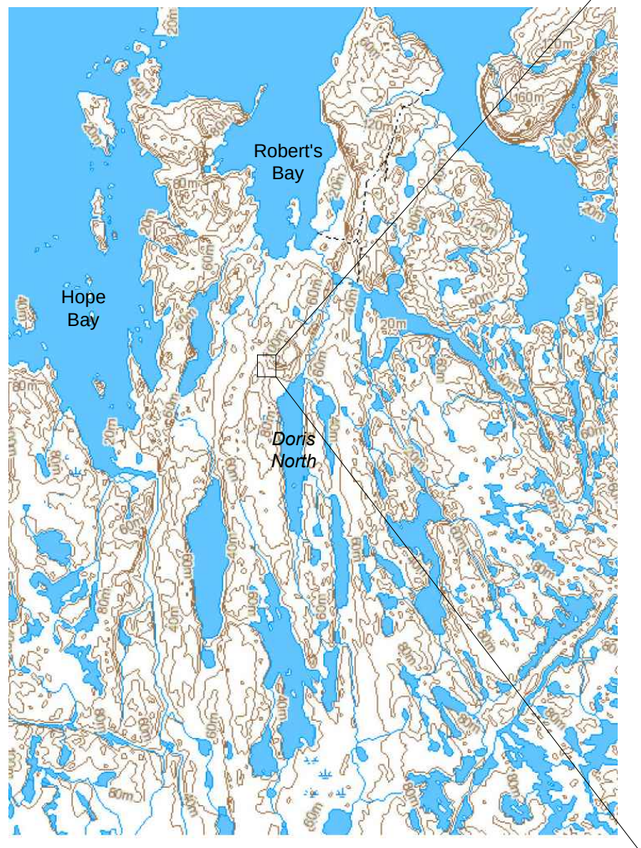
Licence Ref.	Licence Requirement (2AM-DOH1323)	Management Plan Ref.	Management Response/Specification
Part D. 19	The Licensee shall operate the Wastewater Treatment Plant in accordance with conditions provided in Part G, Item 3 with compliance at monitoring station ST-8 during construction	N/A	Plant is built
Part G. 3	The Licensee shall operate the Wastewater Treatment Plant in accordance with the following:	see below	
Part G. 3. a	All sewage and greywater shall be collected and treated in the Wastewater Treatment Plant	Section 2.3	Addressed in this report

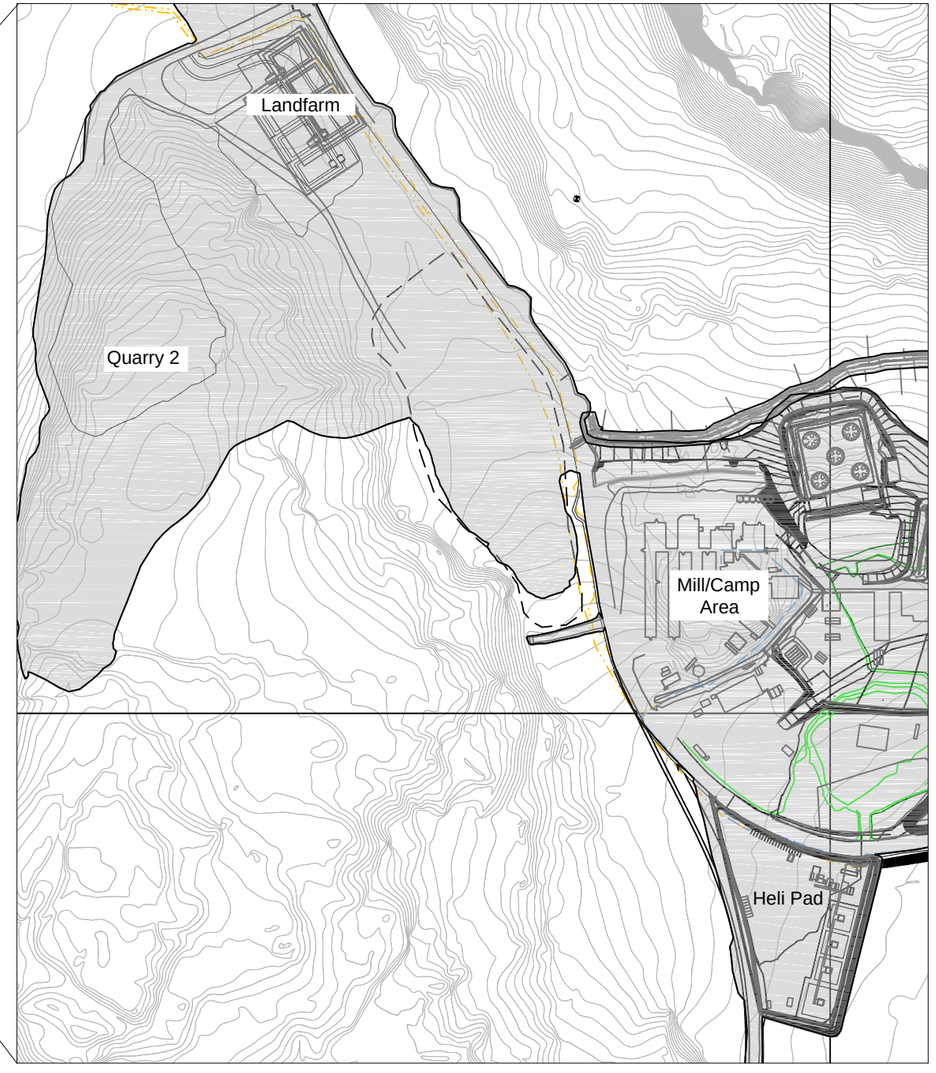
Licence Ref.	Licence Requirement (2AM-DOH1323)	Management Plan Ref.	Management Response/Specification
Part G. 3. b	During the construction and care and maintenance phases, all effluent discharged from the Wastewater Treatment Plant at monitoring station ST-8 shall not exceed the following quality limits:	Section 3.2	Addressed in this report
Part G. 3. c	All effluent from the Wastewater Treatment Plant shall be discharged approximately 1000 metres north of the camp pad;	Section 2.7.1	Addressed in this report
Part G. 3. d	During operations, effluent from the Wastewater Treatment Plant shall be discharged to the Tailings Impoundment Area, or as required, to the tundra as per Item 3(c) upon providing notification to an Inspector; and	Section 2.7.1	Addressed in this report
Part G. 3. e	The Licensee shall notify an inspector at least ten (10) days prior to start-up of the Wastewater Treatment Plan and subsequent discharge from the facility, indicating the discharge location.	Section 2.7.1	Addressed in this report
Part G. 4	The NWB has approved the plan “Hope Bay Mining Ltd. Wastewater Treatment Management Plan, October 2012 (Rev 3)”. The Licensee shall submit a revised Plan to the Board for review, sixty (60) days prior to re-commissioning of the Wastewater Treatment Plant, that takes into consideration the following:	see below	
Part G. 4. a	Operation, maintenance and sludge management; and	Section 2	Addressed in this report

Licence Ref.	Licence Requirement (2AM-DOH1323)	Management Plan Ref.	Management Response/Specification
Part G. 4. b	Comments received during the review of the March 2012 (Rev 2) Plan as well as the technical review comments provided on the October 2012 (Rev 3) Plan through the renewal application process.	Section 2.6 and 2.7.1	Addressed in this report
Part J. 12	The Licensee shall measure and record all flow and volume measurements on a monthly basis, during the operations, and any use of water (unless otherwise stated):	Section 3.1	Addressed in this report
Part J. 12. f	The volume of sewage sludge removed from the Wastewater Treatment Plant and the locations or method of sewage sludge disposal during construction, operation and closure	Section 2.7.2, and 3.1	Addressed in this report
Part J. 20.	The Licensee shall visually monitor and record observations, to be made available to an Inspector upon request, on a daily basis during periods of discharge onto the tundra from:	see below	
Part J. 20. f	Wastewater Treatment Plant (during the construction phase)	Section 3.1	Addressed in this report
Part J. 21.	The Licensee shall, within thirty (30) days following the month being reported, submit to the NWB a monthly monitoring report in an electronic and hardcopy. The report shall include the following:	see below	
Part J. 21. a	All data and information required by this Part and generated by the Monitoring Program in the Tables of Schedule J	Section 3.1 and 3.2	Addressed in this report

This wastewater treatment management plan is also based on the following regulations:

- Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, prepared by the NWT Municipal and Community Affairs - Community Development (Duong and Kent 1996)
- Consolidation of Environmental Protection Act (Government of Nunavut 2014)
- Consolidation of the Environmental Rights Act (Department of Justice 2014a)
- Consolidation of Camp Sanitation Regulations (Department of Justice 2014b)
- Environmental Guideline for General Management of Hazardous Waste (Department of Environment 2010)





srk consulting	TMAC RESOURCES	Doris North Project Wastewater Management Plan
SRK JOB NO.: 1CT022.001	Hope Bay Project	Location Map
FILE NAME: 1CT022.001_doris_north_SMP_Overview.dwg	DATE: February 2014 / APPROVED: MP/ML	FIGURE: 1

\\SSK-SVR0.saskcns.srk.ca\Saskatoon Projects\GL_SITES\Hope Bay\000_Base_Files\Acad\1CT022.001\1CT022.001_doris_north_SMP_Overview.dwg

2 Wastewater Treatment Management

2.1 Roles and Responsibilities

TMAC's Chief Operations Officer has overall responsibility for this plan and will provide the resources to operate and maintain the WTP.

The surface manager has responsibility at the Doris North Camp to:

- Implement this management plan,
- Provide the on-site resources required to operate, manage, and maintain the WTP in accordance with this management plan and the WTP operation manual,
- Conduct regular inspections of the WTP and audits of the maintenance records, and
- Provide input on modifications to design and operational procedures to improve operational performance of the facility.

The environment manager has the responsibility to:

- Review and update this management plan as required,
- Sample the treated wastewater, report on the performance of the wastewater treatment facilities, and assess whether the treated wastewater has met applicable regulatory standards, and
- Provide operational personnel with direction as to where the WTP sludge should be moved.

The WTP operator has the responsibility to:

- Provide input on modifications to design and operational procedures to improve operational performance of the facility,
- Provide technical expertise for the operation and maintenance of the WTP, and
- Maintain the WTP maintenance records.

2.2 Background

The WTP treats and removes contaminants (organic, inorganic, and bacteria) from wastewater generated from toilets, showers, sinks, and the kitchen on site. The treatment of wastewater occurs at various levels and incorporates physical, chemical, and/or biological methods, including:

- Mechanical treatment—physical removal of large objects such as floatables and grease,
- Primary treatment—physical removal of suspended and faecal solids by precipitation,
- Secondary treatment—removal of organic matter via biological/chemical processes, and

- Tertiary treatment—physical removal of residual suspended solids (after secondary treatment).

The treatment process produces two separate waste streams:

- A clean waste stream (or treated effluent) suitable for discharge back into the environment, and
- A solid waste (or sludge) suitable for proper disposal.

A packaged WTP designed for small populations may combine two or more treatment stages. Often, a tank (e.g., primary settling tank or equalization tank) is installed to collect wastewater prior to entering the package treatment system. This tank may be the primary treatment tank where solids are settled and the liquid is transferred for further treatment. The secondary treatment stage is where bacterial activity is used to break down the biological content of the wastewater. After the biological content is broken down, the liquid is pressed through a membrane or filter to remove residual total suspended solids prior to removal from the system to the discharge location (tertiary treatment).

The majority of WTPs are based on aerobic biological processes where organic compounds are degraded and ammonia is converted to nitrate. The treatment system must be well-aerated and include suitable nutrients for the bacteria to perform effectively. Sludge is produced from a combination of decaying bacteria from the biological processes and settled particles. This sludge is separated for proper disposal.

The efficiency of treatment of organic compounds in the WTP are measured by biochemical oxygen demand (BOD_5), ammonium (NH_4-N), phosphorus, oil and grease, and total suspended solids.

2.3 Doris Camp Membrane Biological Reactor Wastewater Treatment Plant

The Doris Camp has two Sanitherm® membrane biological reactor (MBR) WTPs housed in seven 40 foot long containers. Each plant has the capacity to manage the average waste volume generated by 180 people as well as the capacity to accept raw wastewater and sludge from other WTPs into its surge and conditioning tanks. The Doris North Camp is currently permitted to accommodate 180 people, which is half the maximum design capacity of the two plant system at the Doris Camp.

The treatment process operates aerobically and anoxically. It can treat the carbon fraction of the wastewater (the BOD_5) and address ammonia and other nitrogen containing compounds to some extent. Ammonia reductions exceeding 95% are possible with this type of WTP.

A regular cleaning process is necessary to maintain the membrane filter. Under continual operation (i.e., 24 hours/day and 7 days/week), the Sanitherm filter has a life of three to five years before requiring replacement. With cleaning and extremely good wastewater preparation and screening, a life of seven years may be possible.

2.4 Membrane Biological Reactor Wastewater Treatment Plant Process

The Sanitherm membrane biological reactor WTP consists of the following major processes:

- Pre-treatment—primary settling and equalization,
- Biological treatment and effluent separation—anoxic treatment, aeration, and membrane reactor,
- Treated effluent discharge,
- Sludge de-watering (membrane press), and
- Clean in-place (CIP) system.

The general layout of the plant and the process diagram are provided in Figure 2 and Figure 3. The full operation and maintenance manual for the system is included in Appendix A. The operation and maintenance manual also describes the critical operating limits as well as potential operational failures and alternatives.

2.4.1 Pre-treatment Primary Settling/Screening

Separate pre-treatment methods are used for each of the WTP systems. In system #1, wastewater enters the WTP flowing into the primary settling tank, which is divided by a bulkhead into two sections. Settling occurs in the first section while aeration for odour control and mixing by coarse bubble diffusers occurs in the second section. Wastewater then flows from the primary settling tank into the equalization tank through a basket screen. In system #2, wastewater enters the WTP flowing through a travelling screen inside of a primary screened tank. Wastewater then flows from the primary screening tank into the equalization tank through a basket screen. Materials removed by the basket screens are dewatered and are disposed of with the sludge.

Wastewater enters the WTP in two ways:

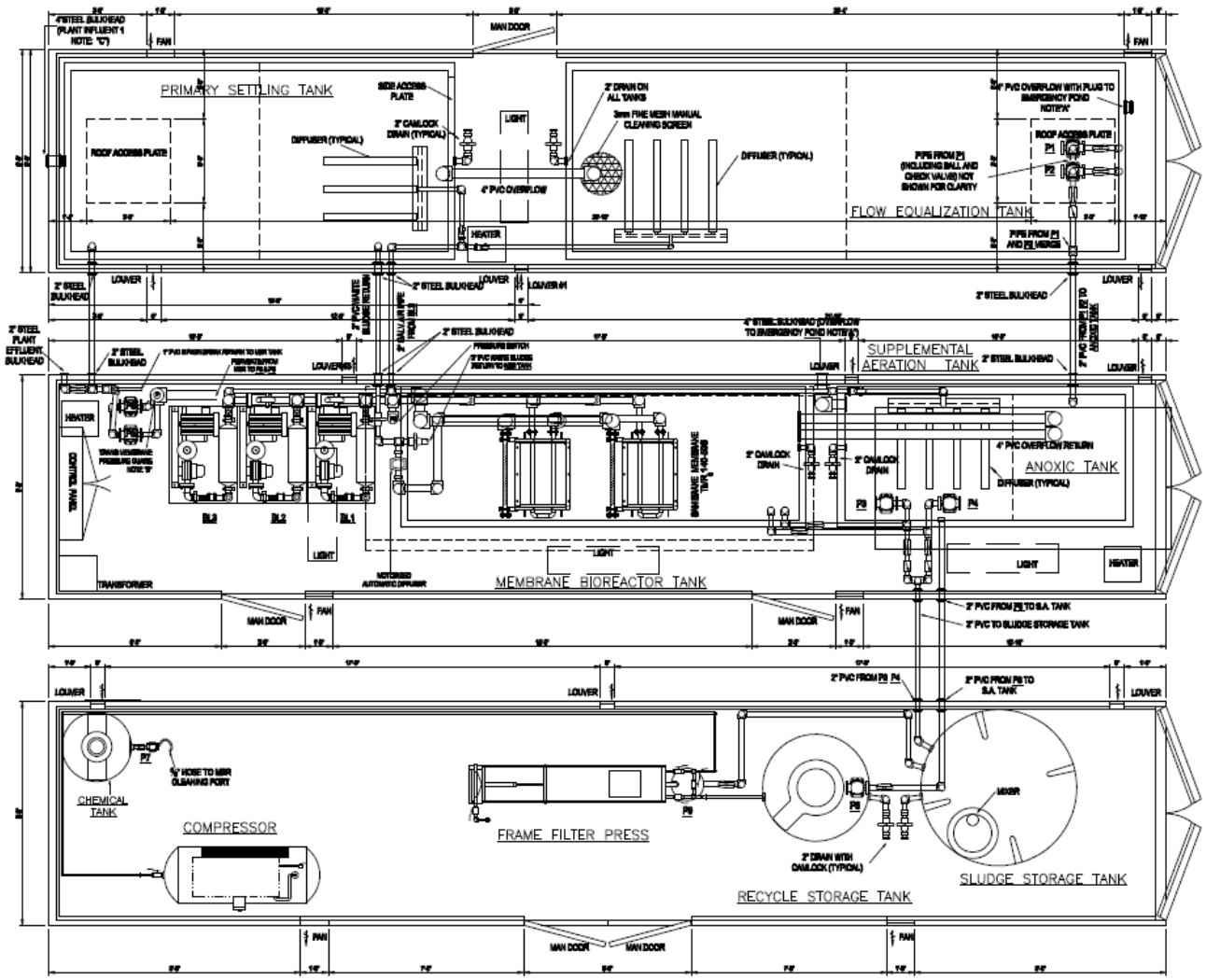
- Piped directly from Doris Camp through a heat traced line, and
- Transferred with a wastewater truck from washcars placed around the project site into the Doris wastewater stream through one of the lift stations.

2.4.2 Pre-Treatment Equalization

The equalization tanks provide a reservoir for the fluctuating wastewater feed, allowing the downstream biological process to be fed at a constant rate. The equalization tank is divided into two sections by a bulkhead and is designed to hold a volume up to 3,880 L with an average flow of approximately 0.95 L/s. The tank has coarse bubble aeration for mixing to reduce odours.

Two submersible equalization pumps are located in the tank and provide the forward flow at a controlled rate of 0.95 L/s. The pumps operate with one primary duty pump running at design flow and one in standby. The standby pump automatically responds if the primary duty pump fails, because the system is controlled by a programmable logic controller. The tanks are equipped

with level switches and alarms. The flow to the anoxic tank is set by throttling ball valves. By the end of equalization, actual removal of any organic compounds is minimal and incidental. Aeration in the equalization tank may remove 5% of the BOD_5 and some organics may be collected by screening.



Note: WTP #2 at Doris Camp shares the primary settling tank and the sludge tank and filter press with WTP #1.

Figure 2: General Layout Wastewater Treatment Plant 1

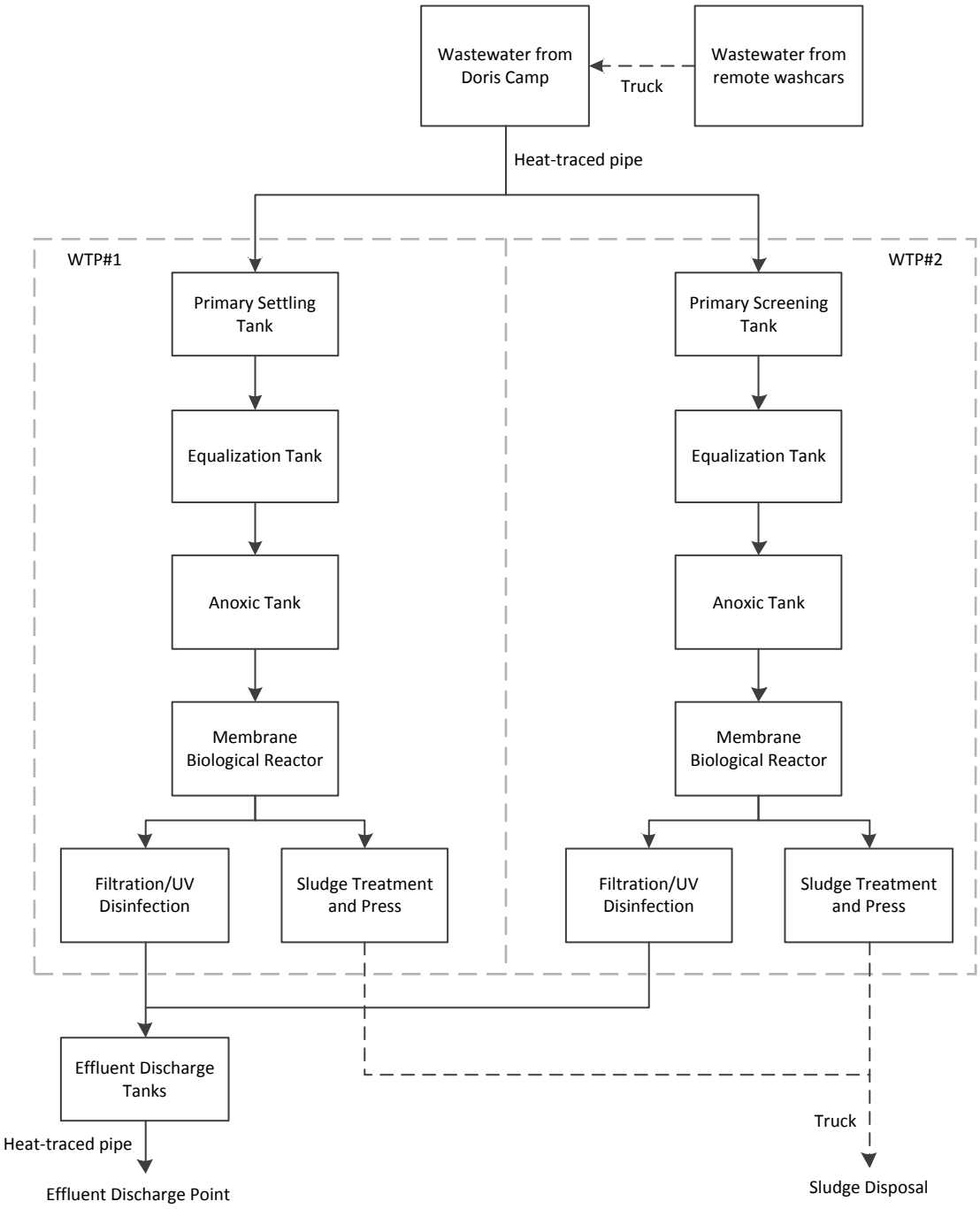


Figure 3: Wastewater Treatment Process Flow Diagram

2.4.3 Biological Treatment and Effluent Separation Anoxic Tank

The anoxic tank is divided by a bulkhead to form anoxic and supplemental aeration tanks. The flow into the anoxic tank is received from the equalization tank and a recycle flow from the membrane reactor tank. The mixing of streams forms a mixed liquor with a suspended solids concentration ranging from 10,000 to 20,000 mg/L. The recycle flow contains high levels of nitrates (NO_3-N), which are the end products of nitrification (ammonia removal). Under anoxic conditions (zero dissolved oxygen), the nitrates are removed and in the conversion a portion of the BOD_5 is also removed. To achieve anoxic conditions, the tank is not aerated, but mixing is provided by bubble diffusers using a manual ball valve on the air line.

The process switches, pumps, and alarms are controlled by a programmable logic controller. In the event of high flows, the equalization tank pumps are stopped. In the event only low levels of effluent liquid are available for processing, timers are activated and the process enters into a sleep mode. Sleep mode involves periodically turning on blowers for scouring in the membrane modules and provides minimal mixing to the equalization tank. The entire system stays in sleep mode until the equalization tank is reactivated and levels in the anoxic tank are raised. Transfer pumps forward the partially treated liquid to the membrane reactor.

2.4.4 Membrane Biological Reactor

The MBR step in the process provides the same aeration as in the previous step, with the added purpose of separating the biological solids from the flow stream, thereby creating a highly treated, acceptable effluent for disposal (Figure 4). Also, like the previous tank, the mixed liquor suspended solids will range from 10,000 to 20,000 mg/L.

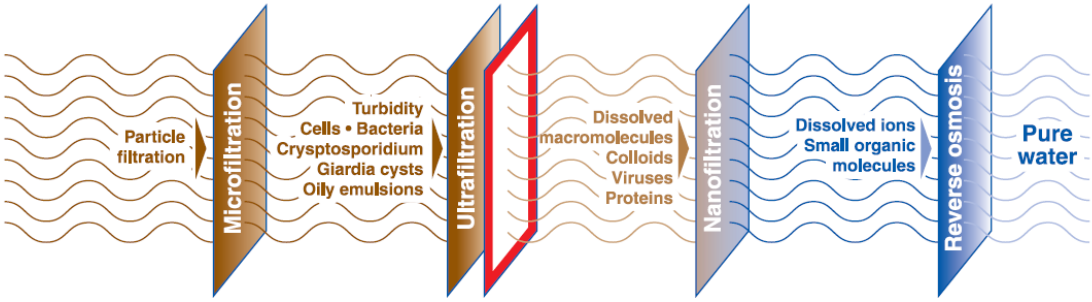


Figure 4: Sanitherm Membrane Shown in Red (0.08 micron pore size) and the Quality of the Water that is Produced with Different Types of Filtration

The aluminum MBR tank houses one membrane module that acts as the aeration and the separation device. Air is provided to the unit from the membrane blower and serves primarily as a cleaning or scouring mechanism, while simultaneously providing air for mixing and process oxygenation. Two blowers are used: a primary duty blower and a standby blower. Two effluent pumps are associated with the membrane reactor tank. One operates as a primary duty pump and the other as a standby unit. The pumps are responsible for removing treated effluent from the module at a rate of 0.95 L/s.

This module is protected by level switches, alarms, and the programmable logic controller. The float switches in the membrane tank prevent the water level above the membrane module from falling to a level where the unit can be affected. On low level alarms, the permeate pumps are deactivated. In addition, the permeate pumps cannot be operated if scouring air is cut off; therefore, the blower pressure supply is monitored. Failure to supply air because of motor failure or failure to pressurize the line (possibly due to blockage or V-belt failure) prevents the effluent pumps from operating. This prevents poor quality effluent from leaving the Sanitherm unit. Failure of the main membrane blower triggers an alarm and results in start-up of the standby unit. Recycle liquid flow continues regardless of equalization pump or effluent pump operation. The effluent removed by the permeate pump is discharged (to the tundra), while overflow from the MBR tank is recycled back to the anoxic tank

After the MBR, the treated effluent is pumped through the UV disinfection modules (separate modules are in each WTP) and then into the effluent discharge trailer.

2.5 Care and Maintenance Treatment Options

During care and maintenance or any other period when the camp population is low, it may be necessary to shut down the existing WTP at the Doris Camp. The manufacturer indicates that the system can operate with low wastewater inputs; however, TMAC may, depending upon the camp head count in 2014 going forward, bring in a smaller rotating biological contactor or MBR plant that would potentially be more efficient with a small camp population. A smaller plant would meet all the licence discharge criteria and appropriate legislation and regulations. If the camp population is sufficiently small, TMAC may choose to switch to an alternate toilet system (i.e., Pacto, composting) and will manage waste according to appropriate legislation and regulations.

2.6 Treatment Option Contingency

During Hope Bay Project operations, if Doris North Camp population is above 180 people both WTPs would need to be in operation; therefore, no backup treatment plant would be available. To ensure sufficient wastewater treatment capacity during these times, TMAC has multiple bladders and holding tanks available onsite to hold untreated effluent. TMAC would also place restrictions on water usage to minimize the amount of wastewater produced. If required, they may also reduce the number of people at camp by providing off-site housing. Untreated wastewater stored temporarily would later be fed into the plant once repaired at a rate appropriate for effective plant treatment.

