As Built Report
Saline Water Treatment Plant (SWTP)

In Accordance with Water License 2AM-MEL1631

Prepared by:
Agnico Eagle Mines Limited – Meliadine Division

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	29/07/2019			As Built Design report

Prepared By:  2019-07-29
Thomas Genty
Water Treatment Specialist

mark.long@agnicoeagle.com Digitally signed by mark.long@agnicoeagle.com DN: cn=mark.long@agnicoeagle.com Date: 2019.07.29 09:27:45 -05'00'
Mark Long
Construction Civil Lead

Approved by: nancy.harvey@agnicoeagle.com Digitally signed by nancy.harvey@agnicoeagle.com DN: cn=nancy.harvey@agnicoeagle.com Date: 2019.07.29 15:38:20 -04'00'
Nancy Duquet Harvey
Environment Superintendent

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1 INTRODUCTION

As required by the Water License A (No. 2AM-MEL1631), this report summarizes the construction and commissioning work associated with the saline water treatment plant (SWTP). Included in this report is:

- A summary of the characteristics of the feed water of the saline water treatment plant, and effluent water outfall system to CP1;
- Documentation on field decisions that deviate from the original plans;
- Specifications of equipment;
- As-built drawings; and
- Photographs.

1.1 SITE LOCATION PLAN

The figure below presents a site location plan for the saline water treatment plant (SWTP), pipelines, and effluent water outfall in CP1.