2.7 Waste Disposal

2.7.1 Effluent Discharge

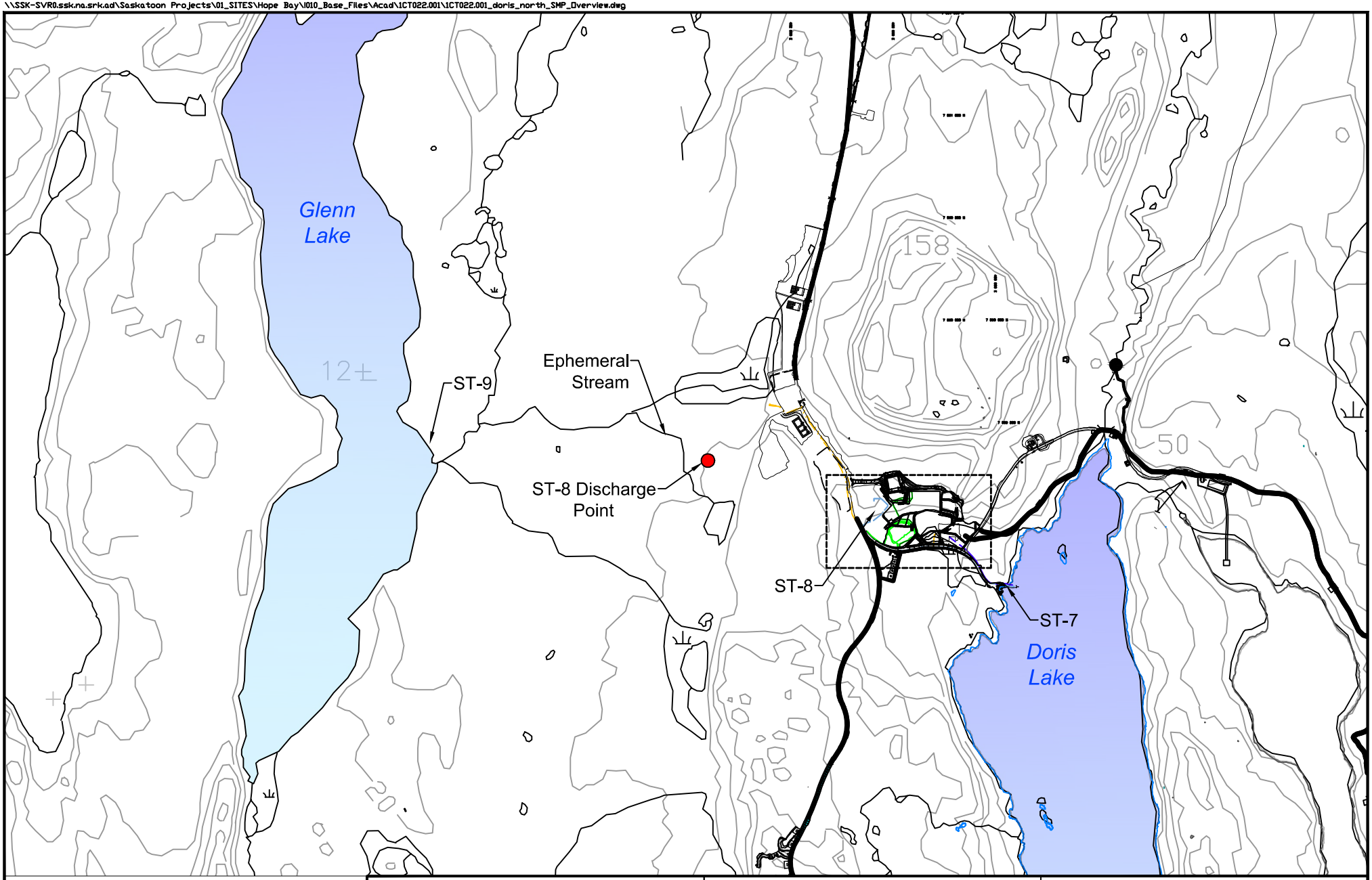
Ten days prior to the start-up or recommissioning of the WTP following a shut-down, TMAC will notify the inspector and provide the location of effluent discharge. Currently the effluent discharge from the WTP occurs from the effluent discharge trailer through a pipeline to, preferentially, theST-8 discharge point (UTM 432125E 7559324N), which is located on a rock outcrop, approximately 1 km northwest of the Doris Camp (Figure 5 and Figure 6). The wastewater effluent monitoring station (ST-8) is located inside the WTP on the effluent discharge line.

A three-inch diameter HDPE pipeline was laid from the WTP to the tundra discharge point northwest of Quarry 2. The effluent is fed into the discharge pipeline by pumps in the effluent discharge trailer. The discharge is directed to the tundra through a diffuser which drains west towards Glenn Lake (UTM 430285E 7560303N), which is over 1 km from the discharge point. The wastewater discharge diffuser was designed to reduce the discharge energy, disperse the effluent, and minimize erosion or vegetation damage from ice build-up. Erosion protection needs are monitored routinely at the discharge point and the down slope area to ensure the erosion management is effective.

Occasionally, TMAC may be required to discharge to the old tundra discharge point, located next to the batch plant pad. This location requires less heat trace to thaw the pipeline for spring start-up and fall shutdown activities. This location is routinely used in winter months during care and maintenance activities, as permitted by the inspector, as very low flows in the pipe would freeze in transit to the distant discharge point.

As permitted in the water licence per Part G Item 3d, during operations TMAC may discharge effluent into the tailings impoundment area or to the tundra (as required), upon providing notification to the inspector. TMAC will transfer treated effluent to the tailings impoundment area prior to operations provided the proper infrastructure is in place.

\\SSK-SVR0.ssk.na.srk.ad\Saskatoon Projects\01_SITES\Hope Bay\l010_Base_Files\Acad\1CT022.001\1CT022.001_doris_north_SMP_Overview.dwg



0 200 400 600 800 1000

Scale in Metres

srk consulting

SRK JOB NO.: 1CT022.001

FILE NAME: 1CT022.001_doris_north_SMP_Overview.dwg

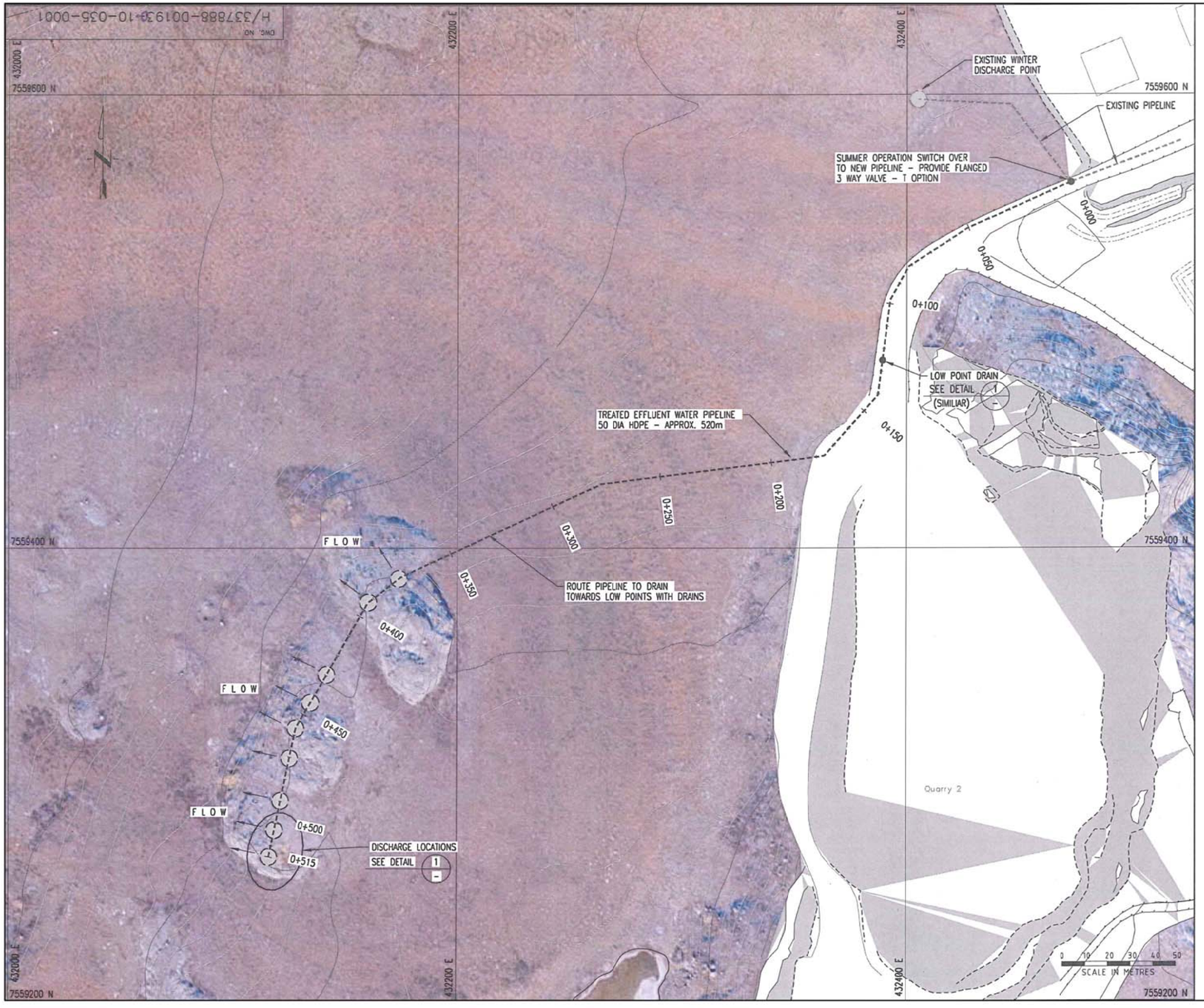
MAC RESOURCES

Hope Bay Project

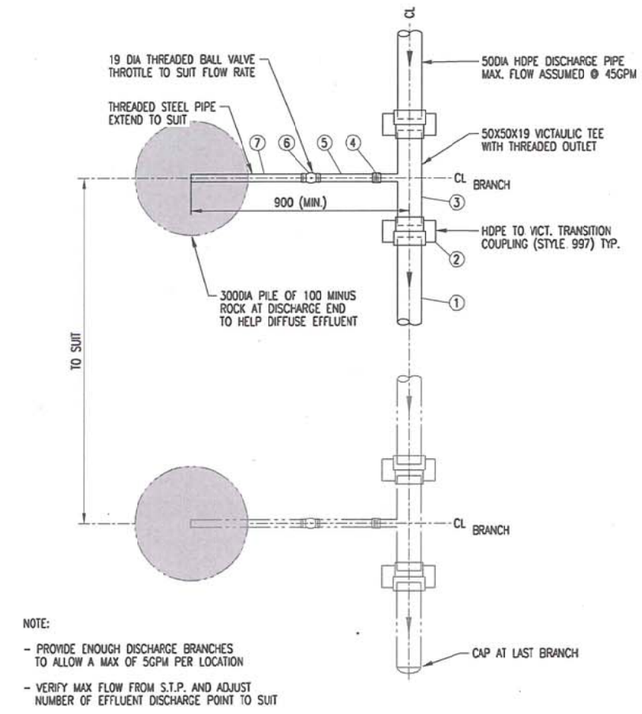
Doris North Project Wastewater Management Plan

Station Locations

DATE:	APPROVED:	FIGURE:
February 2014	MP/ML	5



ITEM	DESCRIPTION	QUANTITY
1	50 DIA SDR17 HDPE PIPE	520m
2	GROOVE TO FLANGE TRANSITION CPLG (VICTAULIC OR EQUIV.)	20
3	50x50x19 GROOVED TEE (VICTAULIC OR EQUIV.)	10
4	19 DIA THREADED CPLG	10
5	15D LONG THREADED NIPPLE	10
6	19DIA THREADED BALL VALVE	10
7	300 LONG THREADED NIPPLE	9
8	50 DIA HDPE CAP	1
9	50 DIA FLANGE ADAPTER – STUB END WITH FLANGE	3
10	50 DIA 3 WAY FLANGED VALVE – FULL PORT – T OPTION	1



NOTE:

- PROVIDE ENOUGH DISCHARGE BRANCHES TO ALLOW A MAX OF 5GPM PER LOCATION
- VERIFY MAX FLOW FROM S.T.P. AND ADJUST NUMBER OF EFFLUENT DISCHARGE POINT TO SUIT

SUMMER DISCHARGE ARRANGEMENT

DETAIL 1 – N.T.S.

\\SSK-SVR\saskcns.srkad\Saskatoon Projects\01_SITES\Hope Bay\000_Base_Files\Acad\1CT022.001\1CT022.001_doris_north_SMP_Overview.dwg

srk consulting	TMAC RESOURCES	Doris North Project Wastewater Management Plan
SRK JOB NO.: 1CT022.001		Sewage Disposal Diffuser Plan and Detail
FILE NAME: 1CT022.001_doris_north_SMP_Overview.dwg	Hope Bay Project	DATE: March 2014 / APPROVED: MP/ML / FIGURE: 6

2.7.2 Sludge Dewatering, Destruction, and Use

Sludge dewatering is a manual process. The WTP operator directs some of the flow from the anoxic and supplemental aeration tank via pumps to the sludge holding tank. Polymers for thickening sludge may be added to the mixing tank. The solution is then pumped to a plate and frame press with filtrate directed to the sump from where it is periodically pumped back to the anoxic and supplemental aeration tank by a submersible pump. Dewatered sludge is collected in a sludge hopper and is removed for disposal.

The sludge has a typical solids content of 25-30% after the frame press. Under normal operations the sludge is incinerated in accordance with the Incinerator Management Plan (HBML 2012), or buried in the overburden pile when the pile is not frozen.

TMAC may replace the incineration of dewatered sludge with one or more of the following alternatives, which could then be used for future reclamation activities:

- Placement in covered pits in the overburden stockpile,
- Composting, or
- Placement at isolated reclamation sites.

2.7.3 Care and Maintenance Waste Disposal Options

During care and maintenance, the treated effluent and sludge disposal options will remain as described in sections 2.7.1 and 2.7.2. The disposal locations and volumes of effluent and sludge will continue to be reported in the monthly and annual water licence reports.

During seasonal shutdown activities, TMAC may separate the greywater from the blackwater to reduce the quantity of wastewater that needs to be held in the storage tanks over winter. As per discussions with AANDC, the greywater will be discharged onto the overburden pile by Quarry 2 during the shutdown of the WTP.

2.8 Sanitherm Membrane Cleaning and Critical Operating Limits

2.8.1 Sanitherm Clean-In-Place System Organic Cleaning

A mild solution of sodium hypochlorite (0.5%) is added to the membrane modules for cleaning as required. The system requires cleaning if there is an increase of more than 3 psi (20 kPa) in the initial daily readings between the discharge headers in the MBR tank and the discharge pressure on the effluent pump. A chemical feed pump introduces 500 L of sodium hypochlorite solution into the module and the system is allowed to soak for several hours. If an inorganic cleaning is required, a solution of oxalic acid or citric acid is used instead of sodium hypochlorite.

The majority of the cleaning agents are consumed and their oxidizing potential reduced during the cleaning process. Under normal circumstances, the water from the plant is discharged as part of the effluent stream. However under the current temporary operating procedure, the effluent stream is discharged to the tundra and the water from the cleaning process is collected and

returned to the front end of the WTP. This ensures any oxidizing potential is completely consumed and the water is subjected to further dilution and treatment with new raw wastewater.

2.8.2 Critical Operating Limits

For a complete list of installation, operation and maintenance requirements, refer to the manufacturer's manual (Appendix A). The following points are noted by the manufacturer as critical operating limits that must be met to ensure proper system operation, maximum lifespan and good effluent quality:

- The Sanitherm WTP is designed to treat normal human domestic waste from toilets, showers, laundry, and kitchens.
- The Sanitherm system is not designed to treat industrial wastes, chemical cleaning agents, bactericides, or any product that is toxic to the bacteria.
- Only biodegradable detergents and products should be used in effluent feeds.
- Kitchen grease traps must be well serviced to prevent overloading the Sanitherm system with oils and grease.
- Plastic, rubber, and other non-biodegradable items must be kept out of the wastewater flow.
- The Sanitherm unit must be protected from freezing. Maintain a temperature range from 5 to 40°C (41 to 104°F).
- The effluent discharge from the Sanitherm unit must not be used for drinking water.
- Sanitherm effluent water should be tested for suitability before it is used again.
- To protect the membranes and prevent clogging, design the peripheral equipment in such a way that the raw water is supplied to the membrane submerged basin via a screen with openings 3 mm or less.
- Avoid applying pressure to the permeate side.
- Large amounts of iron, manganese, calcium, and/or silica may cause clogging in the membrane.

2.9 Wastewater Treatment Plant Operator Training

Thorough knowledge of the operation and maintenance of the WTP is required to properly operate the plant and achieve compliant effluent discharge limits. TMAC has a designated WTP operator, provided by the camp catering and maintenance contractor, who manages all aspects of the plant and performs the routine maintenance as specified by the manufacturer in the Operation and Maintenance Manual (Appendix A). New WTP Operators are provided with mentoring and on-the-job training by an experienced operator.

3 Wastewater Treatment Plant Monitoring and Reporting

3.1 Record Keeping

Records of operation and maintenance are required to evaluate the effectiveness of the WTP operation. Daily records include the following information:

- Volume and discharge location of any effluent discharged to environment,
- Sludge volume pressed and removed from the plant, and
- Details of any maintenance undertaken at site.

Record sheets are stored in the camp catering office and the daily operations log is kept in the WTP.

3.2 Discharge Monitoring

TMAC has implemented a monitoring program for the WTP as required by the Type A Water Licence (No. 2AM DOH1323).

The objective of discharge monitoring is to:

- Measure the performance of the WTP,
- Ensure treated water from the WTP meets the appropriate discharge limits, and
- Assess water quality in the receiving water environment.

During the construction and care and maintenance phases, all treated effluent discharged from the WTP at the ST-8 monitoring station must meet the effluent limits as outlined in Part G, Item 3b of Water Licence (No: 2AM-DOH1323) and summarized in Table 3.

Table 3: Wastewater Treatment Plan Effluent Quality Limits for Monitoring Station ST-8

Parameter	Maximum Average Concentration (mg/L)	Maximum Allowable Grab Sample Concentration (mg/L)
pH	6–9	9
Total Suspended Solids	100	100
BOD_5	80	80
Fecal Coliforms	10,000 CFU/100mL	10,000 CFU/100mL
Total Oil and Grease	5 and no visible sheen	10 and no visible sheen

Monthly samples are collected by TMAC's environmental department or a designate from station ST-8 (the treated effluent prior to discharge form the plant), which is located in the WTP. While discharging to the tundra, monthly samples are also collected from station ST-9, located near the shore of Glenn Lake. All samples are collected and handled following the sampling procedures and QA/QC methods outlined in the Hope Bay Quality Assurance and Quality Control Plan (HBML 2012) and in any applicable water sampling standard operating procedures developed by TMAC's Environment Department.

All samples from ST-8 and ST-9 are analyzed for:

- pH,
- Total suspended solids,
- BOD_5,
- Fecal coliforms, and
- Oil and grease (concentration and visible sheen).

Sample results from stations ST-8 and ST-9 are reported to the WTP operator upon receipt from the laboratory. The results are reported in the monthly and annual reports required under the Water Licence (No: 2AM-DOH1323).

3.2.1 Off-Specification Effluent Quality

The potential does exist for isolated, short-term discharges of treated wastewater effluent that does not meet the discharge limits due to equipment malfunction or operator error. However, the system design limits the potential for partially treated wastewater to be discharged from the plant.

In the event that analysis indicates a sample exceeded the specified discharge limit, TMAC will, as soon as possible upon receiving the analytical results:

- Re-sample the effluent and submit the sample for appropriate analysis,
- Conduct a detailed inspection of the entire WTP and all associated facilities to identify the cause of the off-specification discharge and ensure the facility is operating within the prescribed parameters and operation limits,
- Correct the original cause, and
- If necessary, implement additional monitoring of the downstream environment to assess the level, if any, of the impact of the off specification discharge.

During these upset conditions the wastewater effluent typically has slightly elevated pH and fecal coliforms; however, due to the limited frequency and relatively short duration of such events residual environmental effects are negligible.

4 Health, Safety, and Emergency Response

4.1.1 General Health and Safety Requirements

Employees working in the WTP facility are trained prior to the commencement of work to be aware of the health and safety risks associated with the wastewater treatment. The following two absolute points of compliance are part of the training program:

- No person is to drink the water in the Sanitherm plant or the water that is discharged from the plant.
- Working with wastewater requires adequate protection for operators that includes wearing steel toed boots, protective goggles, and protective gloves. Face shields should be used if there is a risk of wastewater or sludge being splashed near the operator's face.

Operators and workers assisting with operation or maintenance of the WTP must have current Hepatitis A and B vaccinations.

4.1.2 Chemical Handling

Before handling and using any chemicals, the appropriate material safety data sheets (MSDS) must be reviewed (MSDSs are available in the WTP building). When handling chemicals operators should wear protective goggles, protective gloves and any other personal protective equipment as described in the MSDS. First aid and emergency response procedures described in the MSDS (Appendix B) are to be followed. Various oxidizing chemicals are used on the Sanitherm WTP facility as indicted in Table 4.

Table 4: Details of Chemicals and Volumes Needed for Cleaning the Sanitherm MBR WTP

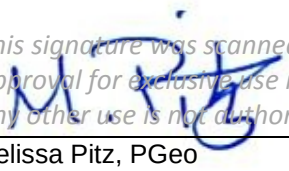
Contaminant	Chemical	Solutions Concentration	Amount Used	Hold time
Organic matter	Sodium hypochlorite	2,000 – 6,000 mg/L (effective chlorine concentration) (pH is about 12)	5 L/element	1 to 3 hours
Inorganic matter	Oxalic acid	0.5 - 1.0 wt%	5 L/element	1 to 3 hours
Inorganic matter	Polymer	1.0 – 3.0 wt%	½ Kg/press	1 hour
Inorganic matter	Defoamer	1.0 – 3.0 wt%	Varies (~ 1 L/day)	1 to 3 hours
Inorganic matter	Citric acid	1.0 – 3.0 wt%	5 L/element	1 to 3 hours

4.1.3 Spill Response

Only small quantities of chemicals are maintained on hand for the WTP. In the event of a minor chemical spill, the MSDS instructions for containment and cleanup are followed and the incident must be reported to the environmental and health and safety departments. In the event of a large chemical spill, the emergency response team (ERT) are called and cleanup crew members follow the direction of the ERT. Spills of raw or partially treated wastewater are managed following the same procedure. The details for the spill response procedures are included in the Hope Bay Spill Contingency Plan (TMAC 2014).

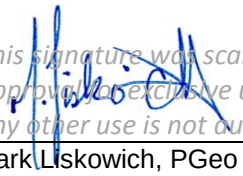
All spills are internally reported, and any meeting Nunavut and Northwest Territories' spill reporting requirements will be reported to the spill line as required and will be included in the monthly and annual reports for the water licence.

This report, ***"Doris North Wastewater Treatment Management Plan"***, was prepared by



Melissa Pitz, PGeo

and reviewed by



Mark Liskowich, PGeo

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

.

5 References

Department of Environment. 2010. Environmental Guideline for the General Management of Hazardous Waste. Iqaluit (NU): Government of NWT. October.

Department of Justice. 2014a. Consolidation of Environmental Rights Act R.R.N.W.T. 1988, c.83 (Supp.). Iqaluit (NU): Government of NWT. Accessed Feb 24. Available from: http://www.justice.gov.nu.ca/apps/search. Search term: camp sanitation regulations.

Department of Justice. 2014b. Consolidation of Camp Sanitation Regulations R.R.N.W.T. 1990, c.P-12. Iqaluit (NU): Government of NWT. Accessed Feb 24. Available from: http://www.justice.gov.nu.ca/apps/search. Search term: consolidation of the environmental rights act.

Duong D. and Kent R. 1996. Guidelines for the preparation of an operation and maintenance manual for sewage and solid waste disposal facilities in the Northwest Territories. NWT Municipal and Community Affairs, Community Development Branch. October.

Government of Nunavut. 2014. Consolidation of Environmental Protection Act R.R.N.W.T. 1988, c.E-7 Iqaluit (NU): Government of NWT. Accessed Feb 24. Available from: http://www.gov.nu.ca/sites/default/files/rsnwt-nu-1988-c-e-7-part-1.pdf

HBML. 2012. Quality Assurance and Quality Control Plan (Rev 7.1). North Vancouver (BC): Hope Bay Mining Ltd. November. HB-QA-ENV-MP-001

HBML. 2012. Incinerator Management Plan (Rev 1.1). North Vancouver (BC): Hope Bay Mining Ltd. March.

TMAC. 2014. Hope Bay Project Spill Contingency Plan. Toronto (ON): TMAC Resources Inc. January.

Appendix A: Sanitherm Operation Manual

SaniBrane®
Operations Manual

Suite 100 – 340 Brooksbank Avenue
Vancouver, BC, Canada V7J 2C1
Tel: 604-986-9168 Fax: 604-986-5377
E-mail: saneng@sanitherm.com
www.sanitherm.com

SANITHERM A DIVISION OF wellco

Over Sixty Years of Excellence

SANIBRANE® OPERATIONS MANUAL

TABLE OF CONTENTS

FORWARD:

This operations manual has been created to provide the user:

- An overview of Sanitherm's SaniBrane® Membrane
- Requirements for safe operations
- Installation information
- Operation information
- Maintenance procedures
- Peripheral equipment requirements

Important NOTE:

- All metric conversions (") were done using an electronic converter, however are not deemed exact.

- Operators must read through this manual to ensure efficient and effective operation.

OVERVIEW OF SANITHERM'S SANIBRANE® MEMBRANE:

1.1 Introduction:

The following is a brief overview of the operation and maintenance of SANITHERM SANIBRANE® MBR, a revolutionary system that utilizes cutting edge FLAT PLATE membrane technology. There are many benefits of our FLAT PLATE membranes. The design ensures effective, reliable air scouring and consistent, long-term flux rates. The design has been proven in installations around the world in both industrial and municipal applications.

1.2 Module:

The module, shown in Diagram 1.3i, consists of a membrane case and a diffuser case. The membrane case incorporates multiple membrane elements shown in Diagram 1.3ii, which are connected to a manifold with transparent tubes. The diffuser case contains the air header and diffusers. Each membrane element can be removed individually.

Diagram 1.3i - Module

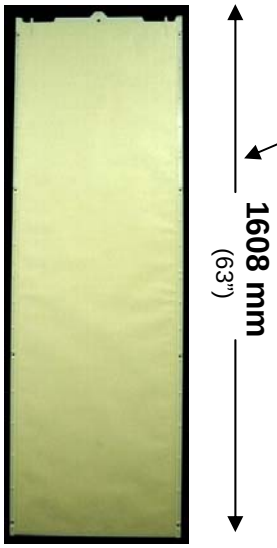
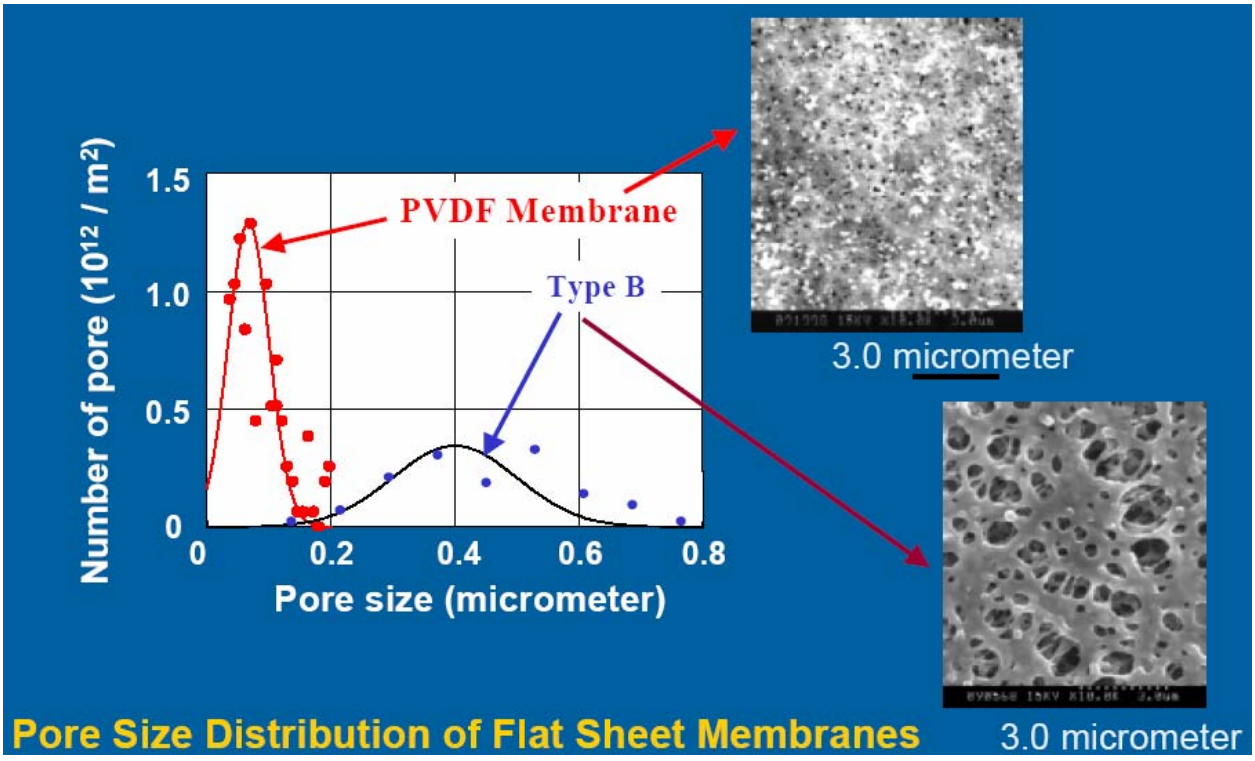


Diagram 1.3ii - Membrane element

1.3 Membrane Materials and Structure:

The membrane sheets are made from polyvinylidene fluoride (PVDF) that is bonded to the Polyethylene Terephthalete (PET) support fabric, chemically welding them to the surface. The PET is a non-woven fiber for the base and makes this membrane superior in strength and chemical stability.

The structure has a small pore size (.08 micron) with narrow pore size distribution. This structure gives an outstandingly high treated water quality.



2 SAFETY PRECAUTIONS:

All installation, operations and maintenance procedures must adhere to each jurisdictions occupational health and safety standards, including providing individuals with appropriate protective attire and safe working conditions.

Throughout this manual, special attention is given to areas that outline Danger, Caution and Warnings. Although they are outlined in each individual section, they are reiterated in Table 2.1, 2.2 and 2.3 for added awareness.

2.1 Danger:

The symbol within Table 2.1 shows anything that will pose a hazard to one's self or equipment.

Table 2.1 DANGER SYMBOLS

SYMBOL:	
MESSAGE(s):	• DO NOT leave the SaniBrane® in temperatures higher than 40^{O} C (104^{O} F). • Avoid direct sunlight • Protect SaniBrane® from freezing • Sparks from welding, fusion cutting or grinding can cause irreversible damage. Use fireproof sheets or other protective measures. • The chains or slings being used to raise the SaniBrane® must be sufficient for the weight of the SaniBrane® System. Lifting should be done in a straight upward motion not allowing any shaking of the product. • No one should ever be under the SaniBrane®! • To install SaniBrane® set a foothold. • Never climb on the module. • Use protective equipment to ensure the safety of the worker. • DO NOT place heavy objects on the module.

2.2 Warning:

The symbol within Table 2.2 indicates a possible or impending hazard to self or equipment.

Table 2.2 WARNING SYMBOLS

SYMBOL:	
MESSAGE(s):	• DO NOT use permeated water for drinking. To use permeated water, analyze its quality and ensure that the water quality meets the intended purpose. • Many chemical agents are extremely hazardous to one's health. When handling chemicals, one should wear protective goggles, gloves and any other available protective gear. Be sure to carefully read the details of the material safety data sheet (MSDS) BEFORE handling any chemicals. • If chemicals come in contact with your skin or clothes, immediately rinse with large amounts of water and see a physician. • Store chemicals in a dark, cold place away from direct sunlight. • If chemicals come in contact with your eyes, immediately flush with running water and see a physician. • Be sure to use the proper storage and mixing tanks for all chemicals • Do not mix sodium hypochlorite with heavy metals or acids. Its mixture with an acid generates toxic chlorine gas. • If an abnormality is found in the equipment during chemical cleaning, immediately stop the operation. • If chemicals are injected forcibly with the chemical feed pump or by any other means, the internal pressure of the element may increase, causing damage to the element. Be sure to inject chemicals by gravity at 10 pKa or less. • Before feeding chemicals for chemical cleaning, check that the water surface is 500 mm (20") or more above the top of the module. Feed chemicals after SaniBrane® are completely submerged.

2.3 Caution:

The symbol shown in Table 2.3 indicates care should be taken to avoid hazards or mistakes to one's self or equipment.

Table 2.3 CAUTION SYMBOLS

SYMBOL:	**CAUTION**
MESSAGE(s):	• DO NOT leave the SaniBrane® in temperatures higher than 40^{O} C (104^{O} F). • Avoid direct sunlight • Protect SaniBrane® from freezing • Sparks from welding, fusion cutting or grinding can cause irreversible damage. Use fireproof sheets or other protective measures. • DO NOT place heavy objects on the module. • To protect the membranes and prevent clogging, design the peripheral equipment in such a way that the raw water is supplied to the membrane submerged basin via a screen with openings 3 mm or less. • Avoid applying pressure to the permeate side. • Before feeding clean water to the membrane submerged basin, open the air discharge valve to release air form the element. After feeding water, close the air discharge valve. • DO NOT use raw ground water for start up testing. If it contains a large amount of iron, manganese, calcium and/or silica it may cause clogging the membrane. • Clean water operations tend to cause clogging, and should only be done cautiously. • After clean water operation, keep the membranes wet. Dried membranes will reduce permeable amounts of water. • To restart filtration after maintenance, keep the membranes wet during the maintenance. Dried membranes will reduce permeable amounts of water.

3 PRE-INSTALATION PRE-PREPARATION:

3.1 Equipment check:

To ensure that you are ready to start installation, keep in mind the following:

1. All items match the shipping slip*
2. There has not been any damage in transport.
3. The protective cover is in position.
4. There should be full preparation for the transportation of the SaniBrane® including a clear route.
5. You will require a cargo crane or forklift for unloading the SaniBrane® from the truck.

** Please contact the trucking company should any items be missing.*

3.2 Storage of the SaniBrane®:

Store the SaniBrane® indoors, keeping it upright, at 5^{O} to 40^{O} C (41^{O} to 104^{O} F). Avoid direct sunlight.

During the entire process take adequate measures to protect the elements and other components. Sparks from welding, fusion cutting or grinding can cause irreversible damage. Use fireproof sheets or other protective measures.
If the SaniBrane® system *must* be stored outdoors during the construction phase, make certain that it is not for a long period of time and note the following requirements:

1. Maintain the temperature from 5^{O} to 40^{O} C (41^{O} to 104^{O} F).
2. Prevent freezing.
3. Prevent it from getting wet
4. Prevent it from being immersed in water
5. Avoid direct sunlight

CAUTION

- DO NOT leave the SaniBrane® in temperatures higher than 40^{O} C (104^{O} F).
- Avoid direct sunlight
- Protect SaniBrane™ from freezing
- Sparks from welding, fusion cutting or grinding can cause irreversible damage. Use fireproof sheets or other protective measures.
- DO NOT place heavy objects on the module.

4 SPECIFICATIONS:

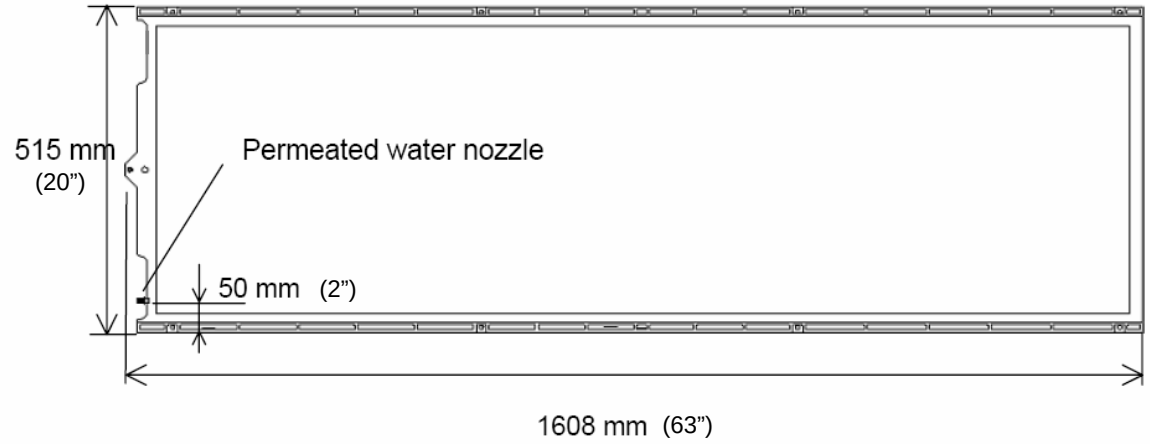
4.1 Specifications of the Element:

Table 4.1 and Diagram 4.1 – show the specifications and the appearance of the element, respectively.

Table 4.1 Element (TSP – 50150)

Model Name		TSP-50150
Membrane configuration		Flat Sheet
Application		Filtration of activated sludge
Filtration method		Suction filtration
Nominal pore diameter (um)		0.08
Effective membrane)area (m^2)		1.4
Dimensions (mm)	Total width	515
	Total Height	1,608
	Thickness	13.5
Weight	Dry	4.8
	Wet (Reference)	8.0
Main Material	Membrane	PVDF and PET non-woven fibre
	Supporting Panel	ABS resin

Diagram 4.1 Appearance of the Element.



4.2 Specifications of the Tube:

Table 4.2 shows the specifications of the tube.

Table 4.2 Specifications of the Tube

Material	TPU-ARET*[1]
Inside diameter/ outside diameter/ total length (mm)	8/12/360

* - Allowable temperature limit: 60° C (140° F)

*1 - The material name as per ISO-18064

4.3 Specifications and Performance of the Module:

Table 4.3i shows the specifications of the Module.

Table 4.3i Specifications of the Module

Model Name		TMR 140-050S	TMR140-100S	TMR140-200W	TMR 140-200D
Number of membrane elements		50	100	200	200
Element block structure		1 deck 1 row	1 deck 1 row	1 deck 2 rows	2 decks 1 row
Dimensions *[1]	Width (mm)	810	810	840	810
	Length (mm)	950	1,620	3,260	1,620
	Height (mm)	2,100	2,100	2,100	4,130
Weight (kg)	Module (dry)	400	695	1,430	1,365
	Aeration block (dry)	40	65	150	65
	Element block (dry)	360	630	1,280	1,300
	Element block (sludge clogging) *[2]	690	1,240	2,480	2,500
Material	Diffuser, Frame, Permeated water manifold	304 stainless steel			
Connection flange *[3]	Manifold	2” (50 mm)	2” (50 mm)	3” (75mm)	2” (50 mm)
	Air Diffuser	2” (50 mm)	2” (50 mm)	2” (50 mm)	2” (50 mm)
Operating Range	Temperature (degree C)	5-40			
	pH*[4] of liquid	5-10			
	MLSS (mg/L)	Not higher than 18,000			
	Trans-membrane pressure (kPa)	Not higher than 20 (2.9 psi)			
	Cleaning chemicals feed pressure (kPa)	Not higher than 10 (1.45 psi)			
	Cleaning chemicals and chemicals concentration	Sodium hypochlorite (effective chlorine concentration) : 2,000 – 6,000 mg/L (pH is around 12) Oxalic acid : 0.5 -1.0 wt% Citric Acid : 1.0 - 3.0 wt%			
	Scouring Air Flow Rate (NL/min/Module)	650-1,000	1,300 – 2,000	2,600 – 4,000	1,800 – 2,000
		23-35 cfm	46-71 cfm	92-142 cfm	64-71 cfm

*1 indicates the maximum size (excluding the connection tube)
*2 the maximum weight is assumed for a case of sludge clogging between elements.
*3 for flange dimensions see the drawings at the end of this manual
*4 Excludes chemical cleaning of the elements using a designated chemical
* comply with the above operating range.

Table 4.3ii shows the performance of the Module

Table 4.3ii Module Performance

Model Name		TM 140-050S	TMR 140-100S	TMR 140-200W	TMR 140-200D
Permeate water quality *1	TSS (mg/L)*2	Not higher than 1.0			
	Turbidity (NTU) *3	Not higher than 1.0			
Filtration capacity *4	<Reference> Quantity of water treated m3/d (USGPD)	53 (14,000)	105 (27,700)	210 (55,500)	210 (55,500)

*1 - This value can be attained when operated under the standard operating conditions as specified in this Instruction Manual during a period specified separately by Sanitherm, a division of Wellco Energy Services.
*2 – Measuring method of TSS is complied with Standard Method of Examination of Water and Wastewater 20th Edition (1998), Section 254OD, Total suspended Solids Dried at 103^{O} to 105^{O} or ISO 11923.
*3- Measuring method of NTU is complied with Standard Method of Examination of Water and Wastewater 20th Edition (1998), Section 2130, Turbidity or ISO 7027
*4 - Reference value, not a guaranteed value, for treatment of ordinary sewage in a case where the water temperature is higher than 15^{O} C (59^{O} F). Based on a flex rate of 0.75 M^3/ M^2/ D (18.4 9/ft 2/0)

5 PERIPHERAL EQUIPMENT DESIGN FOR SANIBRANE® SYSTEM:

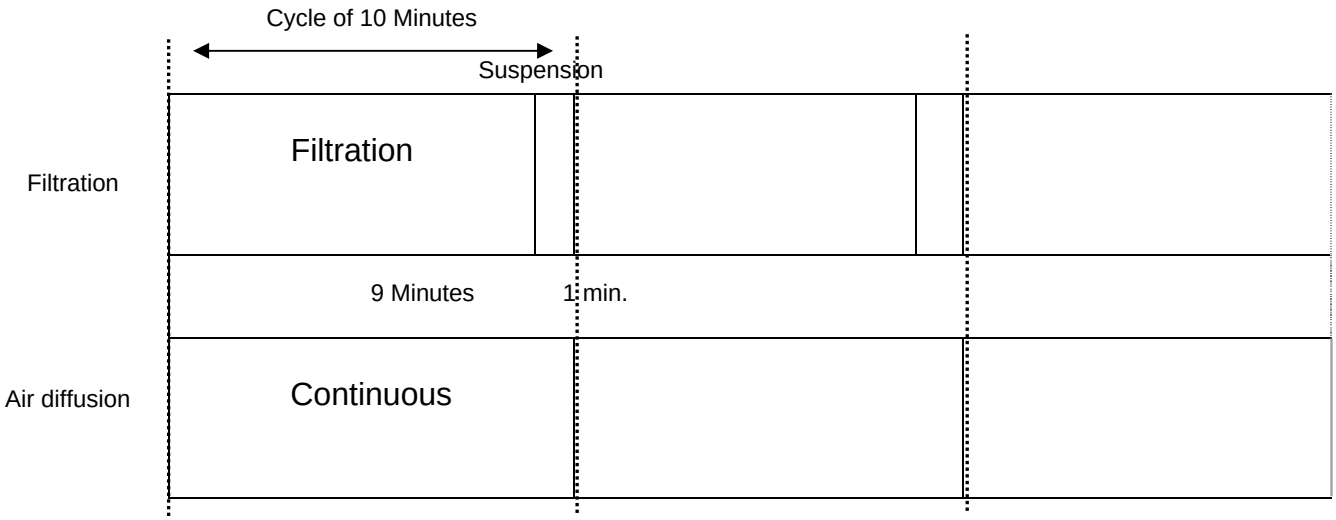
The following explains the standard time chart, membrane filtration flow chart, pipeline procedures and SaniBrane® system layout in the membrane submerged basin. This information will help you design the peripheral equipment necessary to operate your SaniBrane® system.
In order to design the peripheral equipment necessary to operate your SaniBrane® system, you must first understand the process.

5.1 Standard Time Chart:

Two operations are available for filtration, continuous filtration and intermittent filtration. In intermittent filtration, filtering operation is suspended at certain intervals while air diffusion continues, as shown in Diagram 5.1.

While filtration is suspended, air diffusion continues in the absence of suction, enabling effective cleaning of the membrane surfaces. Although a control device is required to start and stop filtration, intermittent filtration is recommended when you need a higher filtration flux.
Recommended intermittent filtration setting: 9 minutes for filtration and 1 minute for suspension:

Diagram 5.1: Standard Time chart:



5.2 Flow Diagram of Membrane Filtration:

Points (5.2.1) and (5.2.2) follow with standard examples of the operation of the SaniBrane® system with a natural water head and with suction pump. Ancillary devices necessary for operations are explained in (5.2.3).

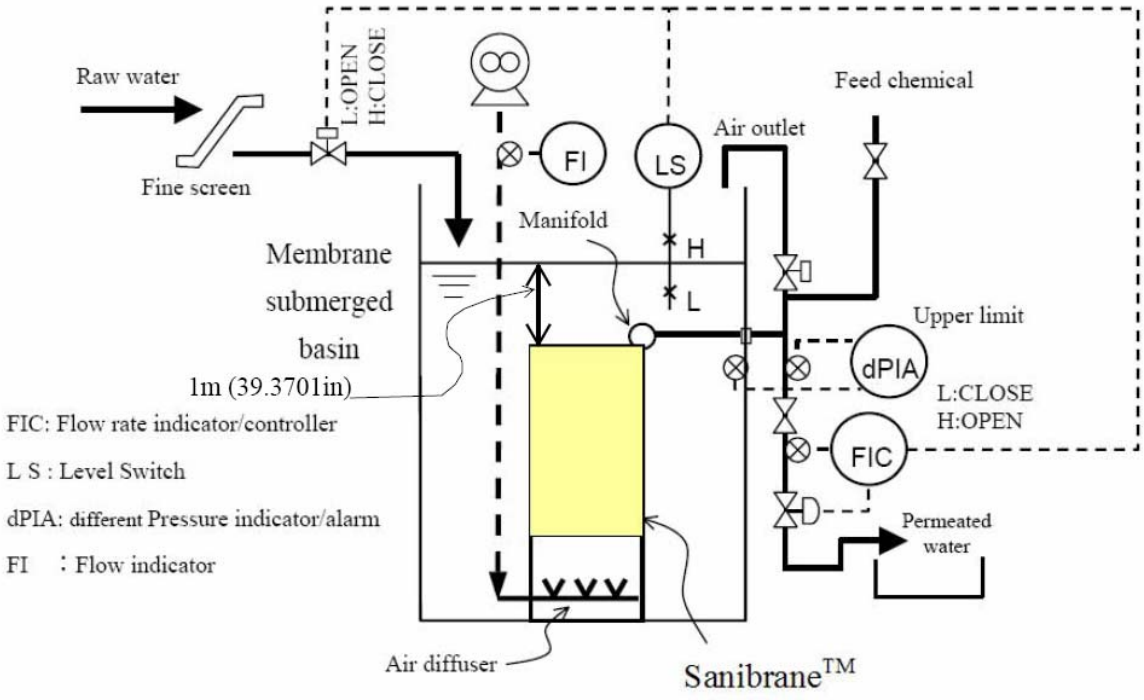
5.2.1 Operation with natural water head:

In natural water head operation, filtration is performed using the natural water head differential pressure, generated from the vertical distance between the membrane submerged basin's water surface and water outlet (see Diagram 5.2.1).

To produce a water head, the water outlet should be located below the surface of the water in the membrane submerged basin, typically 1 meter lower.

It is recommended that the permeated water pipe be connected to the water outlet so that the pipe penetrates the basin wall, as shown in Diagram 5.2.1.

Diagram 5.2.1 Natural Water Head Operation



The opening of the permeated water flow control valve is automatically controlled for flow rate. Moreover, if the water level in the membrane submerged basin gets to the lower limit, filtration will be stopped. If it gets to the higher limit, it will stop raw water inflow. The equalization tank (not shown) is designed to meet the fluctuation of the raw water flow rate.

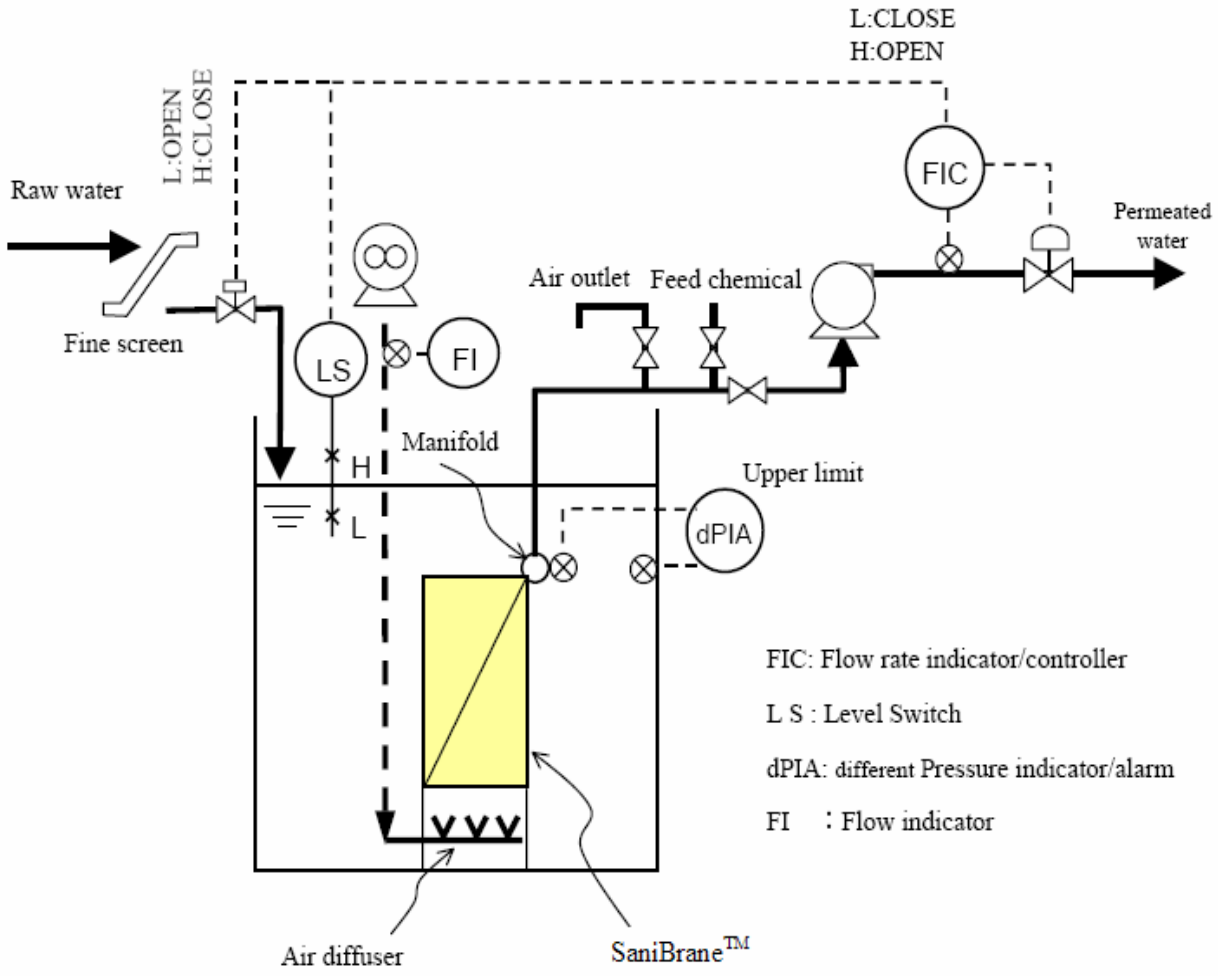
Air must be discharged once a day from the natural water head. If air were allowed to collect inside the pipe it will reduce its effectiveness.

If the pipe is connected to the water outlet by penetrating the basin wall, then air can be discharged by opening the air discharge valve during suspension of filtration. However, installing an automatic air discharge valve is highly recommended.

5.2.2 Operation with suction pump:

Filtration is performed by using the suction of a pump (see Diagram 5.2.2)

Diagram 5.2.2 Pump Suction Operation



In filtration, the opening of the permeated water flow control valve is automatically controlled for flow rate. If the water level in the membrane submerged basin gets to the lower limit, filtration will be stopped, and if it gets to the higher limit, it will stop raw water inflow. Fluctuation of the raw water flow rate is absorbed by the equalization tank (not shown), as its capacity is designed to meet the amount of fluctuation.

5.2.3 Ancillary Devices:

The following explains devices shown in the examples on the preceding pages. For the operation of the SaniBrane® System, devices other than those specified here may be used after consultation with Sanitherm:

a) Fine Screen
   To protect the membrane from clogging, raw water should be supplied to the membrane submerged basin through a screen with openings 3 mm or smaller.
b) Flow rate control device
   A flow rate controller, such as a flow rate control valve and flow meter, should be installed on the permeated water line to control the flow rate of permeated water. To operate multiple units of the SaniBrane® System, one should install one flow rate controller on each train of the SaniBrane® System.
c) Differential pressure instrument
   The sensors of the differential pressure instrument should be installed on the permeated water line and the membrane submerged basin at the same level to measure the trans-membrane pressure. To operate multiple units of the SaniBrane® System one should install a differential pressure instrument on each train.
d) Air supply unit (blower)
   This unit supplies air to the air diffuser. The flow rate of air supplied to a module should be equal to the specified scouring air flow rate for the module (see Table III-3)
e) Air Flow Meter.
   An air flow meter should be used to measure the amount of air supplied to the air diffuser. To operate multiple units of the SaniBrane® System, you should install an air flow meter on each train of the SaniBrane® System.
f) Permeate pump.
   A suction pump is required in order to operate with a pump suction install a self-priming pump compatible with the desired flow rate.
g) Level Switch
   It is required that a level switch be installed in the membrane submerged basin to control the liquid level.

CAUTION

- To protect the membranes and prevent clogging, design the peripheral equipment in such a way that the raw water is supplied to the membrane submerged basin via a screen with openings 3 mm or less.

5.3 Layout of the SaniBrane® System:

Diagram 5.3i shows how water circulates in the membrane submerged basin. An upward flow is generated as air is supplied from the lower side of the SaniBrane®. The flow then goes along both sides of the element block.

This circulation flow cleans the membrane surfaces and at the same time stirs up the sludge. It is extremely important to arrange units of SaniBrane® with appropriate distances in order to obtain an effective circulation flow.

Diagram 5.3i and Diagram 5.3ii present a top view and a side view of a basin containing three units of SaniBrane®. To install the modules, you are required to pay attention to dimensions W1, W2, W3, a and b.

Diagram 5.3i Example of SaniBrane® Modules layout in submerged basin (side view)

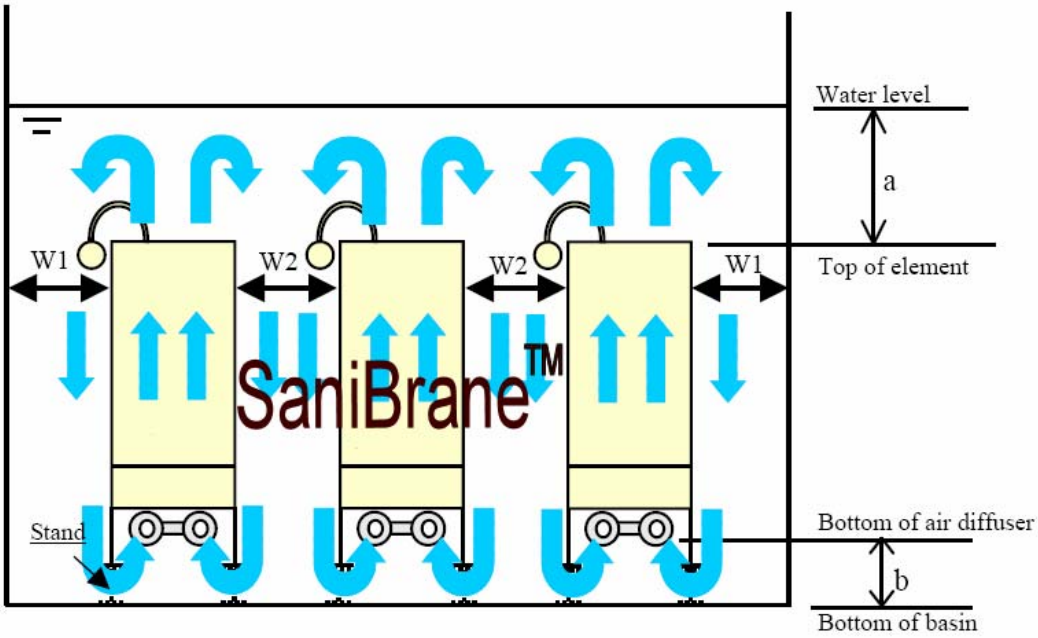
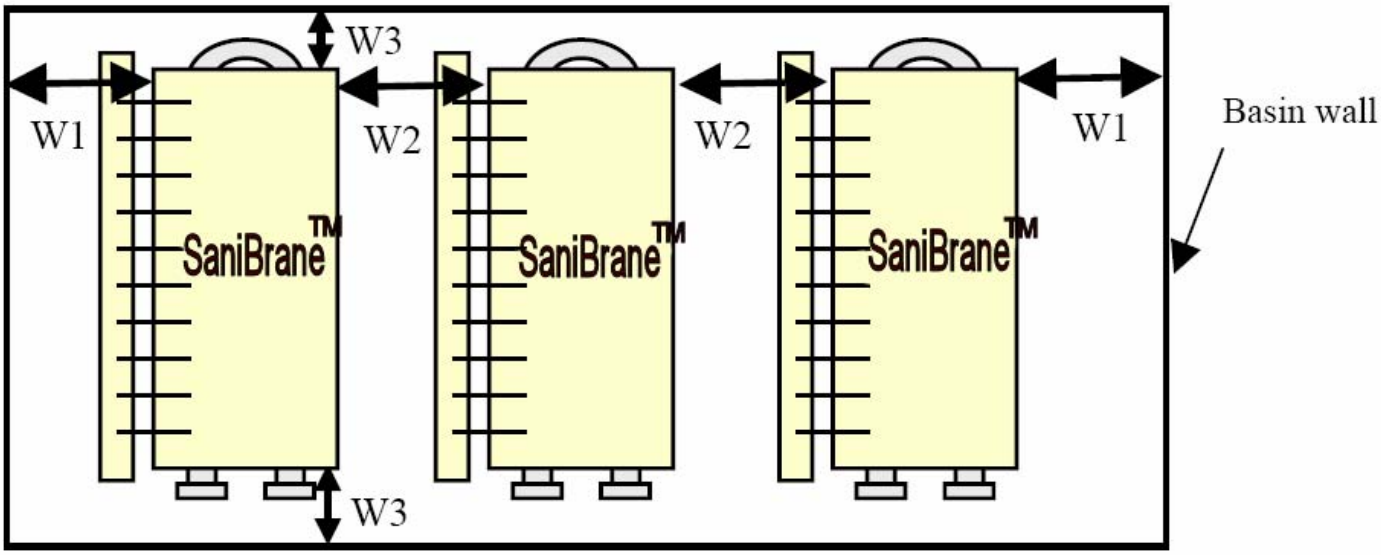


Diagram 5.3ii Example of SaniBrane® Modules layout in submerged basin (top view)



i. W1: 380 to 680 mm (15" to 27")
ii. W2: 430 to 730 mm (17" to 29")
iii. W3: Make W3 as small as possible (normally about 400mm (16") after allowing for piping and maintenance work.
iv. a: Allow at least 500 mm between the top of the element and the water level of the basin (lower limit for operation).
v. b: When a stand is used to support the module, the distance between the water level of the basin and the bottom of the air diffuser should not exceed 400mm (16").

- Please contact Sanitherm if you have any difficulty with the layout design, including installation of the SaniBrane® in an existing activated sludge tank.

5.4 Piping:

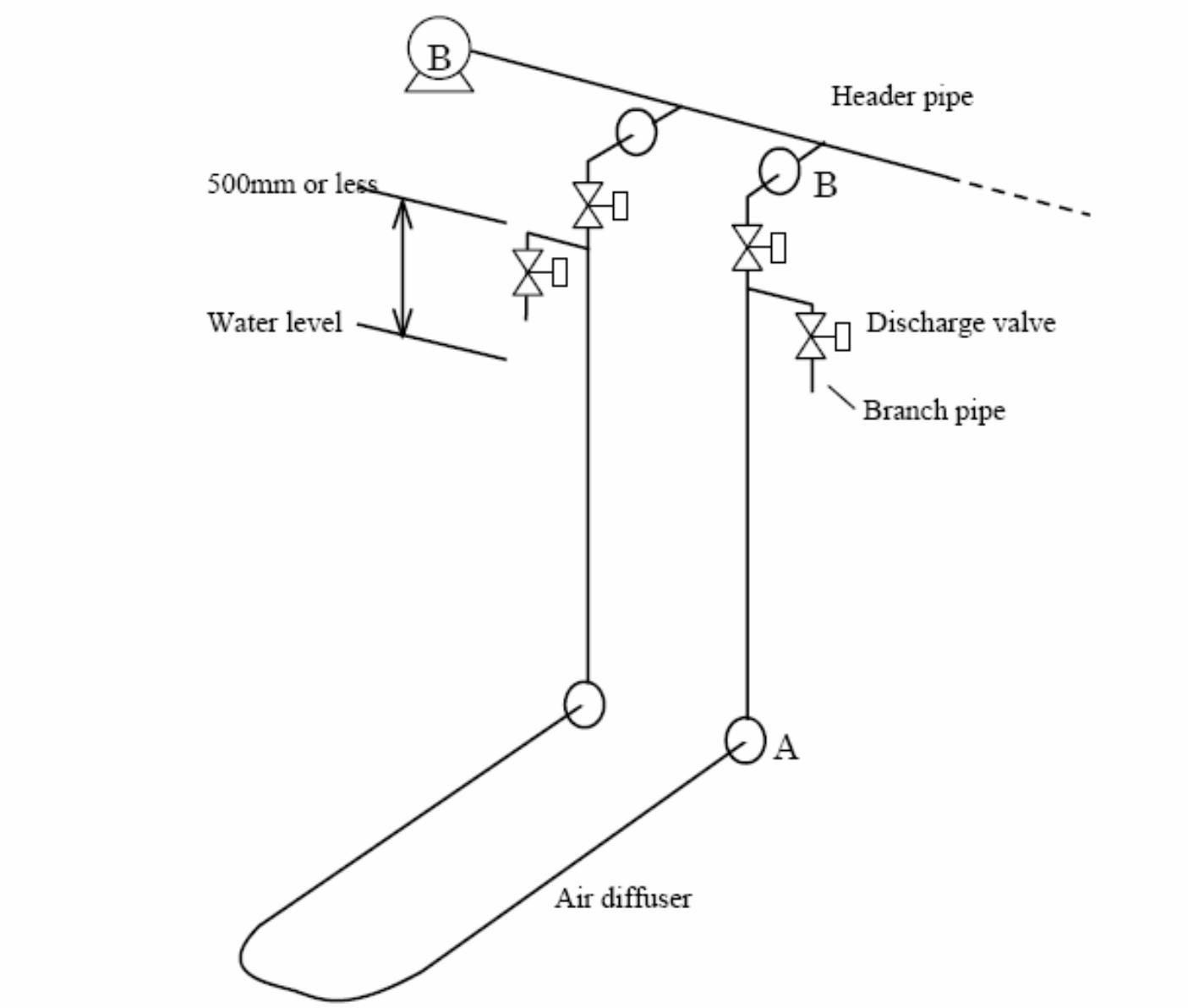
Following is a description of the procedure for piping to the air diffuser and manifold on a SaniBrane® System. For piping arrangements, see the product drawing at the end of this manual.

5.4.1 Piping into the air diffusers:

When piping into the air diffusers, use the flange (A) to connect the pipe from the air supply device to the side of the aeration block (see Diagram 5.4.1). Install another flange connection (B) above the liquid surface on this pipe line to disconnect piping in case it becomes plugged.

Also install branch piping and valves for cleaning the air diffuser into the pipe from the blower. Make sure to place the branch piping within 500mm (20”) above the liquid surface. It is recommended that the cleaning system be automated by installing automatic valves. For the air diffuser cleaning procedure 10.2.

Diagram 5.4.1 Example of piping to Air diffusers:



5.4.2 Piping to the manifold:

For piping into the manifold, Diagram 5.4.2i and Figure 5.4.2ii give two examples of leading permeated water from the membrane submerged basin. One demonstrates downward piping and the other upward piping.

In the operation of a natural water head, downward piping is recommended. In the operation of a suction pump, if the pump is located above the membrane submerged basin, upward piping is preferred, and vice versa.

In both upward and downward piping, a chemical injection valve and an air discharge valve should be installed on a branch pipe between the permeated water valve and the air diffusers. For devices necessary for chemical cleaning, see VIII-3 to VIII-6.

Diagram 5.4.2i Downward Piping from Basin

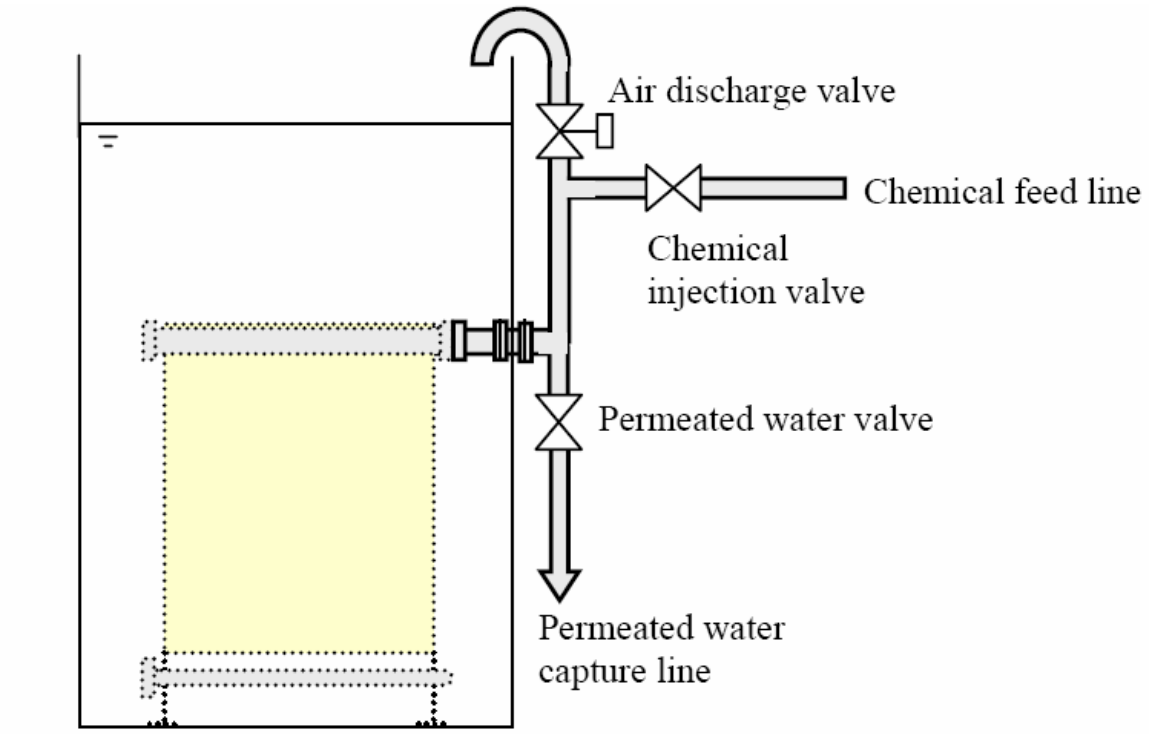
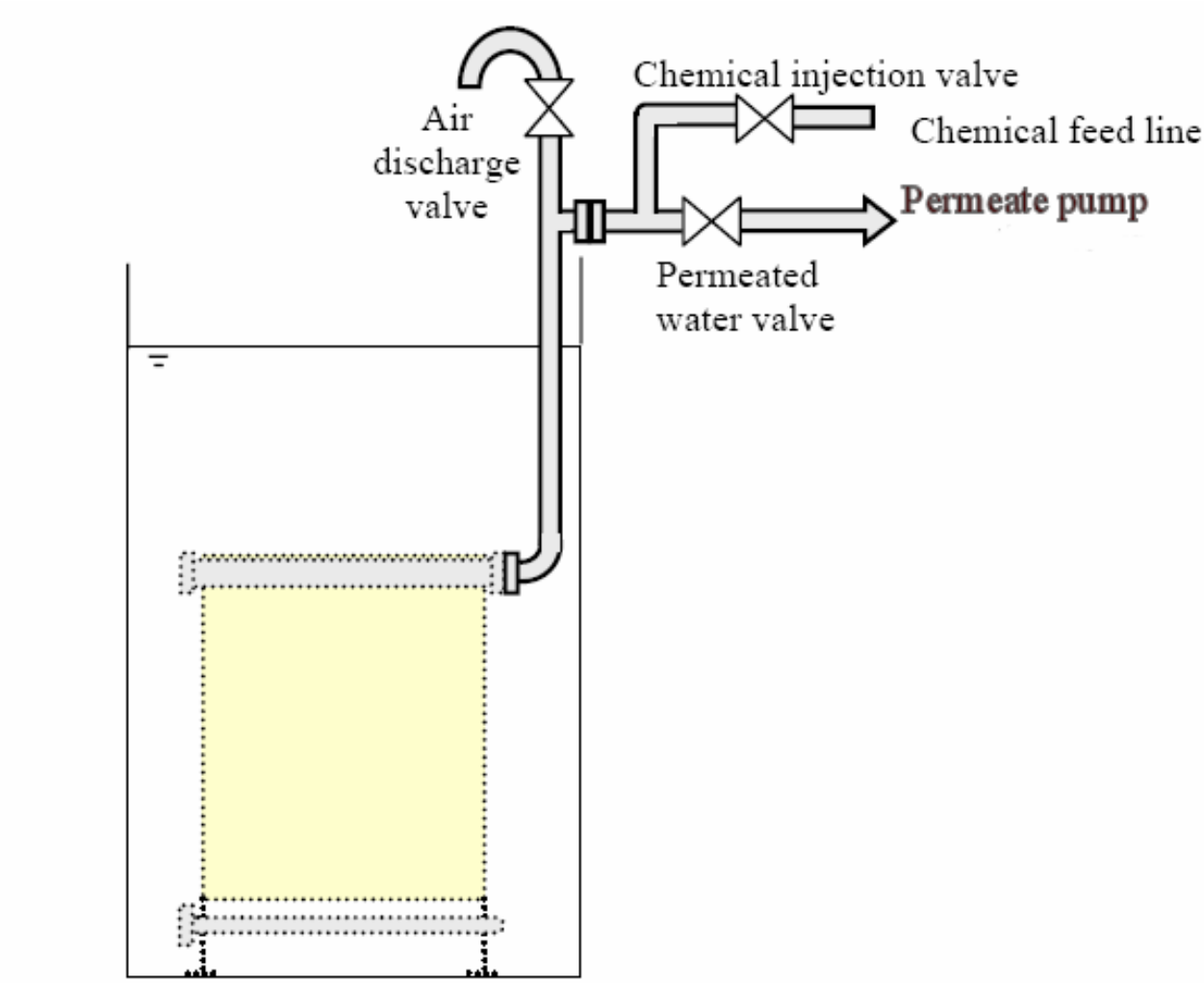


Diagram 5.4.2ii Upward Piping from Basin



6 INSTALLING SANIBRANE®:

6.1 Preparation:

1. There should be full preparation for the transportation of the SaniBrane® including a clear route.
2. You will require a cargo crane or forklift for unloading the SaniBrane® from the truck.
3. Ensure that the membrane submerged basin where the modules will be installed is clean. All waste such as concrete clusters, scrapes and mill ends must be removed.

6.2 Unloading SaniBrane®:

You will require a cargo crane or forklift to unload the SaniBrane®.

When lifting the SaniBrane® please note:

1. The Element block and the Aeration block are delivered in separate packages.
2. When lifting the element block keep it horizontal and lift from all lifting points equally. Be careful not damage the nozzles, air diffusers or other components.

DANGER

- The chains or slings being used to raise the SaniBrane® must be sufficient for the weight of the SaniBrane® System. Lifting should be done in a straight upward motion not allowing any shaking of the product.
- No one should ever be under the SaniBrane®!

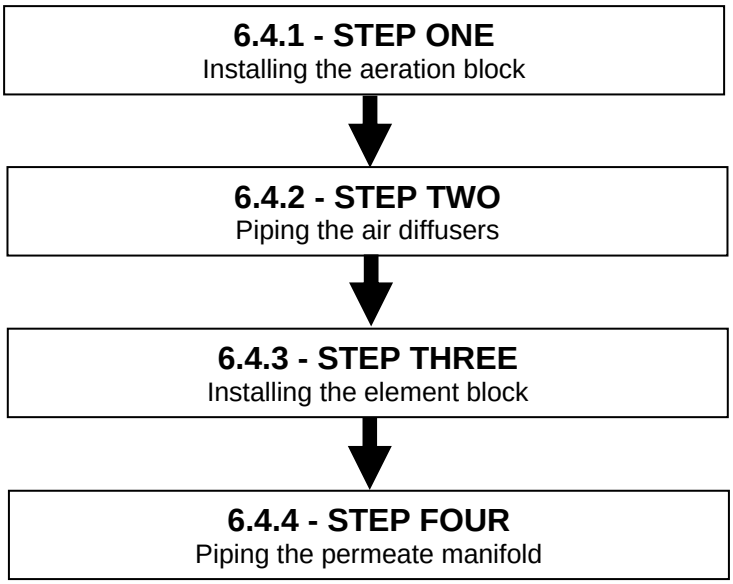
6.3 SaniBrane® check:

After you have the SaniBrane® in place, re-check the following;

1. All items match the shipping manifest.*
2. There has not been any damage in transport.
3. The protective cover is in position.

** Please contact the trucking company should any items be missing.*

6.4 Installation of the SaniBrane®:



6.4.1 STEP ONE - Installing the Aeration block:

Set the aeration block in the membrane submerged basin using anchors. In this installation, it is important to keep the air diffusers horizontal. In order to achieve uniform flows along the membrane surfaces of each element, the air diffuser must be completely level.

To ensure uniform flows, maintain the levelness within 3/1,000 (3mm over 1 meter or 1/8" over 40") on the top surface of the aeration block in both lateral and longitudinal directions.

6.4.2 STEP TWO - Piping the air diffusers:

Each air diffuser is furnished with two blank flanges. Modify the blank flanges or procure suitable flanges, and connect them to the pipe from the air supply unit. Prior to piping, flush the pipes.
After piping the air diffusers, feed clean water until the aeration block is completely submerged and then supplies air for diffusion. Next, check that the air is provided evenly among the aeration blocks and that it is diffused evenly in each aeration block.

6.4.3 STEP THREE – Installing the element block:

To install the element block, take the following steps, depending on the module type:

a) TMR140-050S and 100S
   Set the element block on the aeration block and connect the two with provided bolts.
b) TMR 140-200W

TMR 140-200W consists of two element blocks and one aeration block. Each element block has one manifold and each manifold is furnished with two blank flanges. In installation, these flanges may interfere with each other between the element blocks. In order to prevent this, offset either of the facing blank flanges. Then set two elements on the aeration block to fix them using the provided bolts.

c) TMR140-200D
Place an element block furnished with an intermediate block onto the aeration block, and secure them with the provided bolts. Place another element block on the first element block, and connect the two blocks with the provided bolts.

6.4.4 STEP FOUR – Piping the Permeate Manifold:

The manifold is furnished with blank flanges. Modify the blank flanges or procure suitable flanges. In piping, take the steps shown below in accordance with the module type.

The manifold is designed to allow fine adjustments with the brackets on both ends of it. To prevent air collection inside the manifold, vertically adjust the brackets to raise the permeated water outlet side a little higher than the other.

Prior to connecting the manifold to the pipe, flush the permeated water pipe and check the pipe for leakage.

Avoid applying pressure to the permeate side of the element or the element could suffer damage.

a. TMR140-050S and 100S
Connect one end of the manifold to the permeated water pipe. Leave the other end closed with a blank flange.

b. TMR140-200W
One-side connection
   i. Loosen the U-bolt on the manifolds, connect one manifold to the other on two element blocks. After piping, fasten all U-bolts and check that the manifolds are secured firmly.
   ii. Then connect one end of the joined manifolds to the permeated water pipe. Leave the other end closed with a blank flange.
   iii. Two side connection
   iv. Loosening the U-bolts on the manifolds, connect one manifold to the other on two element blocks. After piping, fasten all U-bolts and check that the manifolds are secured firmly.
   v. Then connect both ends of the joined manifolds to the permeated water pipe.

c. TMR140-200W
Connect one end of the upper and lower manifolds to the permeated water pipe on the relevant line. Leave the other end closed with a blank flange. To connect the manifold to a piping assembly, provide an upper and lower line.

DANGER

- The chains or slings being used to raise the SaniBrane® must be sufficient for the weight of the SaniBrane® System. Lifting should be done in a straight upward motion not allowing any shaking of the product.
- No one should ever be under the SaniBrane®!
- To install SaniBrane® set a foothold.
- Never climb on the module.
- Use protective equipment to ensure the safety of the worker.

CAUTION

- Avoid applying pressure to the permeate side.

7 START OF OPERATIONS:

When starting up the plant for the first time, fill the tank with fresh water, vent the air and test all pumps, blowers and level switches.

7.1 Clean Water Operation

7.1.1 Inspection and arrangements:

Prior to clean water operation; make the following inspection and arrangements:

a) Check that the air diffusion pipe and the permeated water pipes are connected properly.
b) Check that the element block is secured on the aeration block.
c) Check that the membrane submerged basin has been completely cleaned. Then remove the protective cover. The presence of soil, dust, concrete chips, wire ends ty-wrap ends etc. and dust may cause damage to the SaniBrane®.
d) Before feeding clean water to the membrane submerged basin, open the air discharge valve to release air from the element.
e) Feed clean water (tap water or filtered water) to the membrane submerged basin up to the operating level.
f) After feeding water, close the air discharge valve.

CAUTION

- Before feeding clean water to the membrane submerged basin, open the air discharge valve to release air from the element. After feeding water, close the air discharge valve.
- DO NOT use ground water for clean water operation. If it contains a large amount of iron, manganese, calcium or silica it may cause clogging in the membrane.

7.1.2 Clean water operation:

After feeding clean water to the membrane submerged basin, start clean water operation in accordance with the following procedure:

a) Start the blower and check that the required amount of air has been supplied and that the defused air is supplied evenly.
    - Foaming may occur in the membrane submerged basin during clean water operation. This phenomenon is caused by the dissolution of biodegradable hydrophilic components contained in the membrane. Operation can be continued regardless of the foaming.
b) When using only one blower to achieve air diffusion for two or more modules, check that an even amount of air is supplied to them. Otherwise, modify the piping structure (such as the diameter of the header pipe) to attain uniform air supply.

c) While maintaining clean water operation, check the control devices for proper performance.
d) Perform clean water filtration, and measure and record the trans-membrane pressure and water temperature at designed filtration rates (at a normal, maximum and minimum flow rate). These records should be maintained.
e) Upon completion of performance checks in clean water operation, immediately terminate the operation and stop air diffusion.

CAUTION

- Clean water operations tend to cause clogging, and should not be done excessively.
- After clean water operation, keep the membranes wet. Dried membranes may reduce permeable amounts of water.

7.1.3 Injecting seed sludge:

Be sure to inject seed sludge (where possible). Otherwise, if raw water is separated directly by the membranes, membrane clogging may occur at an early stage.

To follow are the steps for injecting seed sludge.

- **STEP ONE:**
  For seed sludge, procure sludge used for the treatment of same kind of waste water. Sludge with MLSS of 20,000 mg/L or higher is recommended.
- **STEP TWO:**
  Right before feeding raw water, inject seed sludge. To remove foreign matter, be sure to use a screen (with an opening of 3 mm or less).
- **STEP THREE:**
  The amount of seeding sludge injected should be adjusted so that MLSS of the membrane submerged basin is 7,000 mg/L or more.

DO NOT use seeding agents (engineered bacteria).

CAUTION

- Be sure to use a screen (with an opening of 3 mm or less) to remove foreign matter.

7.1.4 Actual Operation:

Upon completion of seeding sludge injection, start air diffusion. Then start filtration and the feeding of raw water. Once the permeated water level has been stabilized, measure and record the trans-membrane pressure and water temperature at the actual filtration rate. Details of operation management are given in the next chapter.

8 OPERATION CONTROL:

8.1 Standard Operating conditions:

Table 8.1 shows standard operating conditions for SaniBrane®.

To ensure stable performance, such operation parameters as MLSS, sludge viscosity, DO (dissolved oxygen concentration) and PH must be kept in a range of standard operation conditions given in 8.1.

If raw water contains foreign matter, big chunks of suspended solid or oil, pretreatment is required.

When using an antifoaming agent in the membrane, ensure that it is alcohol-based, such as Kurita Water Industries “Kuriless P.F-663”.

Table 8.1 Standard conditions for SaniBrane®

Parameter	Unit	Operating condition
MLSS	mg/L	7,000 – 18,000
Sludge viscosity*	mPa-s	Not higher than 250
DO	mg/L	1.0 or more
pH	-	6-8
Water temperature	Degree C	15 to 40
Continuous filtration flux	$m^3/m^2/d$	0.75 or less

*Measured by C-type viscometer

- **DO NOT** use permeated water for drinking. To use permeated water, analyze its quality and ensure that the water quality meets the intended purpose.
- **Please contact Sanitherm** if the operating conditions are not standard

CAUTION

- In the activated sludge tank, avoid using chemicals, toxic agents, oils or other substances that can adversely affect activated sludge.
- Avoid abrupt changes in pH, temperature, trans-membrane pressure or any other conditions even if they are within the standard operating conditions.
- Replace renewal parts regularly after inspection.
- Protect SaniBrane® from freezing.

8.2 Operation Control Parameters:

The performance of SaniBrane® varies in accordance with the raw water quality and the preset operating conditions. To ensure stable operation, it is recommended that you record monitored values of control parameters in order to monitor the performance and characteristics of your unit of SaniBrane®.

8.2.1 Control parameters for the operation of SaniBrane®:

1. Scouring Air Flow rate (blower air flow)
2. Diffusion pressure (blower discharge pressure)
3. Permeated water flow rate
4. Trans-membrane pressure (TMP)
5. Permeated water quality (BOD, COD, turbidity, T-N, T-P, TSS etc)
6. Liquid temperature of membrane submerged basin
7. Raw water quality (BOD, COD, turbidity, T-N, T-P, etc.)
8. Excess-sludge discharge rate
9. DO (dissolved oxygen concentration) of membrane submerged basin
10. pH of membrane submerged basin
11. MLSS
12. Sludge viscosity
13. Sludge volume (SV30 or SV60)

8.3 Daily inspection of the Membrane submerged basin:

To ensure consistent operation of SaniBrane® it is essential to stabilize the trans-membrane pressure, diffused air condition, and biological treatment.

8.3.1 Inspection steps:

1. Trans-membrane pressure:

Check that the trans-membrane pressure is stable. A sudden increase in differential pressure suggests membrane clogging, caused by abnormal diffused air conditions or deteriorating sludge properties. In such an event, check the following parameters and take necessary action, such as chemical cleaning of the elements.

2. Diffused air condition:

Check that the standard amount of diffused air is supplied and that the air is diffused evenly. Deviation in the scouring air flow rate from the standard value, or extraordinary uneven diffusion, may cause membrane clogging. In such a case, stop filtration, and check the leakage from the piping, valve situation and the blower condition. If necessary, take

appropriate action, such as fix the leakage, correct the valve situation, adjust the blower condition, clean the air diffusers and adjust the scouring air flow rate.

CAUTION

- If the scouring air flow rate drops or becomes extremely irregular, or if air supply is stopped, then immediately stop filtration to prevent membrane clogging.

3. Colour and smell of activated sludge:

Sludge appropriate for treatment should be brownish-red, coagulable, and free from odour. If the sludge appears to be failing to meet these requirements, then measure its MLSS, viscosity, DO, pH, temperature and BOD load. If necessary, take appropriate action, such as additional injection of seeding sludge or adjust the organic loading, etc.

4. MLSS:

The sludge should have an MLSS of 7,000 to 18,000 mg/L. If MLSS is too low, add seeding sludge or stop sludge transfer. If MLSS is too high, increase the sludge wasting rate.

5. Sludge viscosity:

The sludge viscosity should not be more than 250 mPa-s. If the sludge viscosity is too high, replace the sludge or transfer the sludge to the sludge storage tank until an appropriate viscosity value is attained.

6. DO:

DO values should be 1 mg/L or more at any point in the membrane submerged basin. If this requirement is not met, you may increase the scouring airflow rate to the extent that the rate does not exceed its maximum permissible value. Reduce incoming BOD strength. Add supplemental aeration.

7. pH:

pH range should be 6 to 8. If this requirement is not met and activated sludge property is not good, adjust pH by adding acid or alkali.

8. Liquid temperature:

The liquid temperature should be 15^{O} C to 40^{O} C (59^{O} to 104^{O} F). If this requirement is not met and activated sludge property is not good, it is recommended that you take corrective measures.

9. Liquid level:

Check that the liquid level of the membrane submerged basin is in the appropriate range. If this requirement is not met, check (i) the liquid-level meter, (ii) the suction pump, and (iii) the trans-membrane pressure, and when necessary, take corrective action, such as adjusting the control system.

9 MAINTENANCE OF SANIBRANE®:

9.1 Maintenance Items and Maintenance Frequency:

To maintain SaniBrane® perform the following at specified intervals:

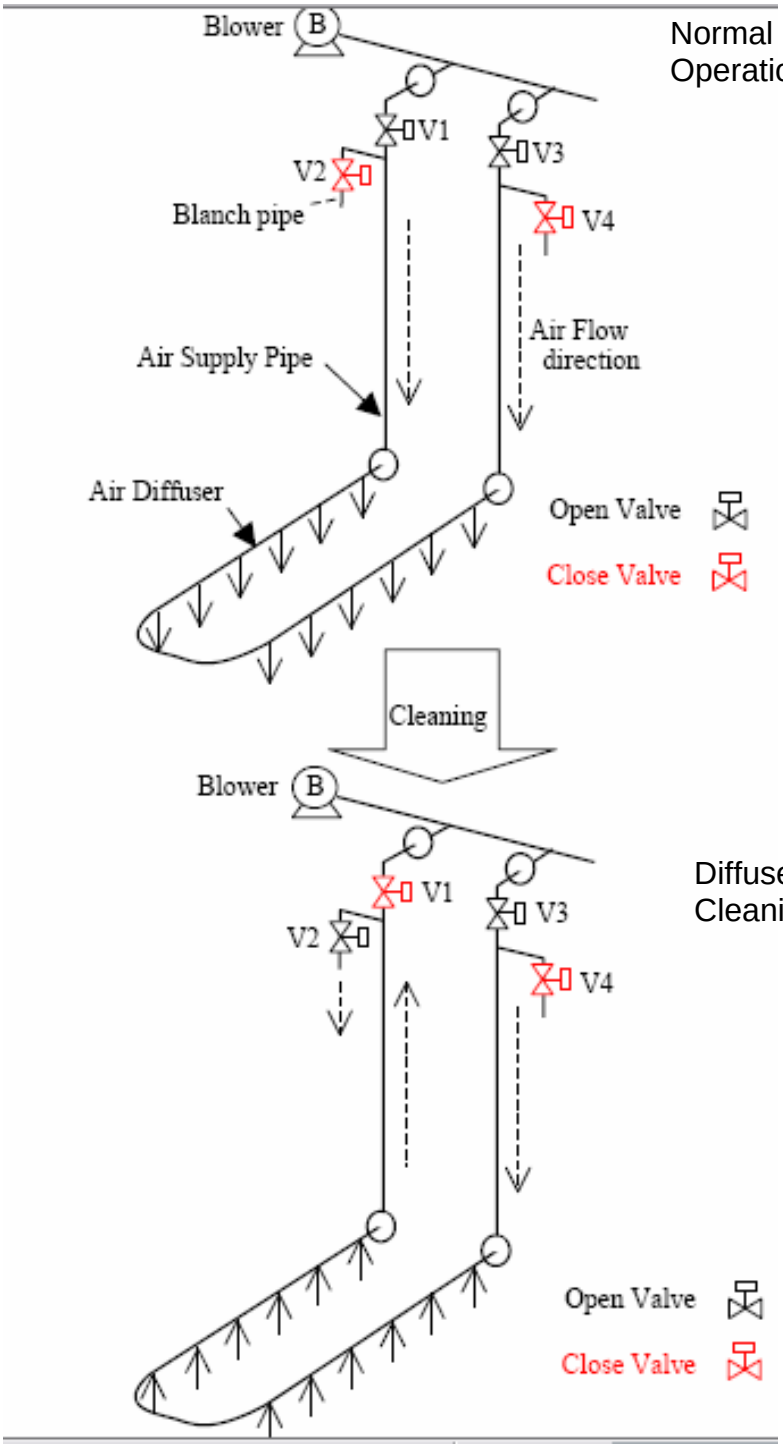
1. Clean the air diffusers (everyday)
2. Chemical cleaning of the element, every six (6) months or when the trans-membrane pressure has risen by 5 kPa or more from its initial operating level at the same permeated water flow rate, whichever occurs earlier.
3. Replace connection tubes (once in three (3) years, or when deteriorated)
    - In replacement of parts, be sure to use specified types.
    - For detailed specifications and procurement routes for replacement parts, please contact us.
    - In replacing tubes, insert the tube securely into the foot of the nozzle.
    - In replacing tubes, avoid applying excess force to the element and manifold nozzles to prevent damage.

9.2 Air Diffuser Cleaning:

Clogging of diffuser holes may lead to uneven air diffusion and membrane clogging. To prevent such clogging, clean the air diffusers at least once a day (it is recommended to automate the air diffuser cleaning process by using automatic valves). Ensure that the permeate flow is stopped before starting.

The cleaning is done by the reverse flow of the sludge from the diffuser hole into the diffuser piping. This is accomplished by opening the air diffuser cleaning valve and releasing the pressure inside the air diffuser, discharging such sludge by the diffusing air through the branch valve.

9.2.1 Air diffuser cleaning procedure:



1. Stop Filtration
2. Close V1 Valve
3. Open V2 valve. At this step, the sludge liquid comes through the diffuser holes into diffuser piping, and is discharged together with the air.
4. Keep V2 valve open for about one (1) minute.
5. Close V2 valve, and then open V1 valve.
6. Clean the other line in the same manner as follows.
7. Close V3 valve.
8. Open V4 valve. At this step, the sludge liquid comes through the diffuser holes into the diffuser piping, and is discharged together with the air.
9. Keep V4 valve open for about one (1) minute.
10. Close V4 valve, and then open V3 valve
11. Restart filtration.

9.3 Chemical Cleaning of Element:

Chemical cleaning of the element should be conducted when the trans-membrane pressure rises in excess of operational limits. Such a pressure increase can be caused when contaminants clog the pores of the membrane surface. The timing of chemical cleaning should be determined as follows:

1. Every six (6) months or when the trans-membrane pressure has risen by 5 k Pa from its initial operating level at the same permeated water flow rate, whichever occurs earlier.
2. If the Trans-membrane pressure is rising rapidly, conduct chemical cleaning much earlier. Early chemical cleaning is effective to remove contaminates clogged in the membrane pores.
3. In the case that the trans-membrane pressure rises by 5 k Pa within six (6) months, record how many months it took to rise and conduct chemical cleaning accordingly. This measure is effective in prolonging the life of membranes.

9.4 Chemical Agents Used for Chemical Cleaning:

For chemical cleaning of the element, it is important to select chemicals in accordance with the type of adherent contaminant. Cleaning under inappropriate cleaning conditions or using the wrong chemicals may cause poor filtration performance or damage to the element. Select chemicals suitable for each contaminant. Table 9.4 shows suitable chemicals and standard cleaning conditions.

Table 9.4 Cleaning Chemicals and Standard Cleaning Conditions by Contaminant

Contaminant	Chemical	Solutions concentration	Amount used	Hold time
Organic matter	Sodium hypochlorite	2,000 – 6,000 mg/L (effective chlorine concentration) (pH is about 12)	5L/ element (1.32 USG)	1 to 3 hours
Inorganic matter	Oxalic acid	0.5 - 1.0 wt %	5 L/element (1.32 USG)	1 to 3 hours
Inorganic matter	Citric acid	1.0 – 3.0 wt%	5 L/element (1.32 USG)	1 to 3 hours

9.5 Handling of Chemical Agents:

Some chemical agents used for chemical cleaning are harmful when they come in contact with skin. In handling chemicals, wear protective goggles, protective gloves and other protectors. Before using chemicals, be sure to check the details of its material safety data sheet (MSDS) and the instructions given below. If chemicals come into contact with your skin, follow the MSDS to take suitable action for each chemical.

Table 9.5i Chemical Handling precautions:

Agent:	Sodium hypochlorite Solution/ NaClO	Oxalic Acid / $(COOH)_2$	Citric acid/ $HOOCCH_2C(OH)(COOH)CH_2COOH$
CHEMICAL HANDLING PRECAUTIONS	Ventilate well. Avoid heat sources and sparks. Also avoid contact with acids.	Keep away from acids and bases.	Keep away from strong acids and bases.
	Handle the chemical container with great care. Avoid toppling, bumping or dragging it.		
	Take care to prevent leaks, spillover or splattering. Do not cause dust or vapor.		
	Firmly seal the container after use.		
	After using chemicals, thoroughly wash your hands and face and rinse out your mouth.		
	Do not eat or drink except in a designated place.		
	Keep gloves in a designated area away from any rest area or lunch rooms.		
	Forbid unauthorized entry to the place where chemicals are handled.		
	Wear appropriate protectors to avoid inhalation, eye or skin contact, and direct contact with your clothes.		
	To handle chemicals outdoors, provide local ventilation.		

Table 9.5ii Storage Precautions:

Agent:	Sodium hypochlorite Solution/ NaClO	Oxalic Acid / $(COOH)_2$	Citric acid/ $HOOCCH_2C(OH)(COOH)CH_2COOH$
STORAGE PRECAUTIONS	Store container in a dark, cold place. Avoid direct sunlight. Firmly seal to prevent direct contact with air.		
	For storage, use corrosion-resistant containers.		

- Many chemical agents are extremely hazardous to one's health. When handling chemicals, one should wear protective goggles, gloves and any other available protective gear. Be sure to carefully read the details of the material safety data sheet (MSDS) BEFORE handling any chemicals.
- If chemicals come in contact with your skin or clothes, immediately rinse with large amounts of water.
- Store chemicals in a dark, cold place away from direct sunlight.
- If chemicals come in contact with your eye, immediately flush with running water and see a physician.
- In the chemical storage tanks, be sure to use a material suitable for each chemical in order to prevent corrosion.
- Do not mix sodium hypochlorite with heavy metals or acids. Its mixture with an acid generates toxic chlorine gas.

9.6 Chemical Cleaning Procedure:

9.6.1 For Elements:

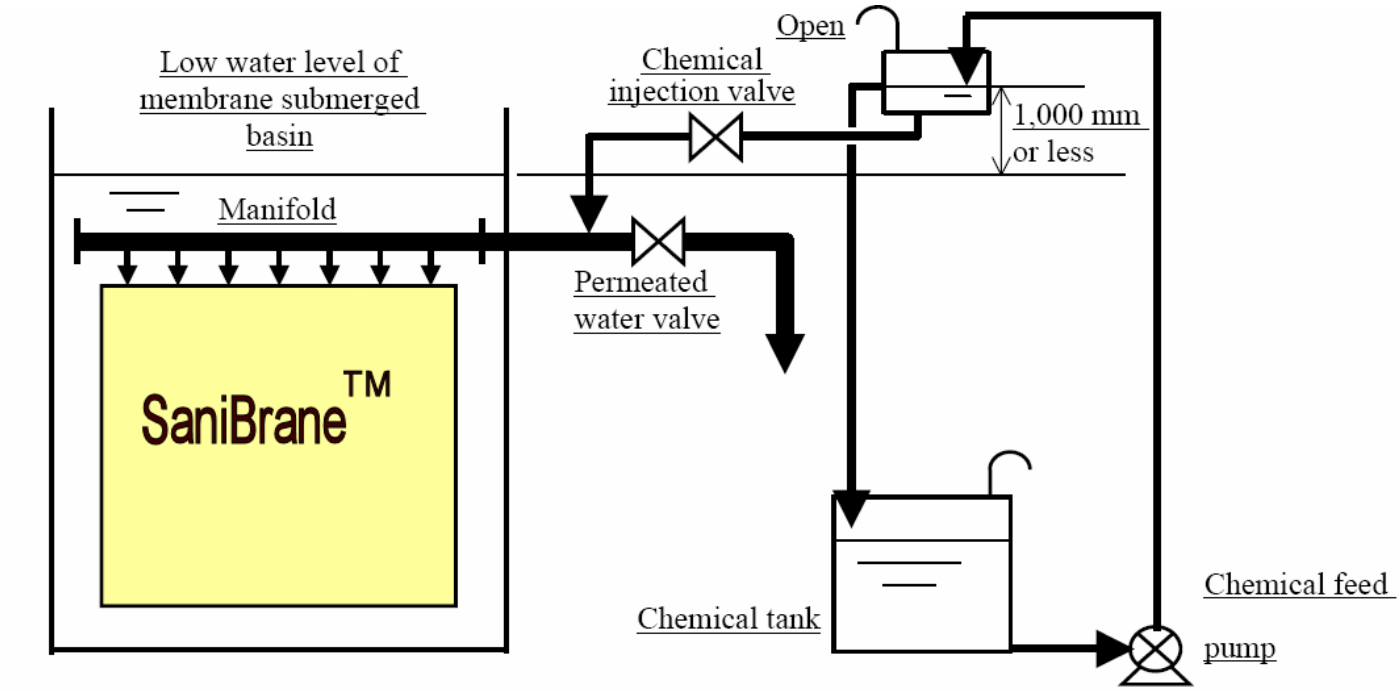
When cleaning, slowly inject chemicals via the permeated water nozzle into the elements until they percolate through the membranes.

Depending on the location of the chemical tank, use a natural water head when injecting chemicals, as shown below.

1. Chemical cleaning with the chemical tank located at the bottom (Diagram 9.6.1A)

a) Check that the chemical injection valve is closed and that the chemical feed pump is at rest.
b) Fill the chemical tank with specified amounts of chemicals.
c) Stop filtration and close the permeated water valve (air diffusion should be continued).
d) Start the chemical feed pump and check that the chemicals circulate.
e) Slowly open the chemical injection valve to inject chemicals.
f) After injecting the specified amount of chemicals, stop the chemical feed pump.
g) Leave the equipment for 1 to 3 hours.
h) Close the chemical valve, open the permeated water valve and restart filtration.
i) Chemicals remain in the permeated water in an early phase of filtration (for a period of 2 or more intermittent cycles). Send back the permeated water to the raw water. Otherwise, dispose of it in accordance with applicable legal standards for waste disposal.

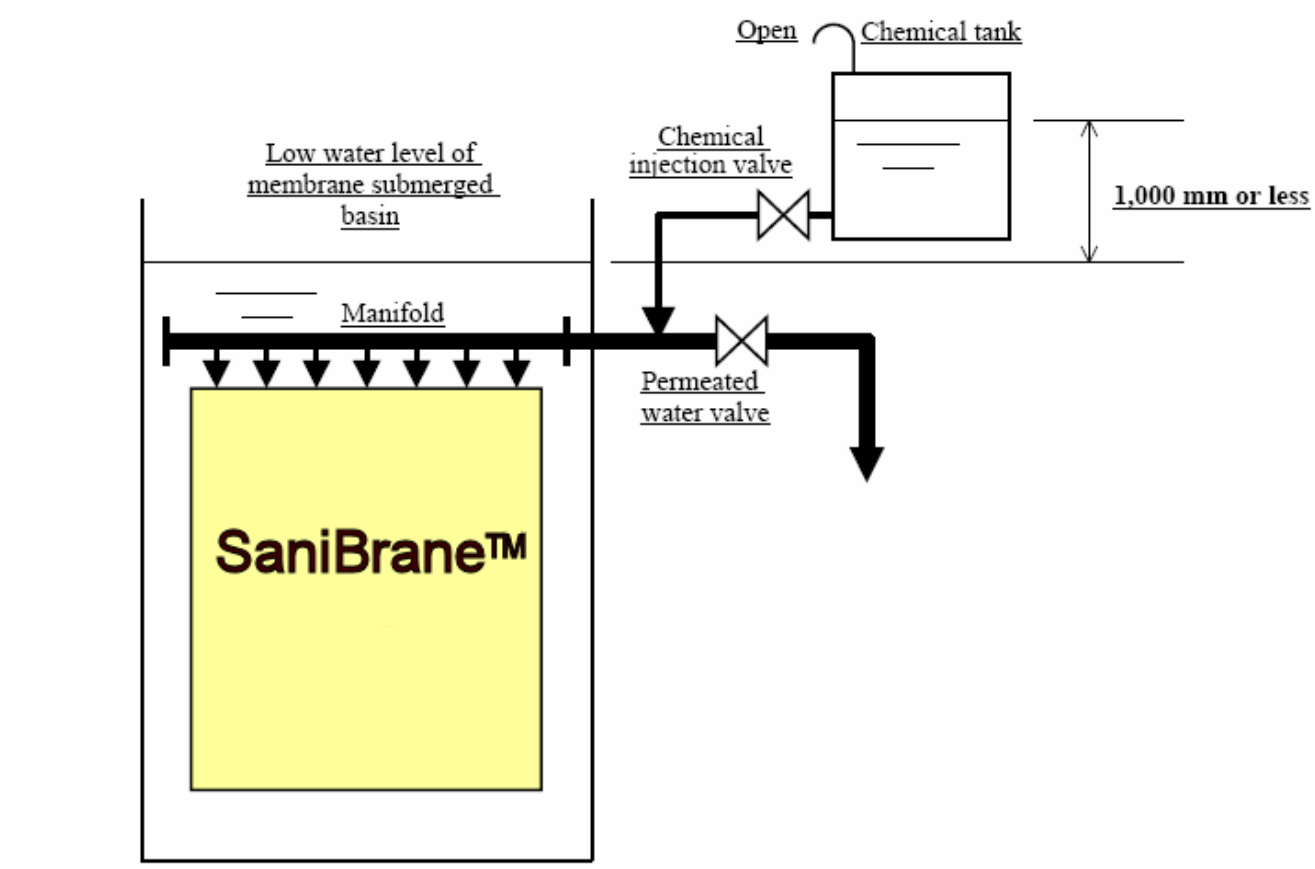
Diagram 9.6.1A - Chemical cleaning with Chemical Tank Located below the MBR liquid level:



2. Chemical cleaning with the chemical tank located above the membrane submerged basin (Diagram 9.6.1B)

a) Check that the chemical injections valve is closed
b) Feed the chemical tank with specified amounts of chemicals.
c) Stop filtration and close the permeated water (air diffusion should be continued)
d) Slowly open the chemical injection valve to inject chemicals
e) After injecting chemicals, leave the equipment for 1 to 3 hours
f) Close the chemical injection valve, open the permeated water valve and restart filtration
    - Chemicals remain in the permeated water in an early phase of filtration (for a period of 2 or more intermittent cycles). Send back the permeated water to the raw water tank. Otherwise, dispose of it in accordance with applicable legal standards for waste disposal.

Diagram 9.6.1 B – Chemical cleaning with Chemical Tank Located above the MBR liquid level



9.6.2 Precautions for chemical cleaning of elements:

a) Inject chemicals using gravity. Maintain the pressure at 10 kPa (1.45 psi or approximately 1 meter) or less. Avoid forcibly applying pressure with the pump directly connected. A higher pressure can damage the elements.
b) Inject chemicals with SaniBrane® submerged in the membrane submerged basin. To ensure the safety of the operator, keep the top of the module at least 500 mm (20") below the water surface.
c) Continue air diffusion during chemical cleaning. Note, however, that foaming may occur inside the membrane submerged basin depending on the type of chemicals used or other conditions. In such a case, reduce the defused air rate.
d) A higher temperature of chemicals produces greater cleaning effects. However, maintain the temperature at 40^{O}C or below. Conversely, a lower temperature causes poor cleaning effects, hampering the recovery of the membrane function. Maintain as high of a temperature as is possible inside the membrane submerged basin.
e) After chemical cleaning, a small amount of chemicals remain inside the elements and filtration piping right. To restart filtration, send back the permeated water to the

raw water tank until the permeated water is free from the effects of the chemicals (for a period of at least 2 intermittent cycles). Otherwise, dispose of it in accordance with applicable legal standards for waste disposal.

- If an abnormality is found in the equipment during chemical cleaning, immediately stop the operation.
- If chemicals are injected forcibly with the chemical feed pump or by any other means, the internal pressure of the element may increase, leading to damage to the element. Be sure to inject chemicals by gravity at 10 pKa or less.
- Before feeding chemicals for chemical cleaning, check that the water surface is 500 mm or more above the top of the module. Feed chemicals after SaniBrane® are completely submerged.

9.7 Lifting Procedure:

To lift SaniBrane® for maintenance, take the following steps:

1. Completely empty the membrane submerged basin.
2. To lift only the element block, remove the manifold. To lift the aeration block along with the element block, also remove the air diffuser pipe.
3. To remove and lift only the element block, remove the bolts connecting it to the aeration block.
4. For TMR140-200W, if the manifold is connected to two element blocks, remove the bolts and separate the manifold.
5. To lift the aeration block along with the element block, remove the fastened anchors.

- The chains or slings being used to raise the SaniBrane® must be sufficient for the weight of the SaniBrane® System. Lifting should be done in a straight upward motion not allowing any shaking of the product.
- The element block will be significantly heavier after operation. Ensure the lifting equipment is suitable.

CAUTION

- To restart filtration right after lifting maintenance, keep the membranes wet during the maintenance. Dried membranes may reduce permeable amounts of water.

10 TROUBLESHOOTING:

Most abnormalities in SaniBrane® concern abnormal air diffusion, increased trans-membrane pressure, decreased permeated water flow rate, and degenerated permeated water quality. The following explains such abnormalities and corrective actions against them:

Table 10 - Troubleshooting

	Problem	Cause	Action
1	The air diffusion rate is below the standard level.	The blower is broken or worn	Check the blower
		The air diffusers are clogged	Clean the air diffusers
2	The air diffusion is uneven inside a module or between modules.	The air diffusers on the module are clogged.	Clean the air diffusers on the module.
3	The permeated water flow rate was decreased. Or, the trans-membrane pressure has increased.	Membrane clogging has worsened.	Perform chemical cleaning.
		Decreased or uneven diffused air is preventing smooth membrane cleaning.	Inspect the blower and clean the air diffusers to improve air diffusion.
		Abnormal properties of sludge have worsened its filterability.	Improve sludge properties: • Adjust the sludge discharge rate. • Prevent entry of abnormal components, such as oils. • Adjust BOD load • Adjust the raw water quality (add nitrogen, phosphorous, etc.)
		Partial clogging of membrane	• Perform an extensive air scour with permeate flow off.
4	The concentration of suspended solids in the permeate water has increased.	An element or tube has fractured.	Seal the element and manifold nozzle.*1
		A leakage has occurred in the permeated water piping.	Inspect the faulty part *2 and correct the fault.
		Germs are generated on the membrane.	To clean the permeated water piping, inject into it a sodium hypochlorite solution with an effective chlorine concentration of 100 to 200 mg/L.

*1: Even if a cause is found in the tube, there still is the possibility of contamination inside the element. Thus, seal the element and manifold nozzle.

*2: To check the piping joints and welds for leakage with pressure being applied, take care not to exert pressure.

Appendix B: MSDS for Chemicals Used in the WTP

SIGMA CHEMICALS

Material Safety Data Sheet
Calcium Chloride Dihydrate

1. IDENTIFICATION

Product Name	**Calcium Chloride Dihydrate**
Other Names	Calcium Chloride Dihydrate; Calcium Chloride Food Grade; Calcium Chloride Granular; Calcium Chloride-2-Hydrate
Uses	Food Applications.
Chemical Family	No Data Available
Chemical Formula	CaCl2.2H2O
Chemical Name	Calcium Chloride Dihydrate
Product Description	No Data Available

Contact Information

Organisation	Location	Telephone
Sigma Chemicals	228 Balcatta Rd Balcatta WA 6021	08 9345 2233
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia New Zealand	1800-127406 0800-243622 +64-3-3530199
National Poisons Centre	New Zealand	0800-764766

2. HAZARD IDENTIFICATION

ADG Code	Non-Dangerous Goods according to the criteria of the Australian Dangerous Goods Code (ADG Code).	
ASCC Hazard Classification	Hazardous according to the criteria of ASCC [NOHSC:1008(2004)]	
Categories	Xi	Irritant
Risk Phrases	R36	Irritating to eyes.
Safety Phrases	S25	Avoid contact with eyes.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S36/39	Wear suitable protective clothing and eye/face protection.
HSNO Hazard Classification	6.1D; 6.3A; 6.4A; 9.3C	
Poisons Schedule (Aust)	No Data Available	

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Calcium Chloride, Dihydrate	No Data Available	10035-04-8	100.0 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Rinse mouth with water. Give water to drink. Do NOT induce vomiting. If vomtiting occurs, give further water. Seek medical advice immediately.
Eye	If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing untill advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
Skin	If skin contact occurs, remove any contaminated clothing and wash skin with running water. If irritation occurs, seek medical advice.
Inhaled	Remove victim from exposure to fresh air - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm and at rest until fully recovered. Seek medical advice if effects persist.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

Flammability Conditions	Product is a non-flammable solid.
Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions. Suitable media may include fine water spray, normal foam, or dry agent such as carbon dioxide or dry chemical powder. Keep containers cool with water spray.
Hazardous Products of Combustion	Non-combustible solid. Negligible fire hazard when exposed to heat or flame. This product does not burn. Incompatible with methyl vinyl ether, bromine trifluoride, acids, bases, water, zinc and sources of ignition. When involved in a fire, this product may generate toxic fumes, including chlorine, oxides of calcium and calcium hydroxide is formed on reaction with strong bases.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves). Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment. Dike area to prevent runoff and contamination of water sources.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Avoid accidents, clean up immediately. spillage of product creates slippery surfaces. Personnel involved in the clean up should wear full protective clothing as listed in section 8. Evacuate all unnecessary personnel. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger area. Do NOT let product reach drains or waterways. If the product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management.
Clean Up Procedures	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled container and dispose of promptly as hazardous waste. Wash area down with excess water.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures.

	Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid handling which leads to dust formation. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes. Instantly remove any soiled and impregnated garments. Launder contaminated clothing before re-use. Keep away from moisture and incompatible materials.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Protect from direct sunlight and moisture. Prevent formation of dust. The product is hygroscopic and absorbs moisture from the air. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Packaging must comply with requirements of Hazardous Substances (Packaging) Regulations 2001. Store in original packaging as approved by manufacturer. SUITABLE: Storage container must be made of corrosion resistant materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limits for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: Wear an effective dust mask (P2 filter) where dusts are generated and engineering controls are inadequate (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: PVC or neoprene gloves (AS2161). Do NOT use leather or cotton. CLOTHING: Chemical-resistant coveralls and safety footwear (AS3765/2210). Do NOT use leather boots/products as they will dehydrate resulting in shrinkage and possible destruction.
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Solid; Granular; Fine Crystals; Flakes; or Powder.
Odour	Odourless
Colour	White to Off White
pH	8.0 - 10.0
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling/Melting Point	>1600 °C
Solubility	42.7g/100g Solution °C
Freezing Point	176 °C
Specific Gravity	1.85g/cm3 (25'C)
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available

Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	No Data Available
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature. Hygroscopic. Absorbs moisture from the surrounding air.
Conditions to Avoid	Avoid excessive heat, generating dust, direct sunlight, moisture, static charges and high temperatures.
Materials to Avoid	Incompatible with methyl vinyl ether, bromine trifluoride, acids, bases, water zinc and sources of ignition.
Hazardous Decomposition Products	When involved in a fire, this product may generate toxic fumes, including chlorine, oxides of calcium and calcium hydroxide is formed on reaction with strong bases.
Hazardous Polymerisation	Polymerisation will not occur. Hygroscopic - absorbs moisture from surrounding air. Metals will slowly corrode in squeous solutions of calcium chloride. Aluminium (and alloys) and yellow brass will be attacked by calcium chloride.

11. TOXICOLOGICAL INFORMATION

General Information	Oral LD50 Rabbit: 1000mg/Kg (33% Liquid)
EyeIrritant	An eye irritant. Eye contact causes pain.
Ingestion	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Inhalation	Breathing in dust may result in respiratory irritation.
SkinIrritant	Prolonged or repeated skin contact may lead to allergic contact dermatitis in some individuals. The skin may react by producing redness, irritation, weals or pustules.
Carcinogen Category	0

12. ECOLOGICAL INFORMATION

Pimephales Promelas LC50/96hr : 4630mg/L Dapnia Magna EC50/48hr : 2400mg/L Selenastrum

Ecotoxicity	Capricornutum EC50/72hr : 2900mg/L
Persistence/Degradability	No information available on persistence/degradability for this product.
Mobility	No information available on mobility for this product. Soluble in water.
Environmental Fate	Do NOT let product reach waterways, drains and sewers.
Bioaccumulation Potential	No information available on bioaccumulation for this product.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice. This should be done in accordance with 'The Hazardous Waste Act'. This material may be suitable for approved landfill. For small disposals dilute with a large amount of water and neutralise with acid to about pH 7.

14. TRANSPORT INFORMATION

ADG Code Non-Dangerous Goods according to the criteria of the Australian Dangerous Goods Code (ADG Code).

Air

IATA

Proper Shipping Name	CALCIUM CHLORIDE DIHYDRATE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land

Australia: ADG

Proper Shipping Name	CALCIUM CHLORIDE DIHYDRATE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
EPG	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

New Zealand: NZS5433

Proper Shipping Name	CALCIUM CHLORIDE DIHYDRATE
Class	No Data Available
Subsidiary Risk(s)	No Data Available

EPG	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

South Africa: NZS5433

Proper Shipping Name	CALCIUM CHLORIDE DIHYDRATE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
EPG	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea

IMDG

Proper Shipping Name	CALCIUM CHLORIDE DIHYDRATE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

15. REGULATORY INFORMATION

General Information No Data Available

EPA (New Zealand)

Hazardous Substances and New Organisms Act (HSNO)
Approval Code: HSR003217

Poisons Schedule (Aust)	No Data Available
AICS Name	CALCIUM CHLORIDE, DIHYDRATE

16. OTHER INFORMATION

Revision	1
Revision Date	23-Apr-2010

Key/Legend

< Less Than
> Greater Than
AICS Australian Inventory of Chemical Substances
atm Atmosphere
CAS Chemical Abstracts Service (Registry Number)
cm² Square Centimetres
CO2 Carbon Dioxide
COD Chemical Oxygen Demand
deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams
g/cm³ Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit

TLV Threshold Limit Value
tne Tonne
torr Millimetre of Mercury
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 08/19/2005
Date Updated: 08/18/2005
Version 1.5

Section 1 - Product and Company Information

Product Name	CALCIUM CHLORIDE DEHYDRATED, CRYSTAL LUMPS, 7-25 MM
Product Number	21085
Brand	FLUKA
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
CALCIUM CHLORIDE	10043-52-4	No

Formula: CaCl2
Synonyms: Calplus * Caltac * Dowflake * Liquidow * Peladow * Snomelt * Superflake anhydrous
RTECS Number: EV9800000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Harmful.
Harmful if swallowed. Risk of serious damage to eyes.

HMIS RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

SPECIAL REQUIREMENTS
Moisture sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid Color: White Form: Crystals

Property	Value	At Temperature or Pressure
Molecular Weight	110.99 AMU	
pH	N/A	
BP/BP Range	1,670 °C	
MP/MP Range	772 °C	
Freezing Point	N/A	
Vapor Pressure	0.01 mmHg	20 °C
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	2.15 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	0.006 Pas	20 °C
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	1.52	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Conditions to Avoid: Exposure to moisture may affect product quality.
Materials to Avoid: Boron oxides, Strong acids, Zinc, Calcium oxide, Methyl vinyl ether, Calcium chloride is attacked by bromine trifluoride.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Hydrogen chloride gas, Calcium oxide.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: Severe eye irritant.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: Harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
1000 mg/kg
LD50

Intraperitoneal
Rat
264 MG/KG
LD50

Subcutaneous
Rat
2630 MG/KG
LD50

Intramuscular
Rat
25 MG/KG
LD50

Oral
Mouse
1940 mg/kg
LD50

Intraperitoneal
Mouse
210 MG/KG
LD50
Remarks: Behavioral:Somnolence (general depressed activity).
Behavioral:Convulsions or effect on seizure threshold.
Behavioral:Change in motor activity (specific assay).

Subcutaneous
Mouse
823 MG/KG
LD50

Intravenous
Mouse
42 MG/KG
LD50

IRRITATION DATA

Skin
Rabbit
Remarks: No irritation effect
Eyes
Rabbit
Remarks: Severe irritation effect

eye/face protection.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CAUSTIC SODA - LIQUID (46%-50%)

Other name(s): Sodium hydroxide - liquid (46%-50%), Soda lye solution (46%-50%), Caustic soda solution (46%-50%), Sodium hydroxide solution (46%-50%), Liquid caustic soda (46%-50%), LCS 46%, Rezolv 46, Algane C46, Rezolv 50.

Recommended use of the chemical and restrictions on use: Chemical manufacture; neutralising agent; pulp and paper, aluminium, detergent, and textile processing; vegetable oil refining; reclaiming rubber; etching and electroplating; food additive.

Supplier: Orica Australia Pty Ltd
ABN: 99 004 117 828
Street Address: 1 Nicholson Street,
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937
Emergency Telephone: **1 800 033 111 (ALL HOURS)**

2. HAZARDS IDENTIFICATION

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

This material is hazardous according to Safe Work Australia; HAZARDOUS SUBSTANCE.

Classification of the substance or mixture:
Corrosive to Metals - Category 1
Skin Corrosion - Sub-category 1B
Eye Damage - Category 1

SIGNAL WORD: POISON

Hazard Statement(s):
H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.

Precautionary Statement(s):

Prevention:
P234 Keep only in original container.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P264 Wash hands 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.
P363 Wash contaminated clothing before re-use.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P310 Immediately call a POISON CENTER or doctor/physician.
P321 Specific treatment (see First Aid Measures on Safety Data Sheet).
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P390 Absorb spillage to prevent material damage.

Storage:
P405 Store locked up.
P406 Store in corrosive resistant container with a resistant inner liner.

Disposal:
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Poisons Schedule (SUSMP): S6 Poison.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Water	7732-18-5	50-54%	-
Sodium hydroxide	1310-73-2	46-50%	H290 H314 H318

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:
Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. For all but the most minor symptoms arrange for patient to be seen by a doctor as soon as possible, either on site or at the nearest hospital.

Skin Contact:
If spilt on large areas of skin or hair, immediately drench with running water and remove clothing. Continue to wash skin and hair with plenty of water (and soap if material is insoluble) until advised to stop by the Poisons Information Centre or a doctor.

Eye Contact:
If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:
Immediately rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:
Treat symptomatically. Can cause corneal burns.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Hazchem or Emergency Action Code: 2R

Specific hazards arising from the substance or mixture:
Non-combustible material.

Special protective equipment and precautions for fire-fighters:
Not combustible, however following evaporation of aqueous component residual material can decompose if involved in a fire, emitting toxic fumes. Contact with metals may liberate hydrogen gas which is extremely flammable. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:
Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:
Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact and breathing in vapours. Work up wind or increase ventilation. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Collect and seal in properly labelled containers or drums for disposal. Caution - heat may be evolved on contact with water.

7. HANDLING AND STORAGE

This material is a Scheduled Poison S6 and must be stored, maintained and used in accordance with the relevant regulations.

Precautions for safe handling:
Avoid skin and eye contact and breathing in vapour, mists and aerosols.

Conditions for safe storage, including any incompatibilities:
Store in cool place and out of direct sunlight. Store away from incompatible materials described in Section 10. Store away from foodstuffs. Do not store in aluminium or galvanised containers nor use die-cast zinc or aluminium bungs; plastic bungs should be used. At temperatures greater than 40°C, tanks must be stress relieved. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters: No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Sodium hydroxide: Peak Limitation = 2 mg/m^3

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

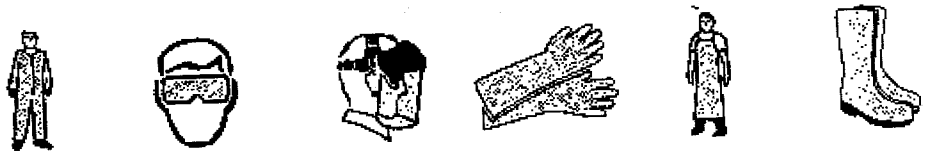
Peak Limitation - a maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time which does not exceed 15 minutes.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:
Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. If inhalation risk exists: Use with local exhaust ventilation or while wearing suitable mist respirator. Keep containers closed when not in use.

Individual protection measures, such as Personal Protective Equipment (PPE):
The selection of PPE is dependant on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

Orica Personal Protection Guide No. 1, 1998: D - OVERALLS, CHEMICAL GOGGLES, FACE SHIELD, GLOVES (Long), APRON, RUBBER BOOTS.



Wear overalls, chemical goggles, face shield, elbow-length impervious gloves, splash apron or equivalent chemical impervious outer garment, and rubber boots. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.
If risk of inhalation exists, wear suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Colourless to Slightly Coloured
Solubility:	Miscible with water.
Specific Gravity:	1.48-1.52 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	1.34 mm Hg (calculated)
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 145 (literature)
pH:	14 (literature)
Freezing Point/Range (°C):	ca. 12 (calculated)

10. STABILITY AND REACTIVITY

Reactivity:	Reacts violently with acids. Reacts exothermically on dilution with water.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Absorbs carbon dioxide from the air.
Possibility of hazardous reactions:	Reacts with ammonium salts, evolving ammonia gas. Reacts readily with various reducing sugars (i.e. fructose, galactose, maltose, dry whey solids) to produce carbon monoxide. Take precautions including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to avoid:	Avoid exposure to moisture.
Incompatible materials:	Incompatible with ammonium salts , aluminium , tin , and zinc .

Hazardous decomposition products: None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain and chemical burns to the gastrointestinal tract.

Eye contact: A severe eye irritant. Corrosive to eyes; contact can cause corneal burns. Contamination of eyes can result in permanent injury.

Skin contact: Contact with skin will result in severe irritation. Corrosive to skin - may cause skin burns.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. For the constituent Sodium hydroxide :

Skin corrosion/irritation: Severe irritant (rabbit).
Chronic effects: No information available for the product.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

13. DISPOSAL CONSIDERATIONS

Disposal methods:
Refer to Waste Management Authority. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport
Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN No:	1824
Transport Hazard Class:	8 Corrosive
Packing Group:	II
Proper Shipping Name or Technical Name:	SODIUM HYDROXIDE SOLUTION
Hazchem or Emergency Action Code:	2R

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Orica Limited cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Orica representative or Orica Limited at the contact details on page 1.

Orica Limited's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

NSF Reference Standards

MATERIAL SAFETY DATA SHEET

NAME OF PRODUCT: Citric Acid MSDS DATE: 17 Nov, 2011

Notice

NSF Reference Standards are for test and assay use only and are not intended for human or animal consumption. This document communicates information relating to test and assay use only and may not be applicable for any unauthorized use.

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Citric Acid
Catalog Code:	RS1-0039
Synonym:	2-hydroxypropane-1,2,3-tricarboxylic acid
Chemical Formula:	$C_6H_8O_7$
CAS #:	77-92-9

Contact Information:

NSF International
789 N. Dixboro Road
Ann Arbor, MI 48113-0140, USA
Toll Free (USA): 800-NSF-MARK (800-673-6275)
Telephone: (+1) 734-769-8010
Fax: (+1) 734-769-0109
www.nsf-rs.org

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Name: Citric Acid

CAS#: 77-92-9

% by Weight: 100%

Toxicological Data on Ingredients:
LD50 (mouse): 5040 mg/ kg, LD50 (rat): 3000 mg/ kg

SECTION 3: HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion, of inhalation (lung irritant). Tissue damage is dependent on length of contact. Skin contact can produce

inflammation and blistering. Severe overexposure can produce lung damage, choking, unconsciousness, or death.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer).
CARCINOGENIC EFFECTS: Not Available
MUTAGENIC EFFECTS: Mutagenic for Human somatic cells, and bacteria/ yeast cells
TERATOGENIC EFFECTS: Not Available
DEVELOPMENTAL TOXICITY: Not Available
Repeated or prolonged exposure to the substance can produce target organ damage.

Repeated or prolonged exposure to the substance is not known to aggravate medical conditions.

SECTION 4: FIRST AID MEASURES

Eye Contact:
Check for and remove contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation occurs.
Skin Contact:
In case of contact, immediately wash skin with non-abrasive soap and plenty of water. Cover the irritated skin with an emollient. Seek medical attention if irritation develops.
Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.
Inhalation:
If inhaled, remove to fresh air. If not breathing give artificial respiration. Seek medical attention.
Serious Inhalation:
Not Available
Ingestion:
Do not induce vomiting. Loosen tight clothing. If a large quantity of citric acid is swallowed, seek medical attention if symptoms appear.
Serious Ingestion: Not Available.

SECTION 5: FIRE-FIGHTING MEASURES

Flammability of the Product: May be combustible at high temperature.
Auto-Ignition Temperature: 1010 °C
Flammable Limits: Lower: 0.28 kg/m^3 (Dust) Upper: 2.29 kg/m^3 (Dust)

Flash Points: Not Available

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6234 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

Products of Combustion: These products are carbon oxides (CO, CO_2)
Special Remarks on Explosion Hazards: Not Available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames.

Explosion Hazards in Presence of Various Substances:
Slightly explosive in the presence of flames and sparks.
Risks of explosion of the product in presence of mechanical impact: Not Available.
Risks of explosion of the product in presence of static discharge: Not Available.
Special Remarks on Fire Hazards: Fire is possible at elevated temperatures.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. After powder clean up, spread water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Stop leak if without risk. Do not touch spilled material. Call for assistance. Use appropriate tools to put the material into a suitable waste disposal container. After powder clean up, spread water on the contaminated surface and dispose of according to local and regional authority requirements.

SECTION 7: HANDLING AND STORAGE

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and provide the container or the label. Avoid contact with skin and eyes. Keep away from oxidizing agents, reducing agents, metals, alkalis.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area.

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6234 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:
If laboratory operations generate dust, fume or mist, use local exhaust ventilation or other appropriate engineering controls to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not Available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state and appearance: Solid. (crystalline powder)
Odor: Odorless
Taste: Acidic, Strong
Molecular Weight: 192.13 g/mol
Color: Not Available
pH (1% soln/water): Not Available
Boiling Point: Decomposes
Melting Point: 153 °C
Critical Temperature: Not Available
Specific Gravity: 1.665
Vapor Pressure: Not applicable.
Vapor Density: Not Available.
Volatility: Not Available.
Odor Threshold: Not Available.
Water/Oil Dist. Coeff.: Citric acid is more soluble in water; log(oil/water) = -1.7
Ionicity (in Water): Not Available
Dispersion Properties: Not Available
Solubility: Soluble in cold water, hot water.

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6234 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

SECTION 10: STABILITY AND REACTIVITY

Stability: The product is stable.
Instability Temperature: Not Available.
Conditions of Instability: Excessive heat, incompatible materials.
Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, metals, alkalis
Corrosivity: Corrosive in the presence of aluminum, zinc, of copper. Not corrosive in presence of glass.
Special Remarks on Reactivity: Incompatible with oxidizing agents, potassium tartrate, alkali, alkaline earth carbonates and bicarbonates, acetates and sulfides, metal nitrates.
Special Remarks on Corrosivity: Will corrode copper, zinc, aluminum, and their alloys.
Polymerization: Will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3000 mg/kg [Rat]

Irritancy data: Skin/ rabbit: not irritating; Eye/ Rabbit: not irritating

Chronic effects on humans: May cause damage to teeth.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion, or inhalation (lung irritant).

Special Remarks on Toxicity to Animals:
LDL [Rabbit] – Route: oral; Dose: 7000 mg/kg

Special Remarks on Chronic Effects on Humans: Not Available

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause mild to moderate irritation/ sensitization, allergic reaction
Eyes: May cause moderate to severe eye irritation and possible injury
Inhalation: May cause respiratory tract and mucous membrane irritation.
Ingestion: May cause GI irritation with nausea, vomiting, diarrhea. Excessive intake may cause teeth erosion and hypocalcaemia. May affect nervous system (tremor, convulsions, muscle contraction).
Chronic potential Health effects:

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6284 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not Available.
BOD5 and COD: Not Available.
Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Toxicity of the Products of Biodegradation:
The products of degradation and the product itself are not toxic.
Special Remarks on the Products of Biodegradation: Not Available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

SECTION 14: TRANSPORT INFORMATION

DOT Classification: Not a DOT controlled material in the United States
Identification: Not applicable.
Special Provisions for Transport: Not applicable.

SECTION 15: REGULATORY INFORMATION

Federal and State Regulations: TSCA 8(b) inventory: Citric Acid

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances/
Other Classifications:
WHMIS (Canada): Class E : Corrosive Solid
DSCL (EEC):
R 36/37/38 – Irritating to eyes, respiratory system, and skin.
S 26 – In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 37/39 – Wear suitable gloves and eye/ face protection.

HMIS (U.S.A.):
Health Hazard: 2

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6234 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

Fire Hazard: 1
Reactivity: 0
Personal Protection: E

National Fire Protection Association (U.S.A.):
Health: 2
Flammability: 1
Reactivity: 0
Specific hazard:

Protective Equipment:
Gloves (Impervious). Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

SECTION 16: OTHER INFORMATION

References: Not Available.
Other Special Considerations: Not Available.

DISCLAIMER:

The information contained in this Material Safety Data Sheet was developed by NSF International staff from sources considered reliable, however the information has not been independently verified by NSF International staff. Therefore this information is provided without any warranty, express or implied regarding its correctness or accuracy, nor will NSF International assume any liability for any loss or damage arising from the use of this information including without limitation direct or indirect losses or expenses. NSF International Reference Standards are intended for use by persons with appropriate technical skills and training. It is solely the responsibility of the user to determine safe conditions for use of this product and to assume liability for any loss, damage or expense whatsoever arising out of the products improper use.

NSF Reference Standards
An NSF International Company

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
+1.734.214.6284 tel • +1.734.827.7792 fax • RSinfo@nsf.org • www.nsf-rs.org

CLEARTECH

MATERIAL SAFETY DATA SHEET

ClearFoam 3132

Section 01 - Product And Company Information

Product Identifier ..... ClearFoam 3132

Product Use ..... Defoamer in industrial and municipal wastewater applications.

Supplier Name..... ClearTech Industries Inc.
1500 Quebec Avenue
Saskatoon, SK. Canada
S7K 1V7

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... October 4, 2012

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients..... ClearFoam 3132

CAS Number..... Mixture

Synonym (s)..... Not available

Section 03 - Hazard Identification

Inhalation..... Vapors or mists may irritate: mucous membranes. High vapor/aerosol concentrations (attainable only at elevated temperatures) may cause: central nervous system depression.

Skin Contact / Absorption..... May cause mild irritation. Prolonged or repeated exposure may cause: dermatitis (inflammation of the skin).

Eye Contact..... May cause mild irritation. May cause: redness. burning.

CLEARTECH

Ingestion..... May cause: gastrointestinal irritation. nausea. vomiting. diarrhea.

Exposure Limits..... Not available

Section 04 - First Aid Measures

Inhalation..... Remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation occurs.

Skin Contact / Absorption..... Flush skin with plenty of water while removing contaminated clothing and shoes. Do not reuse clothing or shoes until cleaned. If irritation develops or persists, get medical attention.

Eye Contact..... Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Tilt head to avoid contaminating unaffected eye. Get immediate medical attention.

Ingestion..... If swallowed, call a physician immediately. DO NOT induce vomiting unless directed to do so by a physician. Never give anything by mouth to an unconscious person. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Additional Information..... Not available

Section 05 - Fire Fighting Measures

Conditions of Flammability..... Not available

Means of Extinction..... Not available

Flash Point..... > 257 Deg. F.

Auto-ignition Temperature..... Not available

Upper Flammable Limit ..... Not available

Lower Flammable Limit..... Not available

CLEARTECH

Hazardous Combustible Products.... Carbon dioxide. Carbon monoxide. Sulfur oxides. Nitrogen oxides. Phosphorous oxides. Aldehydes. Ketones. Toxic vapors.

Special Fire Fighting Procedures..... Evacuate area of unprotected personnel. Wear protective clothing including NIOSH approved self-contained breathing apparatus. Remain upwind of fire to avoid hazardous vapors and decomposition products. Use water spray to cool fire-exposed containers.

Explosion Hazards..... Not available.

Section 06 - Accidental Release Measures

Leak / Spill..... Eliminate all sources of ignition. Evacuate unprotected personnel from area. Maintain adequate ventilation. Follow personal protective equipment recommendations found in Section 8. Never exceed any occupational exposure limit. Contain spill, place into drums for proper disposal. Soak up residue with inert absorbent material. Place in non-leaking containers for immediate disposal. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs. CAUTION: Spilled material may be slippery.

Deactivating Materials..... No data

Section 07 - Handling and Storage

Handling Procedures..... Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Do not swallow. Avoid breathing vapors, mists, or dust. Do not eat, drink, or smoke in work area. Wash thoroughly after handling. Avoid formation of aerosols.

Storage Requirements..... Store in a cool, well-ventilated area, out of direct sunlight. Store in a dry location away from heat. Keep away from incompatible materials. Keep containers tightly closed. Do not store in unlabeled or mislabelled containers. Keep away from all sources of ignition. Prolonged storage in the presence of air or oxygen may cause product degradation. Do not freeze.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Wear safety glasses with side shields while handling this product. Wear additional eye protection such as chemical safety goggles and/or face shield when the possibility for eye contact with splashing or spraying liquid, or airborne material.

Respiratory..... None required under normal use. If exposure limits are exceeded, wear: NIOSH-Approved respirator for dusts and mists. DO NOT exceed limits established by the respirator manufacturer. All respiratory protection programs must comply with OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements and must be followed whenever workplace conditions require a respirator's use.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times. No special footwear is required other than what is mandated at place of work.

Note..... If oil mists are generated, observe the OSHA exposure limit of 5 mg/m^3. ACGIH exposure limits for mineral oil mists are 5 mg/m^3-TWA,10 mg/m^3 -STEL.

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Keep an eye wash fountain and safety shower available and in close proximity to work area.

Section 09 - Physical and Chemical Properties

Physical State..... Liquid

Odor and Appearance..... Clear to slightly hazy. Yellow to amber.

Odor Threshold..... Not available

Specific Gravity (Water=1)..... 0.942 @ 20°C

Vapor Pressure (mm Hg, 20°C)..... Not available

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Flash Point..... >257 Deg. F.

CLEARTECH

Freeze/Melting Point..... < 10F (But will have a titer point at 70F)

pH..... Not available

Water/Oil Distribution Coefficient..... Not available

Bulk Density..... Not available

% Volatiles by Volume..... Not available

Solubility in Water..... Dispersable

Molecular Formula..... Mixture

Molecular Weight..... Not available

Section 10 - Stability and Reactivity

Stability..... Stable under normal conditions

Incompatibility..... Strong oxidizing agents.

Hazardous Products of Decomposition.... Carbon dioxide; carbon monoxide.

Polymerization..... Will not occur under normal conditions

Section 11 - Toxicological Information

Irritancy..... Not available

Sensitization..... Not available

Chronic/Acute Effects..... Not available

Synergistic Materials..... Not available

Animal Toxicity Data..... Not available

Carcinogenicity..... Not available

CLEARTECH

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... Not available

Environmental Effects..... Not available

Section 13 - Disposal Consideration

Waste Disposal..... Dispose of in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. Since emptied containers retain product residue, follow label warnings even after container is emptied.

Section 14 – Transport Information

TDG Classification

Class..... Not regulated

Group..... Not regulated

PIN Number..... Not regulated

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....Not a controlled product

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

CLEARTECH

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

ClearTech Industries Inc. - Locations

Corporate Head Office: 1500 Quebec Avenue, Saskatoon, SK, S7K 1V7
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	19 Peters Ave, North Corman Park	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION

OSTREM CHEMICAL CO. LTD.
2310 - 80 AVENUE
EDMONTON AB T6P 1N2

Phone: 780-440-1911 or 780-446-0177
In Case of Emergency Only:
phone CANUTEC at (613) 996-6666

Product name: CS-30 LIQ. CAUSTIC SODA
Other name:
Distributed by:
Product use:
Date completed: July 13, 2011

Code: D396

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	%W/W	CAS number
Sodium hydroxide (50%)	40-70	1310-73-2

3. HAZARDS IDENTIFICATION

Corrosive liquid. Causes burns. Harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Induce vomiting only on the direct advice of a poison control centre. Drink 1-2 glasses of water. Never give anything by mouth to an unconscious person. Get medical attention.

Eye contact: Flush with plenty of water for at least 15 minutes. Get medical attention.

Skin contact: Remove contaminated clothing and flush with plenty of water.

5. FIRE - FIGHTING MEASURES

Flash point (test method): Not applicable
Flammable limits (%): Non-flammable
Lower: Not applicable
Upper: Not applicable
Fire extinguishing substances: Use extinguishing media appropriate for surrounding fire.
Autoignition temperatures: Not applicable
Hazardous combustion products: May liberate carbon monoxide, carbon dioxide and oxides of sodium.
Explosion data:
Sensitivity to mechanical impact: Not applicable
Sensitivity to static discharge: Not applicable
Special firefighting procedures: As for surrounding fire. Fire fighters should wear full protective clothing and self contained breathing equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Wear appropriate protective equipment.
Environmental precautions: Prevent from entering sewers, waterways or low areas.
Methods for cleaning up: Isolate hazard area and restrict access. Small spills: soak up with inert absorbent material and scoop into containers. Large spills: prevent contamination of waterways. Dike and pump into suitable containers. Clean up residual with absorbent material, place in appropriate container and flush with water.

7. HANDLING AND STORAGE

Handling: Do not ingest. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.
Storage: Keep out of reach of children. Keep container tightly closed. Store in a cool, dry area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: Provide exhaust ventilation to keep airborne levels below recommended exposure limits.
Respiratory protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator
Eye protection: Chemical goggles. Wear a face shield if splashing hazards exists.
Other protection: Wear protective clothing as necessary to prevent skin contact.

Exposure limits:

INGREDIENT	ACGIH	OSHA	Other
Sodium hydroxide (50% Sol.)	2 mg/m3 Ceil.	Not available	

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid	**Solubility in water:**	Complete
Boiling point:	Not available	**Vapour pressure:**	Not available
Vapour density:	Not available	**Evaporation rate:**	Not available
Freezing point:	Not available	**Odour threshold:**	Not available
Sp. Gravity:	1.318	**pH:**	14

Appearance & odour: Colourless and odourless liquid

10. STABILITY AND REACTIVITY

Stability: Stable
Conditions of instability: Not available
Incompatibility: ( ) Water (X) Oxidizers (X) Acid ( ) Base ( ) Other
Conditions of reactivity: Reacts with acids and metals
Hazardous decomposition products: Not available

11. TOXICOLOGICAL PROPERTIES

POTENTIAL ACUTE HEALTH EFFECTS

Inhalation: Corrosive to respiratory system.
Ingestion: Harmful if swallowed. Causes burns to mouth, throat and stomach.
Eye contact: Corrosive to eyes. Causes severe burns.
Skin contact: Corrosive to skin. Causes severe burns.
Skin absorption: Not applicable

POTENTIAL CHRONIC HEALTH EFFECTS:

Inhalation: Repeat or prolonged exposure may cause damage to lungs.
Ingestion: Not available
Eye contact: Not available
Skin contact: Not applicable
Skin absorption: Not applicable

Irritancy of product:		See WHMIS criteria
Sensitization of product:		Not available
Carcinogenicity:	IARC (1, 2A or 2B)	No known significant effects.
	ACGIH: (A1, A2 or A3)	No known significant effects.
Reproductive toxicity:		No known significant effects.
Teratogenicity:		No known significant effects.
Mutagenicity:		No known significant effects.
Synergistic product:		Not available

HAZARDOUS INGREDIENTS	CAS NO.	TOXICITY DATA
Sodium hydroxide (50%)	1310-73-2	LD_{50} oral (rabbit) 365 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicological information: Not available

Other information:

13. DISPOSAL CONSIDERATIONS

Waste disposal: Disposal of all waste must be done according to local, provincial and federal regulations.

14. TRANSPORT INFORMATION

TDG classification: Sodium hydroxide, solution; Class 8; UN 1824; PG II

15. REGULATORY INFORMATION

WHMIS: E Corrosive material

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16. PREPARATION INFORMATION

Prepared by: Technical Services Department, Ostrem Chemical Co. Ltd., Ph: (780) 440-1911

* * * MATERIAL SAFETY DATA SHEET * * *

PARKSIDE PROFESSIONAL PRODUCTS
4777 Kent Avenue
Niagara Falls, Ontario L2H 1J5
PHONE: (905) 358-8364

PRODUCT NAME: VESTEC 290
PRODUCT USE: Dish Destainer/Sanitizer
PRODUCT CODE: FLD290P & FLD290J-12
FAX: (905) 358-9680

HMIS RATINGS:

Health	3
Flammability	0
Reactivity	1
PPE	B

EMERGENCY TELEPHONE NUMBER: CANUTEC (613) 996-6666 **Preparation Date**: December 1, 2011

SECTION 1 - Regulatory Information

WHMIS Classification: D2B; E

TDG Classification: HYPOCHLORITE SOLUTION, more than 7% available chlorine Class 8 UN1791 PGII

SECTION II - Hazardous Ingredients

Chemical Name	Wt/Wt%	CAS #	LD50	LC50
Sodium Hypochlorite	10-30	7681-52-9	4445 mg/kg Oral Rat	Not Available

SECTION III - Physical Data

Physical State: Liquid
Viscosity (cps) @ 25°C: Water Thin
Freezing Point: -25°C
Vapour Density: Not Available
Specific Gravity: 1.13 ± 0.015
pH: 13.0± 0.5
Odour Threshold: Not Available
Evaporation Rate: 1.0 (water=1)
Vapour Pressure (mm of Hg @20°C): 17.5
Odour/Appearance: Chlorine/Clear Pale Yellow
Coefficient of Water/Oil Distribution: Not Available
Boiling Point (°C @ 1 atm): 100

SECTION IV - Fire or Explosion Hazard

Upper Flammable Limit: Not Applicable
Flash Point & Test Method: Not Applicable
Conditions of Flammability: Not Flammable
Sensitivity to Mechanical Impact: Not Available
Means of Extinction: Water, carbon dioxide, dry chemical.
Lower Flammable Limit: Not Applicable
Auto-Ignition Temperature: Not Available
Hazardous Combustion Products: Chlorine Gas
Sensitivity to Static Discharge: Not Applicable

SECTION V - Reactivity Data

Conditions of Chemical Instability: Stable
Conditions of Reactivity: Heat, Sunlight
Special Shipping Information: Not Applicable
Storage Requirements: Store in original container in a cool, dry place away from incompatibles.
Hazardous Decomposition Products: Hazardous gas may evolve with aluminum or galvanized metals. Chlorine gas may evolve when mixed with acids.
Incompatible Substances: Ammonia, metals, and acids.

SECTION VI - Toxicological Properties

Routes of Entry: Eyes, Skin Contact, Ingestion, Inhalation
Irritancy of Product: Hazardous by WHMIS Criteria
Effects of Acute Exposure: Eye Contact - Can cause severe irritation and burns.
Skin Contact - Can cause severe irritation, burns, ulcerations. Onset of pain may be delayed minutes or hours.
Inhalation - Can cause sneezing, coughing and discomfort.
Ingestion - Can cause pain, burning or gastrointestinal tract irritation, vomiting and diarrhea.
Effects of Chronic Exposure: Skin - May cause drying, defatting and dermatitis.
Carcenogenicity: Non-Hazardous by WHMIS
Teratogenicity: Not Available
Mutangenicity: Not Available
Reproductive Effects: Not Available
Sensitization: Not Available
Synergistic Materials: Not Available

SECTION VII - First Aid Measures

Eye Contact: Immediately flush with water for 15 minutes. Contact a physician immediately.
Skin Contact: Immediately flush with water for 15 minutes. Contact a physician if irritation develops. Completely decontaminate clothing, shoes and leather goods before reuse, or discard.
Inhalation: Remove to fresh air. If symptoms persist, contact a physician.
Ingestion: Do not induce vomiting. Rinse mouth with water, then drink several glasses of water. Contact a physician. Never give anything by mouth if victim is unconscious, is rapidly losing consciousness or is convulsing.

SECTION VIII - Protective Equipment

Personal Protective Equipment:
Eyes: safety glasses, splash goggles for direct contact
Gloves: impervious
Respiration: not normally required if good ventilation is maintained
Ventilation: General ventilation normally adequate.
Special Measures: Avoid ingestion and inhalation. Avoid contact with eyes, skin or clothing.

SECTION IX - Spill/Leak Procedures

Procedures for Leaks or Spills: Small spills may be absorbed with non-reactive absorbent and placed in suitable labeled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice.
Waste Disposal: Review Federal, Provincial and local government requirements prior to disposal.

SECTION X - Preparation Information

Manufacturer/Supplier: Parkside Professional Products, 4777 Kent Avenue, Niagara Falls, Ontario L2H 1J5 **Telephone:** (905) 358-8364
Preparer: Parkside Professional Products, 4777 Kent Avenue, Niagara Falls, Ontario L2H 1J5 **Telephone:** (905) 358-8364

Sylvite AGRI-SERVICES LTD.

Date of Origin: 06/05/02
Date of Review: 8/08/11
Revision No.9

Material Safety Data Sheet

Product Name: **HYDRATED LIME**

INFOTRAC: 1-800-535-5053 (In case of an emergency call this number 24 HOURS a day 7 DAYS a week)

1. IDENTIFICATION OF THE SUBSTANCE AND COMPANY

1.1. Identification of the substance:

Chemical name:	Calcium hydroxide
Product name:	Hydrated Lime, Industrial Hydrate
Formula:	Ca(OH)2
CAS #:	1305-62-0
Molecular Weight:	74.08
Material Uses:	Water treatment, steel flux, caustic agent, pH adjustment, acid gas absorption, construction

1.2 Company:

Main Office:
Carmeuse North America
11 Stanwix Street, 11th Floor
Pittsburg, PA 15222
Telephone: 412-995-5500
Fax: 412-995-5594

Canadian Office:
Carmeuse Lime (Canada) Limited
P.O. Box 190
Ingersoll, Ontario N5C 3K5
Telephone: 519-423-6283
Fax: 519-423-6545

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	% by Weight	CAS	Exposure Limits
Calcium carbonate	>85	1305-62-0	OSHAPEL: 15mg/m3 (total), 5mg/m3 (resp) ACGIH TLV: 5mg/m3 O. Reg.833 TWAEV: 5mg/m3 O.Reg.833 TWAEV: 10mg/m3
Silica-crystalline quartz	<1	14808-60-7	OSHAPEL*:10mg/m3 (total dust): 3.3mg/m3 (respirable) ACGIH TLV: 0.025 mg/m3 (respirable) O.Reg 845:0.1mg/m3

*PEL (total dust) = (30mg/m3) (%silica+2); PEL (respirable) = (10mg/m3) / (%silica+2)

Product Name: **HYDRATED LIME(continued)**

3. HAZARDS IDENTIFICATION AND CLASSIFICATION

Overview:	Hydrate lime is an odorless white or grayish-white granular powder. Contact can cause irritation to eyes, skin, respiratory system, and gastrointestinal tract. Contact may aggravate disorders of eyes, skin, gastrointestinal tract, and respiratory system.
Eyes:	Can cause severe irritation or burning of eyes including permanent damage.
Skin:	Can cause severe irritation or burning of skin, especially in the presence of moisture.
Ingestion:	Can cause severe irritation or burning of gastrointestinal tract if swallowed.
Inhalation:	Can cause severe irritation of the respiratory system. Long-term exposure may permanent damage. Hydrated lime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain crystalline quartz silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.
Irritant:	Eyes, mucous membranes, moist skin, respiratory tract.
Flammability:	This product is not flammable or combustible
Explosive:	This product is not explosive in dust form
Reactivity:	May react violently with strong acids producing heat and possible steam explosion in confined space
Symbols:	WHMIS Symbol: "E" Corrosive Material; "D2A" Materials causing other toxic effects

4. HEALTH EFFECTS AND TREATMENTS

Health Effects:

Inhalation:	Acute: irritation, sore throat ,cough, sneezing. Chronic: persistent coughing and breathing
problems.	Long-term exposure to silica can cause a chronic lung disorder, silicosis.
Eyes	Acute: severe irritation Chronic: possible blindness when exposure is prolonged
Skin:	Acute: removes natural skin oils, blotches, itching and superficial burns in case of sweating. Chronic: no known effects.
Ingestion:	Acute: sore throat, stomach aches, cramps, diarrhea, vomiting. Chronic: no known effects.

Treatments:

Inhalation:	Move victim to fresh air. Seek medical attention if necessary. If breathing has stopped, give artificial respiration.
Eyes:	Immediately flush eyes with large amounts of water for at least 15 minutes. Pull back the eyelid to make sure all the limestone dust has been washed out. Seek medical attention immediately. Do not rub eyes.
Skin:	Flush exposed area with large amounts of water. Seek medical attention immediately.
Ingestion:	Give large quantities of water or fruit juice. Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth if victim is rapidly losing consciousness or is unconsciousness or convulsing.

Product Name: **HYDRATED LIME(continued)**

5. FIRE FIGHTING MEASURES

Flash Point:	Non-flammable
Auto ignition temperature:	Non-flammable
Inflammability limits:	None
Explosion risk:	None by itself, but heat produced by reaction with strong acids can generate steam and pressure
Hazardous combustion products:	Decomposes to produce calcium oxide (CaO), which can react with water to produce steam and pressure
Extinguishing media:	Use dry chemical fire extinguisher. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of hydrated lime. Use appropriate extinguishing media for surrounding fire conditions.
Fire fighting instructions:	Keep personnel away from and upwind of fire. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (self-contained breathing apparatus).

6. ACCIDENT PREVENTION MEASURES

Individual and collective precautions:	Avoid creating conditions which release dust-use mechanical ventilation to remove dust from work spaces
Avoid inhalation of dust:	Wear respiratory protection-minimum NIOSH N-95 Dust Mask
Cleaning method for spills:	Use personal protective equipment (eyes, skin and inhalation, see Section 8). Use dry methods (vacuuming, sweeping) to collect spilled materials. Avoid generating dust. For large spills, evacuate area downwind of clean-up area operations to minimize dust exposure. For small spills, store spilled materials in dry, sealed plastic or metal containers. Dust residue on surfaces may be washed with water.
Precautions for the protection of The environment:	May not be released into surface waters without controls (increases pH)
Waste Disposal:	Dispose according to federal, provincial/state and local environmental regulations

7. HANDLING AND STORAGE

Handling:	In open air or in ventilated places, avoid skin and eye contact, avoid creating airborne dust
Storage:	Store in dry places sheltered from humidity. Keep away from acids and incompatible substances. Keep out of reach of children

Product Name: **HYDRATED LIME(continued)**

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Exposure Limits:	Calcium hydroxide: 15mg/m3 (OSHA-total), 5mg/m3 (OHSA-resp); 5 mg/m3 (ACGIH, O. Reg.833) Silica (crystalline quartz): 10 mg/m3 (total dust); 3.3 mg/m3 (respirable) (OSHA); 0.05 mg/m3 (respirable-ACGIH); 0.1 mg/m3 (O.Reg.845)
Engineering Controls:	Use ventilation and dust collection to control exposure to below applicable limits.
Respiratory Protection:	Wear NIOSH N-95 Dust Mask.
Eye Protection:	Eye protection (chemical goggles, safety goggles and/or face shield) should be worn where there is a risk of limestone exposure. Contact lenses should not be worn when working with limestone products
Hand Protection:	Use clean dry gloves
Skin Protection:	Cover body with suitable clothes (long sleeves shirts and trousers). Use over the ankle waterproof caustic resistant footwear

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Odor & Appearance:	Odorless, white powder
pH:	12.4 in saturated water solution at 25 degree Celsius
Melting point:	580 degrees Celsius
Boiling point:	2850 degrees Celsius
Vapor pressure:	Non volatile
Vapor density:	Non volatile
Density:	2.24 g/cc
Solubility:	Slightly soluble in water: 0.2%@ 0 degrees Celsius Soluble in acids, glycerin and sugar solutions

10. STABILITY AND REACTIVITY

Stability:	Stable products, not very soluble.
Decomposition temperature:	580 degrees Celsius, forms calcium oxide (CaO) and water
Reactivity:	Reacts with acids to form calcium salts while generating heat. Reacts with carbon dioxide in air to form calcium carbonate.
Conditions to avoid:	Vicinity of incompatible materials
Incompatible materials:	Acids; reactive fluoridated, brominated or phosphorous compounds; aluminum (may for hydrogen gas), reactive powdered metals; organic acid anhydrides; nitro-organic compounds; interhalogenated compounds

Hazardous decomposition products: Calcium oxide (CaO)

Product Name: **HYDRATED LIME(continued)**

11. TOXICOLOGICAL INFORMATION

Toxicity:	LD 50 oral (rat) for calcium hydroxide is 7340 mg/kg.This product is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain crystalline silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled in the form of quartz or cristobalite. No reported Carcinogenicity, Reproductive Effects, Teratogenicity or Mutagenicity.
Exposure Limits:	Refer to Section 8.
Irritancy:	Can cause severe irritation of eyes, skin respiratory tract and gastrointestinal tract.
Chronic Exposure:	Inhalation of silica can cause a chronic lung disorder, silicosis.

12. ECOLOGICAL INFORMATION

Alkaline substance that increases pH to a maximum of 12.4 in a saturated water solution at 25 degrees Celsius
Calcium hydroxide gradually reacts with CO2 in air to form calcium carbonate (CaCO3)
Calcium carbonate is ecologically neutral
Uncontrolled spillage in surface waters should be avoided since the increase pH could be detrimental to fish
Harmful to aquatic life in high concentration

13. DISPOSAL CONSIDERATIONS

Dispose according to federal, provincial/state and local environmental regulations.

14. TRANSPORTATION INFORMATION

Classification:	TDG	Not listed for ground transportation
	HMR	Not listed for ground transportation

TDG: Transportation of Dangerous Goods Regulation (CAN)
HMR: Hazardous Materials Regulation (USA)

Product Name: **HYDRATED LIME**

5. REGULATORY INFORMATION

Symbol:	**WHMIS RATING** D2A, E **NFPA RATING** HEALTH-2 SPECIFIC HAZARD-ALK FLASH POINTS-0 REACTIVITY-0 **HMIS RATING** HEALTH-2 SPECIFIC HAZARD-ALK FLASH POINTS-0 REACTIVITY-0
Risk Phrases:	Risk of serious damage to the eyes Keep out of reach of children
Safety Phrases:	Keep storage container away from humidity Avoid contact with skin and eyes. In case of contact with eyes, rinse Immediately with water for at least for 15 minutes
CPR (Canada):	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation (CPR) of Canada and this MSDS contains all information required by the CPR.

16. MISCELLANEOUS OTHER INFORMATION

Hydrate Lime can be removed from objects (such as vehicles) using rags dampened with dilute vinegar. After applying dilute vinegar, vehicles (especially chrome surfaces) must be washed with water.

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION

OSTREM CHEMICAL CO. LTD.
2310 - 80 AVENUE
EDMONTON AB T6P 1N2

Phone: 780-440-1911 or 780-446-0177
In Case of Emergency Only:
phone CANUTEC at (613) 996-6666

Product name: LIQUID CHLORINE 12% SANITIZER Code: J436
Other name:
Distributed by:
Product use: sanitizer, bleaching agent
Date completed: July 13, 2011

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	%W/W	CAS number
sodium hypochlorite (providing 12% available chlorine)	60-100	7681-52-9

3. HAZARDS IDENTIFICATION

Corrosive liquid. Causes burns. Harmful if swallowed. Oxidizing Material.
Do not mix with acid; poisonous chlorine gas will be liberated.

4. FIRST AID MEASURES

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion: Induce vomiting only on the direct advice of a poison control centre. Drink 1-2 glasses of water. Never give anything by mouth to an unconscious person. Get medical attention.
Eye contact: Flush with plenty of water for at least 15 minutes. Get medical attention.
Skin contact: Remove contaminated clothing and flush with plenty of water.

5. FIRE - FIGHTING MEASURES

Flash point (test method): Not applicable
Flammable limits (%): Not applicable
Lower:
Upper:
Fire extinguishing substances: water
Autoignition temperatures: not applicable
Hazardous combustion products: may produce chlorine gas and/or hydrogen chloride gas
Explosion data:
Sensitivity to mechanical impact: Not available
Sensitivity to static discharge: Not available
Special firefighting procedures: As for surrounding fire. Fire fighters should wear full protective clothing and self contained breathing equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Wear appropriate protective equipment.
Environmental precautions: Prevent from entering sewers, waterways or low areas.
Methods for cleaning up: Isolate hazard area and restrict access. Small spills: soak up with inert absorbent material and scoop into containers. Large spills: prevent contamination of waterways. Dike and pump into suitable containers. Clean up residual with absorbent material, place in appropriate container and flush with water.

7. HANDLING AND STORAGE

Handling: Do not ingest. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Storage: Keep out of reach of children. Keep container tightly closed. Store in a cool, dry, well-ventilated area and away from incompatible materials. Venting of containers is advisable.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: Provide exhaust ventilation to keep airborne levels below recommended exposure limits.

Respiratory protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator

Eye protection: Chemical goggles. Wear a face shield if splashing hazards exists.

Other protection: Wear protective clothing as necessary to prevent skin contact.

Exposure limits:

INGREDIENT	ACGIH	OSHA	Other
sodium hypochlorite	1ppm (chlorine)		

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid	**Solubility in water:**	soluble
Boiling point:	slowly decomposes above 40C	**Vapour pressure:**	12.1 mm Hg at 20C
Vapour density:	Not available	**Evaporation rate:**	Not available
Freezing point:	-19C	**Odour threshold:**	Not available
Sp. Gravity:	1.167	**pH:**	12.6 1% solution: 9.8

Appearance & odour: pale yellow liquid with strong chlorine odour

10. STABILITY AND REACTIVITY

Stability: Stable

Conditions of instability: unstable at temperatures above 40C, in sunlight, and in contact with acid

Incompatibility: ( ) Water (X) Oxidizers (X) Acid ( ) Base ( ) Other

Conditions of reactivity: Not available

Hazardous decomposition products: chlorine (by reaction with acids)

11. TOXICOLOGICAL PROPERTIES

POTENTIAL ACUTE HEALTH EFFECTS

Inhalation: Irritating to respiratory system.

Ingestion: Harmful if swallowed. Causes burns to mouth, throat and stomach.

Eye contact: Corrosive to eyes. Causes severe burns.

Skin contact: Corrosive to skin. Causes severe burns.

Skin absorption: Not applicable

POTENTIAL CHRONIC HEALTH EFFECTS:

Inhalation: Repeat or prolonged exposure may cause damage to lungs.

Ingestion: Not available

Eye contact: Not available

Skin contact: Prolonged contact may cause discomfort.

Skin absorption: Not available

Irritancy of product: See WHMIS criteria

Sensitization of product: Not available

Carcinogenicity: IARC (1, 2A or 2B) No known significant effects.

ACGIH: (A1, A2 or A3)	No known significant effects.
Reproductive toxicity:	No known significant effects.
Teratogenicity:	No known significant effects.
Mutagenicity:	No known significant effects.
Synergistic product:	Not available

HAZARDOUS INGREDIENTS	CAS NO.	TOXICITY DATA
sodium hypochlorite	7681-52-9	LD_{50} Oral (rat) 8910 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicological information: Not available

Other information:

13. DISPOSAL CONSIDERATIONS

Waste disposal: Disposal of all waste must be done according to local, provincial and federal regulations.

14. TRANSPORT INFORMATION

TDG classification: HYPOCHLORITE SOLUTION; Class 8; UN 1791; PG III

15. REGULATORY INFORMATION

WHMIS:

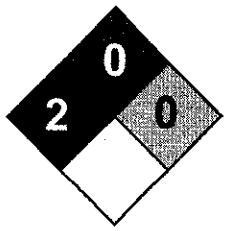
E	Corrosive Material
C	Oxidizing Material
D2B	Toxic Material

NSF Certification: This product is certified under NSF/ANSI Standard 60 for disinfection and oxidation at a maximum usage of 87 mg/L.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16. PREPARATION INFORMATION

Prepared by: Technical Services Department, Ostrem Chemical Co. Ltd., Ph: (780) 440-1911



Health	2
Fire	0
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Oxalic Acid - 10% Solution MSDS

Section 1: Chemical Product and Company Identification

Product Name: Oxalic Acid - 10% Solution

Catalog Codes: SLO1021

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Oxalic acid anhydrous; Water

CI#: Not available.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Oxalic acid anhydrous	144-62-7	10
Water	7732-18-5	90

Toxicological Data on Ingredients: Oxalic acid anhydrous: ORAL (LD50): Acute: 24 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of ingestion. Slightly hazardous in case of eye contact (irritant), of inhalation. Non-corrosive for skin. Non-sensitizer for skin. Non-permeator by skin. Severe over-exposure can produce lung damage, choking, unconsciousness or death. The product is a severe irritant for lungs and respiratory tract.

Potential Chronic Health Effects:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged exposure to the gas can produce lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Non-explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Avoid contact with skin Never add water to this product Wear suitable protective clothing If ingested, seek medical advice immediately and show the container or the label. Keep container tightly closed and dry.

Storage: Corrosive materials should be stored in a separate safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: No special ventilation requirements.

Personal Protection: Splash goggles. Lab coat. Self contained breathing apparatus. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 CEIL: 2 (mg/m3) from ACGIH [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Not available.

Odor: Not available.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Not available.

pH (1% soln/water): Acidic.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.05 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Slightly reactive to reactive with alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Not available.

Section 11: Toxicological Information

Routes of Entry: Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 375 mg/kg [Rat]. Acute dermal toxicity (LD50): 20000 mg/kg [Rabbit].

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion. Slightly hazardous in case of inhalation. Non-corrosive for skin. Non-sensitizer for skin. Non-permeator by skin.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. (Oxalic acid anhydrous)

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: : Corrosive liquid, acidic, organic, n.o.s. (Oxalic acid, solution) : UN3265 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Oxalic Acid - 10% Solution Massachusetts RTK: Oxalic Acid - 10% Solution TSCA 8(b) inventory: Oxalic acid anhydrous; Water

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R22- Harmful if swallowed. R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Self contained breathing apparatus. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

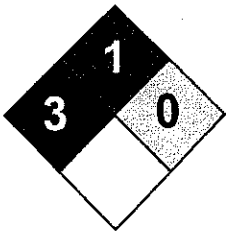
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:07 AM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	3
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Oxalic acid dihydrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Oxalic acid dihydrate

Catalog Codes: SLO1429, SLO1054

CAS#: 6153-56-6

RTECS: Not available.

TSCA: TSCA 8(b) inventory: No products were found. It is a hydrate and exempt from TSCA inventory requirements.

CI#: Not applicable.

Synonym: Ethanedioic Acid, dihydrate

Chemical Name: Oxalic Acid, dihydrate

Chemical Formula: (COOH)2.2H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Oxalic acid dihydrate	6153-56-6	100

Toxicological Data on Ingredients: Oxalic acid dihydrate LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, the nervous system, mucous membranes, heart, brain, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures

Special Remarks on Explosion Hazards:
Fine dust dispersed in air in sufficient concentrations, and in the presences of an ignition source is a potential dust explosion hazard.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 STEL: 2 (mg/m3) from OSHA (PEL) [United States] TWA: 1 STEL: 2 (mg/m3) from NIOSH [United States] TWA: 1 STEL: 2 (mg/m3) [United Kingdom (UK)] TWA: 1 STEL: 2 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 126.07 g/mole

Color: Colorless. White.

pH (1% soln/water): Not available

Boiling Point: Not available.

Melting Point: 101.5°C (214.7°F)

Critical Temperature: Not available.

Specific Gravity: Density: 1.653 @ 18.5 eg. C(Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Soluble in cold water, diethyl ether. Soluble in alcohol, glycerol. Insoluble in benzene, petroleum ether. Solubility in cold water: 1g/7ml. Solubility in hot water: 1g/2ml

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, dust generation.

Incompatibility with various substances: Reactive with oxidizing agents, metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with chlorites, hypochlorites, silver and silver compounds, furfuryl alcohol. Hygroscopic; keep container tightly closed.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
May cause damage to the following organs: kidneys, the nervous system, mucous membranes, heart, brain, skin, eyes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals:
LD50 data for Oxalic acid, ahydrous (CAS no. 144-62-7): LD50[rat] - Route: oral; Dose: 7500 mg/kg

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects based on animal test data. No human data found.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. Rare chemical burns may occur. Harmful if absorbed through the skin. Eyes: Causes severe eye irritation with possible burns. It may result in corneal damage and conjunctivitis. Inhalation: Causes irritation of the respiratory tract, ulceration of the mucous membranes. Inhalation of oxalic acid may also cause digestive disturbances such as nausea and vomiting as well as affecting the nerves and urinary system and causing

headache, muscular irrritability, weakness, and albuminuira Ingestion: Harmful if swallowed. Causes severe digestive tract irritation and possible burns. It may affect the cardiovascular system, and urinary system. Symptoms may include vomiting (often bloody or with coffee-ground appearance), diarrhea, bloody stool, hypermotility, abdominal pain, intense burning pain in the throat, esophagus, stomach, ulceration/burning of the mouth, esophagus, and stomach, severe purging, weak pulse, hypotension, caridac irregularities, cardiovascular collapse. Other symptoms may include convulsions, headache, twitching, tetany, stupor, coma, tingling of fingers and toes, muscular irritability. Renal damage, as evidenced by oliguria, albuminuria, hematuria, may occur because Oxalic acid can bind calcium to form calcium oxalate which is insoluble at physiological pH. The calcium oxalate formed might precipitate in the kidney tubules. Hypocalcemia may also occur, which is what may affect the function of the heart and nerves and cause the above cardiovasular and nervous system effects. Chronic Potential Health Effects: Skin: Prolonged or repeated exposure may cause localized pain and cyanosis of the fingers, and even

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 4000 mg/l 24 hours [Fish (Bluegill)]. 1000 ppm 0.5 hours [Fish (Goldfish)]. 100 ppm 0.3 hours [Fish (Trout)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Corrosive Solid, Acidic, Organic, n.o.s. (Oxalic Acid, Dihydrate) UNNA: 3261 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: Pennsylvania RTK: Oxalic acid dihydrate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). Oxalic Acid, anhydrous (CAS no. 144-62-7) is listed on the Canadian DSL Oxalic Acid, dihydrate (CAS 6153-56-6) is not listed on the Canadian DSL. EINECS no. for Oxalic Acid, anhydrous: 205-634-3 EINECS no. for Oxalic Acid, dihydrate: unlisted Oxalic Acid, dihydrate is on the inventory lists for China, Japan, and Philippines.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R21/22- Harmful in contact with skin and if swallowed. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

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

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:44 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

SAFETY DATA SHEET

MSDS 171-6081 Page 1
Issued: 7/22/2005
Revision No: 1

– WEEPS UPDATE - LAST VERSION I COULD FIND AS FEB 20, 14

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Company name:
Mercury Marine
W6250 W Pioneer Rd.
Fond du Lac, WI 54935

Product name: PVC Glue/Hardener
Use / description of product: Adhesive
Part Number: ~~92-892753~~

Emergency ChemTrec: 800-424-9300 (US Only)
Information: (920) 929-5418

2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous ingredients: ETHYL ACETATE 10-30%
EINECS: 205-500-4 CAS: 141-78-6
[F] R11; [Xi] R36; [Xi] R66; [-] R67
• ACETONE 10-30%
EINECS: 200-662-2 CAS: 67-64-1
[F] R11; [Xi] R36; [Xi] R66; [-] R67
• ETHYL METHYL KETONE 30-50%
EINECS: 201-159-0 CAS: 78-93-3
[F] R11; [Xi] R36; [Xi] R66; [-] R67

3. HAZARDS IDENTIFICATION

Main hazards: Highly flammable. Irritating to eyes. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness.
Other hazards: In use, may form flammable / explosive vapour-air mixture.

4. FIRST AID MEASURES (SYMPTOMS)

Skin contact: There may be irritation and redness at the site of contact.
Eye contact: There may be irritation and redness. The eyes may water profusely.
Ingestion: There may be soreness and redness of the mouth and throat.
Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

4. FIRST AID MEASURES (ACTION)

Skin contact: Remove from skin with paper or towel. Wash effected area thoroughly with soap and water. Seek medical advice if symptoms persist.
Eye contact: Bathe the eye with running water for 15 minutes. Consult a doctor.
Ingestion: Wash out mouth with water. Consult a doctor.
Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. Consult a doctor.

5. FIRE-FIGHTING MEASURES

Extinguishing media: Alcohol resistant foam. Water spray. Carbon dioxide. Dry chemical powder. Use water spray to cool containers.

Exposure hazards: Highly flammable. In combustion emits toxic fumes. Forms explosive air-vapour mixture. Vapour may travel considerable distance to source of ignition and flash back.

Protection of fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Refer to section 8 of SDS for personal protection details. If outside do not approach from downwind. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Turn leaking containers leak-side up to prevent the escape of liquid. Eliminate all sources of ignition.

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

Clean-up procedures: Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method. Do not use equipment in clean-up procedure which may produce sparks.

7. HANDLING AND STORAGE

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of mists in the air. Smoking is forbidden. Use non-sparking tools.

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed. Keep away from sources of ignition. Prevent the build up of electrostatic charge in the immediate area. Ensure lighting and electrical equipment are not a source of ignition.

Suitable packaging: Must only be kept in original packaging.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Workplace exposure limits

WEL (8 hr exposure limit): 200ppm

WEL (15 min exposure limit): 400ppm

Hazardous ingredients: ETHYL ACETATE
WEL (8 hr exposure limit): 200 ppm WEL (15 min exposure limit): 400 ppm
- ACETONE
WEL (8 hr exposure limit): 1210 mg/m3 WEL (15 min exposure limit): 3620 mg/m3
- ETHYL METHYL KETONE
WEL (8 hr exposure limit): 600 mg/m3 WEL (15 min exposure limit): 899 mg/m3

Engineering measures: Ensure there is sufficient ventilation of the area. Ensure lighting and electrical equipment are not a source of ignition.

Respiratory protection: If exposure levels are likely to be exceeded, use a face mask fitted with an organic AXP3 filter for short term low level exposures. For long term or high level exposures, or when spraying, compressed airline breathing apparatus should be used.

Hand protection: Avoid skin contact. For repeated exposure use Viton or 4H chemical gloves.

Eye protection: Safety glasses. Ensure eye bath is to hand.

Skin protection: Protective clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Liquid

Colour: Colourless

Odour: Characteristic odour

Evaporation rate: Fast

Oxidising: Non-oxidising (by EC criteria)

Solubility in water: Insoluble

Viscosity: Viscous

Boiling point/range°C: 56
Flammability limits %: lower: 1.8
upper: 13
Flash point°C: -19
Autoflammability°C: 460
Relative density: 0.86

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Stable at room temperature.
Conditions to avoid: Heat. Hot surfaces. Sources of ignition. Flames.
Materials to avoid: Strong oxidising agents. Strong acids.
Haz. decomp. products: In combustion emits toxic fumes

11. TOXICOLOGICAL INFORMATION

Hazardous ingredients: ETHYL ACETATE
ORL MUS LD50 4100 mg/kg
ORL RAT LD50 5620 mg/kg
SCU RAT LDLO 5 gm/kg
• ACETONE
IVN RAT LD50 5500 mg/kg
ORL MUS LD50 3 gm/kg
ORL RAT LD50 5800 mg/kg
Routes of exposure: Refer to section 4 of SDS for routes of exposure and corresponding symptoms.

12. ECOLOGICAL INFORMATION

Mobility: Volatile.
Persistence and degradability: Biodegradable in part only.
Bioaccumulative potential: No data available.

13. DISPOSAL CONSIDERATIONS

Disposal operations: Arrange for disposal by a licenced waste disposal company
Disposal of packaging: Arrange for disposal by a licenced waste disposal company
NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

14. TRANSPORT INFORMATION

ADR / RID

UN no: 1133
Packing group: II
Shipping name: ADHESIVES
Labelling: 3

ADR Class: 3
Classification code: F1

Hazard ID no: 33

IMDG / IMO

UN no: 1133
Packing group: II
Marine pollutant: .

Class: 3
EmS: F-E,S-D
Labelling: 3

IATA / ICAO

UN no: 1133
Packing group: II
Labelling: 3

Class: 3
Packing instructions: 305(P&CA); 307(CAO)

Marsh Laboratories
MSDS PVC Primer

Section I - Product Identification

Manufacturers Name:
Marsh Laboratories
2437 Waverly Avenue
Pitsburgh PA 15218-2626

Emergency telephone number: Chemtel 800-255-3924
Telephone number for information: 412-271-3060

Date Prepared: 7-20-2006 — LATEST VERSION ON THEIR WEBSITE P.S. FEB 20, 2014

Section II - Hazardous Ingredients/Identity Information

Tetrahydrofuran CAS # 109-99-9 (35 -50 %)
OSHA PEL 200 PPM
ACGIH TLV 200 PPM
Other recommended limits STEL 250 PPM

Methyl Ethyl Ketone CAS # 78-93-3 (5-15%)
OSHA PEL 200 PPM
ACGIH TLV 200 PPM
Other recommended limits STEL 300 PPM

Cyclohexanone CAS # 108-94-1 (5-15%)
OSHA PEL 50 PPM
ACGIH TLV 25 PPM

Section III - Physical/Chemical Characteristics

Appearance: Purle or clear thin liquid. Characteristic solvent odor.
Boiling Point: 151 F.
Vapor pressure (mm Hg): 190
Vapor Density (Air =1): 2.5
Specific gravity (H2O=1): Approximately 0.9
Melting Point: Not applicable - liquid at room tempurature.
Evaporation rate (butyl acetate=1): 5.5 to 8

Section IV-Fire and Explosion Hazard Data

Flash point (Method used): 7 F tag closed cup.
Flammable limits at 25 C: LEL 1.8% UEL 11.8%.
Extinguishing media: Dry chemical, carbon dioxide or alcohol foam.
Special fire fighting procedures: Water may be used to cool containers but may be ineffective in controlling fire.
Unusual Fire and Explosion Hazards: Fire hazard because fo low flash point, high volatility, and heavy vapor.

Section V - Reactivity Data

Stability: Stable.
Hazardous Polymerization: Will not occur.

Section VI - Health Hazard Data

Health Hazards (Acute and Chronic): Inhalation may cause nausea, dizziness, headache. Skin contact may cause dermatitis. Eye irritant. If swallowed, may cause liver and kidney damage.

Carcinogenicity: NTP?: No.
IARC Monographs?: No.
OSHA Regulated?: No.

Signs and symptoms of exposure: Severe over exposure may result in nausea, dizziness or headache. Can cause narcosis. Has normal defatting effect of solvents on skin.

Medical Conditions Generally Aggravated by Exposure: Pre-existing skin and respiratory disorders.

Emergency and First Aid Procedures: Irritant to eyes and nasal passages. If overcome by vapors remove to fresh air. For contact with skin, flush with water for 15 minutes. For contact with eyes, immediately flush with water, call Physician. If swallowed, do not induce vomiting, call a physician, poison control center, or hospital immediately.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled: Eliminate all ignition sources. Avoid breathing vapors. Keep liquid out of eyes. Prevent liquid form entering sewers.

Waste Disposal Method: Dispose of in accordance with federal, state, and local laws. If approved, may be incinerated, evaporated, or disposed of in approved hazardous waste

landfill. Marsh Laboratories recommends evaporation as the preferred method of disposal. To evaporate, leave container open in an outdoor location for 30 days. When material is completely evaporated, dispose of the dauber cap in a non-hazardous landfill, and recycle the steel can.

Precautions to be take in handling and storing: Keep away from heat, sparks. open flame, and other sources of ignition. Use with adequate ventilation. Avoid contact with skin.

Section VIII - Control Measures

Respiratory Protection (Specify Type) None required with normal ventilation. If using where ventilation cannot be supplied, a half-mask respirator with an organic-vapors cartidge is recommended.
Protective gloves: Rubber or PVA
Eye Protection: Chemical safety goggles to prevent splashing in eyes.
Other protective Clothing or Equipment: Rubber, polyethylene, or Tyvek apron.
Work/Hygiene Practices: Use good industrial hygiene practice.

Section IX - Transportation Information

US Department of Transportation
Hazard Class: 3
Shipping Name: Adhesive, Flammable Liquid
Technical Shipping Name: Tetrahydrofuran, Methyl Ethyl Ketone
ID Number UN1133
Packing Group: II
Labels: Flammable Liquid
Exemptions: 1 Liter or smaller containers ship as Limited Quantity / ORM-D No label or placard required.

Section X - Miscellaneous Information

VOC Content: 850 grams per liter.

HMIS:
H: 2
F: 4
R: 1
PP: B

BRI-CHEM SUPPLY CORP.

Material Safety Data Sheet

Soda Ash Dense

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Soda Ash Dense

Product Identifier Soda Ash Dense

MSDS No. 0040

Supplier Bri-Chem Supply Corp, 5151 Bannock Street Unit 5, Denver, CO, 80216, 303-722-1681, www.brichemsupplycorp.com

Emergency Contact Information Chem Trek, (800) 424-9300, 24/7

2. HAZARDS IDENTIFICATION

Potential Health Effects

Inhalation Can irritate the nose and throat.

Skin Contact Repeated or prolonged exposure can irritate or burn the skin.

Eye Contact CORROSIVE. EYE IRRITANT. May cause moderate to severe irritation.

Ingestion Symptoms may include nausea, vomiting, stomach cramps and diarrhea.

Effects of Long-Term (Chronic) Exposure Excessive, long term contact may produce "soda ulcers" on hands and perforation of the nasal septum. Sensitivity reactions may occur from prolonged and repeated exposure. This product does not contain any ingredient designated by IARC, NTP, ACHIH, or OSHA as probable or suspected human carcinogens.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS Registry No.	Concentration %	Other Identifiers
Sodium carbonate	497-19-8	99.8	

4. FIRST AID MEASURES

First Aid Procedures

Inhalation Move victim to fresh air. Call a Poison Centre or doctor if the victim feels unwell.

Skin Contact Immediately wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 15-20 minutes. If irritation or pain persists, see a doctor.

Eye Contact Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay flushing or attempt to remove the lens. If irritation or pain persists, see a doctor.

Ingestion Have victim rinse mouth with water. NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. DO NOT INDUCE VOMITING. Immediately call a Poison Centre or doctor.

Note to Physicians While internal toxicity is low, irritant effects of high concentrations may produce corneal opacities, and vesicular skin reactions in humans with abraded skin only. Treatment is symptomatic and supportive.

5. FIRE FIGHTING MEASURES

Flammable Properties Does not burn.

Suitable Extinguishing Media	Not combustible. Use extinguishing agent suitable for surrounding fire.
Specific Hazards Arising from the Chemical	Carbon dioxide.
Protective Equipment and Precautions for Firefighters	Fight fire from a safe distance or a protected location. Chemical protective clothing (e.g. chemical splash suit) and positive pressure SCBA may be necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Use the Personal Protective Equipment recommended in Section 8 of this MSDS.
Environmental Precautions	It is good practice to prevent releases into the environment. Do not allow into any sewer, on the ground or into any waterway.
Methods for Containment and Clean-up	This product, if spilled, can be recovered and re-used if contamination does not present a problem. Vacuum or sweep up the material. If the spilled product is unusable due to contamination, consult state or federal environmental agencies for acceptable disposal procedures and locations.

7. HANDLING AND STORAGE

Handling	Only use where there is adequate ventilation. Avoid generating dusts. Prevent accidental contact with incompatible chemicals. Wear personal protective equipment to avoid direct contact with this chemical. Avoid repeated or prolonged skin contact with product or with contaminated equipment/surfaces.
Storage	Store in an area that is: cool, dry, separate from incompatible materials (see Section 10: Stability and Reactivity). Prolonged storage may cause product to cake from atmospheric moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guideline Comments	Federal guidelines treat the ingredient(s) in this product as a nuisance dust, as no product-specific guidelines have been issued for exposure. As with all nuisnace dusts, worker breathing zone concentrations should be measured by validated sampling and anyalytical methods. The following limits (OSHA and MSHA) apply to this material: Particulates Not Otherwise Regulated: OSHA = US Occupational Safety and Health Administration. PEL = Permissible Exposure Limits. 15 mg/m3 (total dust) Short-term TWA = Time-Weighted Average with specified time limit. 5 mg/m3 (rasp fraction).
Engineering Controls	Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air. Eye wash facility should be provided in storage and general work area.

Personal Protective Equipment (PPE)

Eye/Face Protection	Do not get in eyes. Wear chemical safety goggles.
Skin Protection	Wear chemical protective clothing e.g. gloves, aprons, boots.
Respiratory Protection	Wear a NIOSH approved air-purifying respirator with an appropriate cartridge.
General Hygiene Considerations	It is good practice to: avoid breathing product; avoid skin and eye contact and wash hands after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	White powder.
Particle Size	Not available
Odour	Odourless
Odour Threshold	Not available
Molecular Formula	Not applicable
Molecular Weight	Not available
Boiling Point	Not available
Decomposition Temperature	Not available
Melting Point	1569 °F (854 °C)
Freezing Point	Not applicable
Relative Density (water = 1)	2.533
Bulk Density	0.00009 - 0.00110 kg/L
Solubility in Water	Slightly soluble.
Solubility in Other Liquids	Not applicable
pH	11.3
Partition Coefficient, n-Octanol/Water	Not applicable
Viscosity-Kinematic	Not applicable
Surface Tension	Not applicable
Vapour Pressure	Not applicable
Vapour Pressure at 50 deg C	Not applicable
Saturated Vapour Concentration	Not applicable
Critical Temperature	Not applicable
Vapour Density (air = 1)	Not applicable
Evaporation Rate	Not applicable
Flash Point	Not applicable
Lower Flammable/Explosive Limit	Not applicable
Upper Flammable/Explosive Limit	Not applicable
Auto-ignition Temperature	Not applicable
Electrical Conductivity	Not applicable

10. STABILITY AND REACTIVITY

Chemical Stability	Normally stable.
Conditions to Avoid	Contact with acids will release carbon dioxide, heat. Contact with lime dust in the presence of moisture can produce corrosive sodium hydroxide.
Hazardous Decomposition Products	When heated to decomposition, cardon dioxide is released.
Possibility of Hazardous Reactions	Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

Inhalation 2 hour LC50 2.3 mg/l (rat)
24 hour LC50 800 mg/m3, 20 h exposure (guinea pig) (moderate toxicity)

Oral LD50 4,090 mg/kg (rat)

Skin Irritation / Corrosion

Animal tests show mild irritation.
500 mg/24hr (rabbit)

Eye Irritation / Corrosion

Animal tests show moderate or severe irritation.
50 mg (rabbit)

Effects of Long-Term (Chronic) Exposure

Excessive, long term contact may produce "soda ulcers" on hands and perforation of the nasal septum. Sensitivity reactions may occur from prolonged and repeated exposure.

Respiratory and/or Skin Sensitization

Not a skin sensitizer. (tested at 0.25% solution).

Carcinogenicity

IARC: Group 3 – Not classifiable as to its carcinogenicity to humans. ACGIH®: A4 – Not classifiable as a human carcinogen. NTP: Not specifically listed. OSHA: Not specifically listed.

No information was located for: Effects of Short-Term (Acute) Exposure, Teratogenicity / Embryotoxicity, Reproductive Toxicity, Mutagenicity, Toxicologically Synergistic Materials

12. ECOLOGICAL INFORMATION

Ecotoxicity	96 hour LC50 265 - 565 mg/l (daphnia magnia) (low toxicity) 300 - 320 mg/l (blue gill sunfish) (low toxicity) 96 hour TLm 1200 mg/l (mosquito fish) 48 hour TLm 840 mg/l (mosquito fish) 48 hour EC50 265 mg/l (daphnia magnia) 5 day EC50 242 mg/l (Nitszcheria linearis) 7 day EC, biomass 14 mg/l (phytoplankton)
Persistence and Degradability	Abiotic degradation: Water (hydrolysis): degradation's products: carbonate (pH>10)/carbonic acid/carbon dioxide (pH<6) Soil: Hydrolysis as a function of pH Biotic degradation: Aerobic/anaerobic: Not applicable (inorganic compound).
Bioaccumulation / Accumulation	Not applicable (ionizable inorganic compound).
Mobility	Air: Not applicable Water: Considerable solubility and mobility Soil/Sediments: Non-significant absorption.
Other Adverse Effects	Observed effects are related to alkaline properties of the product. Product is not significantly hazardous for the environment.

13. DISPOSAL CONSIDERATIONS

Contact local environmental authorities for approved disposal or recycling methods in your jurisdiction.

14. TRANSPORT INFORMATION

Shipping Information

Not regulated under Canadian TDG Regulations. Not regulated under US DOT Regulations.

Other Transport Information

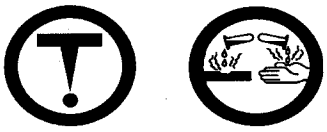
Special Shipping Not applicable

Information

15. REGULATORY INFORMATION

Canada

WHMIS Classification



Class D2B Class E

D2B - Toxic; E - Corrosive

Domestic Substances List (DSL) / Non-Domestic Substances List (NDSL)

All ingredients are listed on the DSL/NDSL.

USA

US OSHA Regulatory Status

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

Toxic Substances Control Act (TSCA) Section 8(b)

All ingredients are listed on the TSCA Inventory. No other TSCA rules affect this product.

16. OTHER INFORMATION

Date of Preparation	December 12, 2012
Disclaimer	This Health and Safety information is correct to the best of our knowledge and belief at the date of its publication, but we cannot accept liability for any loss, injury or damage which may result from its use. We shall ensure, so far as is reasonably practicable, that any revision of this Data Sheet is sent to all customers to whom we have directly supplied this substance, but must point out that it is the responsibility of any intermediate supplier to ensure that such revision is passed to the ultimate user. The information given in the Data Sheet is designed only as guidance for safe handling, storage, and the use of the substance. It is not a specification nor does it guarantee any specific properties. All chemicals should be handled only by competent personnel, within a controlled environment. Should further information be required, this can be obtained through the sales office whose address is at the top of this data sheet.

CLEARTECH

MATERIAL SAFETY DATA SHEET

Sodium Hypochlorite 5-20%

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Sodium Hypochlorite (5-20%)

Product Use ..... Disinfectant, bleaching agent, source of available chlorine, deodorizer.

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... December 22, 2010 — LATEST VERSION I COULD FIND M.S. FEB 20, 2014

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Sodium Hypochlorite	4.90-16.80%
CAS Number.....	Sodium Hypochlorite	7681-52-9

Synonym (s).....Industrial bleach, hypo, bleach, Javel water, household bleach

Section 03 - Hazard Identification

Inhalation..... Irritant of the nose and throat, causing coughing, difficulty breathing, and pulmonary edema.

CLEARTECH

Skin Contact / Absorption..... Causes severe skin irritation with blistering and ulceration.

Eye Contact..... Causes severe irritation of the mucous membranes of the eyes. May cause severe eye damage.

Ingestion..... Burning of the mouth and throat, abdominal cramps, nausea, vomiting, diarrhea, shock. May lead to convulsions, coma, and even death.

Exposure Limits..... ACGIH/TLV-TWA: 0.5ppm (chlorine)

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion..... Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Give large amounts of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information..... Not available

Section 05 - Fire Fighting

Conditions of Flammability..... Non-flammable

Means of Extinction..... Product does not burn. Use appropriate extinguishing media for material that is supplying the fuel to the fire.

Flash Point..... Not applicable

Auto-ignition Temperature..... Not applicable

Upper Flammable Limit ..... Not applicable

CLEARTECH

Lower Flammable Limit..... Not applicable

Hazardous Combustible Products... Decomposition may produce chlorine gas and/or hydrogen chloride gas.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards..... Pressure buildup in containers could result in an explosion when heated or in contact with acidic fumes. Vigorous reaction with oxidizable organic materials may result in a fire.

Section 06 - Accidental Release Measures

Leak / Spill..... Wear appropriate personal protective equipment. Ventilate area. Stop or reduce leak if safe to do so. Restrict access to spill area until clean up is complete. Prevent material from entering sewers, waterways or confined spaces. Soak up smaller spills with absorbent material that does not react with spilled material. Flush with water to remove any residue.

Deactivating Materials..... Spills can be carefully neutralized first with sodium sulphite, sodium metabisulphite or other dechlorination agent for no chlorine residual, then a pH adjustment may be required with hydrochloric acid until the pH is 7. Note neutralization reactions may produce heat so necessary precautions must be taken. Local regulatory agencies should also be contacted for proper disposal.

Section 07 - Handling and Storage

Handling Procedures..... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements..... Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Venting of containers is advisable.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... A NIOSH-approved respirator suitable for chlorine is recommended. Where a higher level of protection is required, use a self-contained breathing apparatus.

CLEARTECH

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Liquid

Odor and Appearance..... Strong chlorine odour. Clear, greenish-yellow solution.

Odor Threshold..... Not available

Specific Gravity (Water=1)..... 1.17 at 20°C (12% trade)

Vapor Pressure (mm Hg, 20C)..... 12.1mm Hg at 20°C (12.5 wt %)

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Boiling Point..... Slowly decomposes above 40°C.

Freeze/Melting Point..... ~ -15°C (12% trade)

pH..... < 12

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... Not available

% Volatiles by Volume..... Not available

CLEARTECH

Solubility in Water..... Complete

Molecular Formula..... NaOCl

Molecular Weight..... 74.44

Section 10 - Stability and Reactivity

Stability..... Unstable at temperatures above 40°C, in sunlight, and in contact with acid.

Incompatibility..... Incompatible with strong acids, ammonia, oxidizable materials, nickel, copper, tin, manganese, and iron.

Hazardous Products of Decomposition.. Chlorine (by reaction with acids), oxygen (by reaction with nickel, copper, tin, manganese, iron), sodium chloride, sodium chlorate, with increased temperature.

Polymerization..... Will not occur

Section 11 - Toxicological Information

Irritancy..... Strong irritant

Sensitization..... Not available

Chronic/Acute Effects..... If over-exposed to the solution, there will be constant irritation of the eyes, nose, and throat.

Synergistic Materials..... Not available

Animal Toxicity Data..... LD_{50}(oral,rat): 8910mg/kg (undiluted sodium hypochlorite)

Carcinogenicity..... Not considered to be carcinogenic (IARC and ACGIH).

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

CLEARTECH

Biodegradability..... Not available

Environmental Effects..... Not available

Section 13 - Disposal Consideration

Waste Disposal..... Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 8 (not regulated at solutions below 7%)

Group..... III (not regulated at solutions below 7%)

PIN Number..... UN 1791(not regulated at solutions below 7%)

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification.....Product is certified under NSF/ANSI Standard 60 for disinfection and oxidation at a maximum dosage for the following:

sodium hypochlorite 5%: 200mg/L
sodium hypochlorite 6%: 175mg/L
sodium hypochlorite 7%: 161mg/L
sodium hypochlorite 8%: 146mg/L
sodium hypochlorite 9%: 131mg/L
sodium hypochlorite 10%: 116mg/L
sodium hypochlorite 11%: 101mg/L
sodium hypochlorite 12%: 87mg/L
sodium hypochlorite 13%: 82mg/L
sodium hypochlorite 14%: 76mg/L
sodium hypochlorite 15%: 70mg/L
sodium hypochlorite 16%: 66mg/L
sodium hypochlorite 17%: 62mg/L
sodium hypochlorite 18%: 58mg/L
sodium hypochlorite 19%: 54mg/L
sodium hypochlorite 20%: 50mg/L

Sanitizer Use: to obtain 10 liters of a 200 mg/L solution as available chlorine, use 16.7 mL of Hypochlor-12 for each 10 liters of clean, potable water.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

MATERIAL SAFETY DATA SHEET

SUPPRESSOR 2360
Product ID: FC236004
Revised: 04-22-2010 — NEED TO UPDATE
Replaces: 02-08-2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name:	SUPPRESSOR 2360
Synonyms:	N.A.
CAS Number:	MIXTURE
Chemical Family:	Defoamer
Formula:	Proprietary Information

Hydrite Chemical Co.
300 N. Patrick Blvd.
Brookfield, WI 53008-0948
(262) 792-1450

EMERGENCY RESPONSE NUMBERS:
24 Hour Emergency #: (414) 277-1311
CHEMTREC Emergency #: (800) 424-9300

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: CAUTION! May cause mild eye and skin irritation.

Physical State:	Liquid.
Color:	Transparent. Yellow.
Odor:	Low odor.

POTENTIAL HEALTH EFFECTS

Routes of Exposure: Eyes. Ingestion. Inhalation. Skin.

Target Organs: Lungs.

Eye Contact: May cause mild irritation.

Skin Contact: May cause mild irritation.

Skin Absorption: No data available.

Inhalation: No hazard expected under normal use. Vapor from heated material or mist may cause: respiratory irritation.

Ingestion: No hazard expected under normal use. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury. May cause: gastrointestinal irritation.

Medical Conditions Aggravated by Exposure to Product: No data available.

Other: Effects of repeated exposure: In animals, effects have been reported on the following organs following exposure to aerosols: lung.

Cancer Information:
This product does not contain 0.1% or more of the known or potential carcinogens listed in NTP, IARC, or OSHA.

Potential Environmental Effects: See Section 12.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	% by Wt.
Proprietary Components	MIXTURE	100 %

4. FIRST-AID MEASURES

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Tilt head to avoid contaminating unaffected eye. Get immediate medical attention.

Skin Contact: Flush skin with plenty of water while removing contaminated clothing and shoes. Do not reuse clothing or shoes until cleaned. If irritation develops or persists, get medical attention.

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration, preferably mouth-to-mouth. GET MEDICAL ATTENTION IMMEDIATELY.

Ingestion: If swallowed, call a physician immediately. DO NOT induce vomiting unless directed to do so by a physician. Never give anything by mouth to an unconscious person. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Water spray. Water fog. Carbon dioxide. Dry chemical. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective. DO NOT USE: Direct water stream.

Fire Fighting Methods: Evacuate area of unprotected personnel. Wear protective clothing including NIOSH-approved self-contained breathing apparatus. Remain upwind of fire to avoid hazardous vapors and decomposition products. Use water spray to cool fire-exposed containers. Do not use direct water stream. May spread fire. Move containers from fire area if possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Run-off from fire control may cause pollution. CAUTION: Spilled material may be slippery.

Fire and Explosion Hazards: Combustible at high temperatures.

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition, which may be toxic and/or irritating. Combustion products may include and are not limited to: Irritating and/or toxic gases. Carbon oxides.

6. ACCIDENTAL RELEASE MEASURES

Spill Clean-Up Procedures: Eliminate all sources of ignition. Evacuate unprotected personnel from area. Maintain adequate ventilation. Follow personal protective equipment recommendations found in Section 8. Never exceed any occupational exposure limit. Contain spill, place into drums for proper disposal. Soak up residue with inert absorbent material. Place in non-leaking containers for immediate disposal. Flush remaining area with water to remove trace residue and dispose of properly. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs. CAUTION: Spilled material may be slippery.

7. HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Do not swallow. Avoid breathing vapors, mists, or dust. Do not eat, drink, or smoke in work area. Wash thoroughly after handling. Product on surfaces can cause slippery conditions. Avoid formation of aerosols or mists.

Storage: Store in a cool, dry place. Keep away from incompatible materials. Keep containers tightly closed. Protect from moisture. Store above 40 Deg. F. Do not contaminate this product with any foreign materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Exposure Guidelines:

Component	Limits
No components found.	

ACGIH Exposure Guidelines:

Component	Limits
No components found.	

Engineering Controls: General room ventilation is required. Local exhaust ventilation may be necessary for some operations. Maintain adequate ventilation. Avoid formation of aerosols or mists.

Eye/Face Protection: Wear safety glasses with side shields while handling this product. Wear additional eye protection such as chemical safety goggles and/or face shield when the possibility exists for eye contact with splashing or spraying liquid, or airborne material.

Skin Protection: Prevent contact with this product. Wear gloves and protective clothing depending on condition of use. Protective gloves: Impervious. Butyl rubber. Nitrile. Neoprene.

Respiratory Protection: None required under normal use. If needed, wear: NIOSH-Approved air-purifying respirator with: Organic vapor cartridge and particulate pre-filter. NIOSH-Approved self-contained breathing apparatus. DO NOT exceed limits established by the respirator manufacturer. All respiratory protection programs must comply with OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements and must be followed whenever workplace conditions require a respirator's use.

Other Protective Equipment: Eye-wash station. Safety shower. Protective clothing.

General Hygiene Conditions: Wash with soap and water before meal times and at the end of each work shift. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid.
Color: Transparent. Yellow.
Odor: Low odor.
Boiling Point (deg. F): N.D.
Freezing Point (deg. F): N.D.
Melting Point (deg. F): N.D.
Vapor Pressure (mm Hg): N.D.
Vapor Density (air=1): N.D.
Solubility in Water: Dispersible
pH: N.D.
Specific Gravity: 0.96 @ 25C
% Volatile (wt%): N.D.
Evaporation Rate (nBuAc = 1): N.D.
VOC (wt%): N.D.
VOC (lbs/gal): N.D.
Viscosity: N.D.
Flash Point: > 200 Deg. F.
Flash Point Method: Estimated.
Lower Explosion Limit: N.D.
Upper Explosion Limit: N.D.
Autoignition Temperature: No Data
Fire Point: N.D.

10. STABILITY AND REACTIVITY

Stability: Stable under recommended storage conditions.

Conditions to Avoid: Avoid elevated temperatures.

Incompatible Materials: Strong bases. Strong acids. Oxidizing agents. Isocyanates.

Hazardous Decomposition Products: Hazardous decomposition products depend upon temperature, air supply, and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids. Polymer fragments. Alcohols. Ethers. Hydrocarbons. Carbon monoxide. Nitrogen oxides. Dense smoke. Unidentified by-products. Carbon oxides.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur under normal conditions. The reaction of polyols and isocyanates generates heat.

11. TOXICOLOGICAL INFORMATION

Component	Oral LD50	Dermal LD50	Inhalation LC50
No components found or no data available for product.			

12. ECOLOGICAL INFORMATION

Ecotoxicological Information: The sample of Suppressor 2360 is not acutely toxic to Daphnia magna at recommended allowed dosage by the Minnesota Pollution Control Agency (MPCA), which is 100mL of product per 850 gallons of water. Daphnia magna LC50 was greater than the one hundred percent solution of 0.311 ppm.

The sample of Suppressor 2360 is not acutely toxic to fathead minnows at recommended allowed dosage by the Minnesota Pollution Control Agency (MPCA), which is 100mL of product per 850 gallons of water. Pimephales promelas LC50 was greater than the one hundred percent solution of 0.311 ppm.

The sample of Suppressor 2360 is not acutely toxic at the highest dose allowed by the Minnesota Pollution Control Agency (MPCA), allowing SF Analytical Bioassay Laboratories to present Suppressor 2360 Defoamer Product with a PASS grade to be used at 100mL per 850 gallons of water.

Chemical Fate Information: No data available.

13. DISPOSAL CONSIDERATIONS

Hazardous Waste Number: N.A.
Disposal Method: Dispose of in accordance with all local, state and federal regulations. The information offered here is for the product as shipped. Use and/or alteration to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method. Since emptied containers retain product residue, follow label warnings even after container is emptied. DO NOT pressurize, cut, weld, solder, drill, grind or expose empty containers to heat, flame, sparks or other sources of ignition. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. Do NOT dump into any sewers, on the ground, or into any body of water.

14. TRANSPORTATION INFORMATION

DOT (Department of Transportation):

Proper Shipping Name: Not regulated by the DOT.

15. REGULATORY INFORMATION

TSCA Inventory Status: All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements.

SARA Title III Section 311/312 Category Hazards:

Immediate (Acute)	Delayed (Chronic)	Fire Hazard	Pressure Release	Reactive
No	Yes	No	No	No

Regulated Components:

Component	CAS Number	CERCLA RQ	SARA EHS	SARA 313	U.S. HAP	WI HAP	Prop 65
No components found.							

***Prop 65 - May Contain the Following Trace Components**
This product may contain a detectable level of (a) chemical(s) subject to Proposition 65.

16. ADDITIONAL INFORMATION

Hazard Rating System
Health: 1*
Flammability: 1
Reactivity: 0
* = Chronic Health Hazard

NFPA Rating System
Health: 1

Flammability: 1
Reactivity: 0
Special Hazard: None

MSDS Abbreviations
N.A. = Not Applicable
N.D. = Not Determined
HAP = Hazardous Air Pollutant
VOC = Volatile Organic Compound
C = Ceiling Limit
N.E./Not Estab. = Not Established

MSDS Prepared by: CSH

Reason for Revision: Change(s) made in Section 12.

BASF
The Chemical Company

Safety Data Sheet
Zetag® 7557

1. Product and Company Identification

Company
BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

24 Hour Emergency Response Information
CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

2. Hazards Identification

Emergency overview

CAUTION:
May cause some eye irritation which should cease after removal of the product.
May cause some irritation to the respiratory system if dust is inhaled.
Frequent and prolonged contact can lead to skin irritation.
This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.
Refer to MSDS Section 7 for Dust Explosion information.
Caution - Slippery when wet!
Organic powders may be capable of generating static discharges and creating explosive mixtures in air. Handle with caution.
Avoid creating dusty conditions, dust build-up or formation of dust clouds.
Avoid all sources of ignition: heat, sparks, open flame.
Take precautionary measures against static discharges.
Wear NIOSH-certified chemical goggles.
Use NIOSH approved respirator as needed to mitigate exposure.
Use with local exhaust ventilation.

State of matter: solid
Colour: off-white
Odour: odourless

Potential health effects

Primary routes of exposure:
Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Sensitization:
Based on the ingredients, there is no suspicion of a skin-sensitizing potential.

Chronic toxicity:

Carcinogenicity: None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.
The whole of the information assessable provides no indication of a carcinogenic effect.

Repeated dose toxicity: Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statement has been derived from the properties of the individual components.

Reproductive toxicity: Based on the ingredients, there is no suspicion of a toxic effect on reproduction.

Genotoxicity: Based on the ingredients, there is no suspicion of a mutagenic effect.

Signs and symptoms of overexposure:
No significant symptoms are expected due to the non-classification of the product.
No hazard is expected under intended use and appropriate handling.

Potential environmental effects

Aquatic toxicity:
Acute effects on aquatic organisms are due to the cationic charge of the polymer, which is quickly neutralised in natural water courses by irreversible adsorption onto particles, hydrolysis and dissolved organic carbon. Fish toxicity and aquatic toxicity are drastically reduced by rapid irreversible adsorption onto suspended and/or dissolved organic matter. The hydrolysis products are not acutely harmful to aquatic organisms. Tested was a substance with a high cationic charge density. As the acute effects are associated with the charge density, substances with a lower charge density are expected to have a lower toxicity.

Degradation / environmental fate:
Not readily biodegradable (by OECD criteria).

3. Composition / Information on Ingredients

CAS Number	Content (W/W)	Chemical name
69418-26-4	85.0 - 95.0 %	Ethanaminium, N,N,N-trimethyl-2-[(1-oxo-2-propenyl)oxy]-, chloride, polymer with 2-propenamide
124-04-9	2.0 - 6.0 %	adipic acid
57-13-6	0.0 - 5.0 %	urea

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

If on skin:
Wash thoroughly with soap and water.

If irritation develops, seek medical attention.

If in eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

Seek medical attention.

If swallowed:
Rinse mouth and then drink plenty of water. Do not induce vomiting. Immediate medical attention required.

Note to physician
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Flash point: not applicable
Flammability: not flammable
Self-ignition temperature: not self-igniting

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet, carbon dioxide

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Hazards during fire-fighting:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental release measures

Personal precautions:
Use personal protective clothing.

Environmental precautions:
Do not discharge into drains/surface waters/groundwater.

Cleanup:
Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature.
Avoid raising dust.
For small amounts: Pick up with suitable appliance and dispose of.
For large amounts: Contain with dust binding material and dispose of.

7. Handling and Storage

Handling

General advice:
Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Storage

General advice:
Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:
Avoid extreme heat.

8. Exposure Controls and Personal Protection

Components with occupational exposure limits

adipic acid

ACGIH TLV TWA value 5 mg/m3 ;

Personal protective equipment

Respiratory protection:
Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

Hand protection:
Chemical resistant protective gloves

Eye protection:
Safety glasses with side-shields.

General safety and hygiene measures:
Wear protective clothing as necessary to minimize contact. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

Form:	beads	
Odour:	odourless	
Colour:	off-white	
pH value:	3.5 - 4.5	(10 g/l)
Melting point:		The substance / product decomposes therefore not determined.
Boiling point:		not applicable
Vapour pressure:		The product has not been tested.
Bulk density:	approx. 800 kg/m3	
Partitioning coefficient n-octanol/water (log Pow):		Study scientifically not justified.
Solubility in water:		Forms a viscous solution.
Miscibility with water:		miscible
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.	

10. Stability and Reactivity

Dust explosion class:
Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1) (St 1)

Conditions to avoid:
Avoid extreme temperatures. Avoid humidity.

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous reactions:
The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

Thermal decomposition:
No decomposition if used as directed.

Corrosion to metals:
No corrosive effect on metal.

Oxidizing properties:
not fire-propagating

11. Toxicological information

Acute toxicity

Oral:
Type of value: LD50
Species: rat
Value: > 5,000 mg/kg (OECD Guideline 401)

Irritation / corrosion

Skin:
Species: rabbit
Result: non-irritant
Method: OECD Guideline 404

Eye:
Species: rabbit
Result: non-irritant

Aspiration Hazard:

No aspiration hazard expected.

Other Information:

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Fish

Acute:
static
Fish/LC50 (96 h): 1 - 10 mg/l

Aquatic invertebrates

Acute:
daphnia/EC50 (48 h): 10 - 100 mg/l

Degradability / Persistence

Hydrolysis

In contact with water the substance will hydrolyse rapidly.

Environmental mobility:

Information on: cationic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Other adverse effects:

The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

13. Disposal considerations

Waste disposal of substance:
Dispose of in accordance with national, state and local regulations.

Container disposal:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

14. Transport Information

Land transport
USDOT

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Federal Regulations

Registration status:
Chemical TSCA, US released / listed

OSHA hazard category: This material is classified as hazardous under OSHA regulations.; Acute target organ effects reported; ACGIH TLV established

EPCRA 311/312 (Hazard categories): Acute;

EPCRA 313:

CAS Number	Chemical name
79-06-1	acrylamide

State regulations

State RTK	CAS Number	Chemical name
MA, NJ, PA	124-04-9	adipic acid

CA Prop. 65:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

16. Other Information

HMIS III rating
Health: 1 Flammability: 1 Physical hazard: 0

NFPA and HMIS use a numbering scale ranging from 0 to 4 to indicate the degree of hazard. A value of zero means that the substance possesses essentially no hazard; a rating of four indicates extreme danger. Although similar, the two rating systems are intended for different purposes, and use different criteria. The NFPA system was developed to provide an on-the-spot alert to the hazards of a material, and their severity, to emergency responders. The HMIS system was designed to communicate workplace hazard information to employees who handle hazardous chemicals.

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

SDS Prepared by:
BASF NA Product Regulations
msds@basf.com

SDS Prepared on: 2013/09/19

END OF DATA SHEET