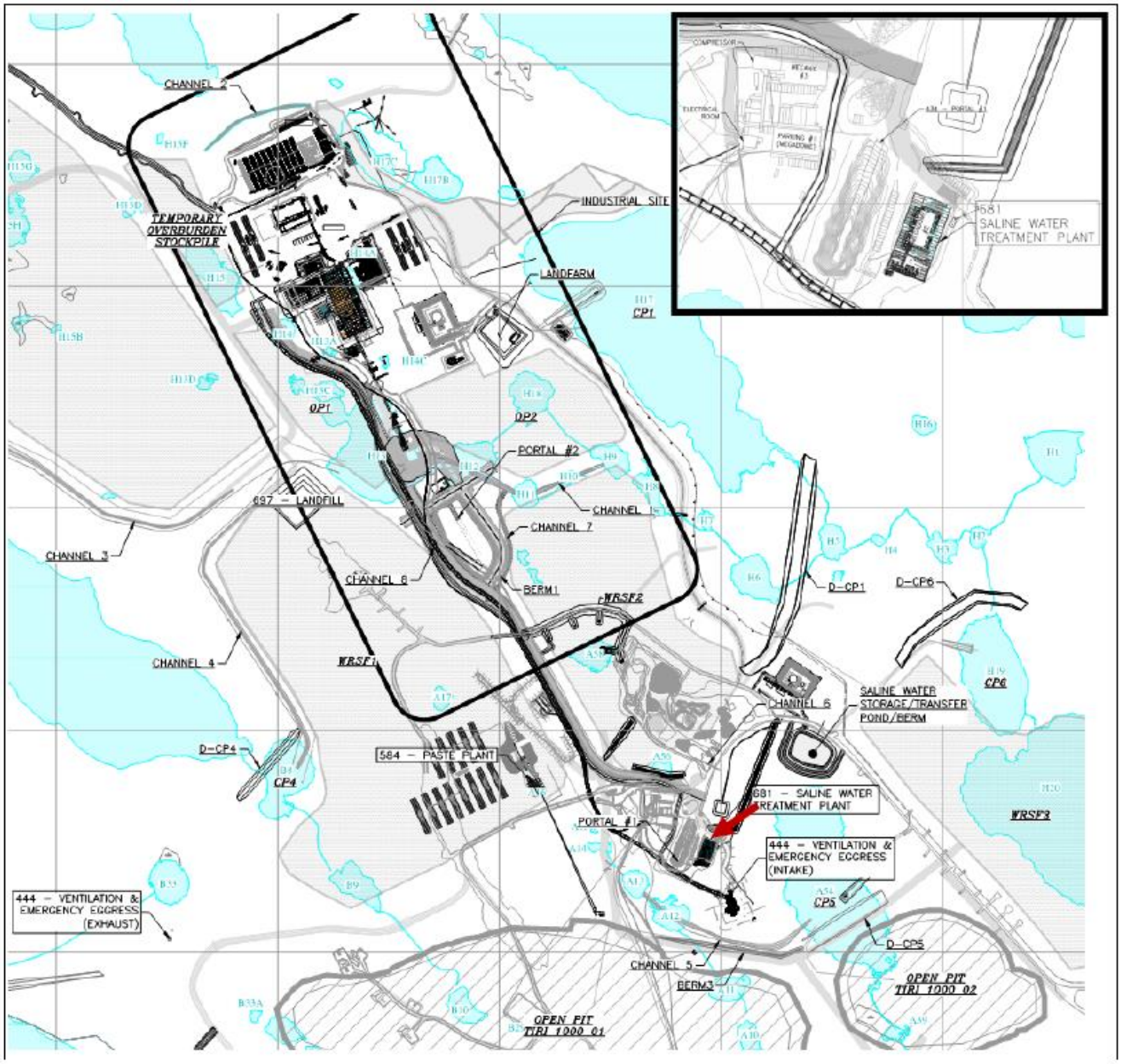


Figure 1 : Location of the SWTP

1.2 UNDERGROUND WATER MANAGEMENT STRATEGY

Underground saline water is firstly stored in an underground stope that has a total capacity of approximately 11 000 m^3 and is then transferred to the surface Saline Ponds or partially to the SWTP feed tanks. Depending on the water volume stored, Saline ponds can feed also the SWTP for treatment. The storage capacity is managed to keep the saline pond and stope volumes as low as possible, in order to have enough space for abnormal flow condition or SWTP shutdown.

2 CONSTRUCTION SUMMARY

2.1 CONSTRUCTION SCHEDULE

The construction of the SWTP were conducted between July 2018 and the end of April 2019. The commissioning was started in December 2018 but not finalized. Distilled water post-treatment is in commissioning currently. The date of the accomplishment of this task is planned for mid July 2019. Construction was completed according to the milestone dates shown in Table 1. Table 2 presents the commissioning schedule.

Table 1: Construction Milestone

Area	Item	Date
Saltmaker SM1 Installation	SM1 Mechanical Component Installation	July 27 - August 17
	SM1 Electrical Installation	August 15 - October 14
	SM1 Piping Installation	August 6 - November 6
	SM1 Instrument Air Installation	October 13 - November 13
	SM1 Process Ducting Installation	October 11 - November 6
Common Area Installation	Common Area Major Components Placed	August 15 - September 6
	Common Area Electrical Installation	October 13 - November 10
	Common Area Piping Installation	September 9 - November 13
	Common Area Instrument Air Installation	October 30 - November 16
SM2 Installation	SM2 Mechanical Component Installation	September 4 - November 13
	SM2 Electrical Installation	November 8 – January 20
	SM2 Piping Installation	November 10 - January 20
	SM2 Instrument Air Installation	December 16 - January 20
	SM2 Process Ducting Installation	October 11 - November 6
Post treatment	Distillate post treatment	Completion date April 20

Table 2: Commissioning Milestone

Area	Date
SM1	Nov 3 – Dec 5 2018
SM2	Jan 22 – March 2019
Common Area Installation	Nov 23 – Dec 5 2018
Solid management system	January - May 2019
Post-treatment	June 1 - Ongoing

During commissioning, the SWTP was not operated directly into the solid production mode. The brine production mode was used at the beginning. The mode consists of producing a brine at approximately

30% salt. The brine was discharged into the Saline Pond 1 (SP1). The second product from the Brine mode is a distilled water which was discharged into CP1 pond.

Below are the milestones on the mode of operation of the SWTP during commissioning.

- SM1:
  - Dec 5: SM1 Brine operations
  - Apr 3: SM1 Solids Mode
- SM2
  - March 4-26: SM2 Brine Operations
  - May 4: SM2 Solids Mode
- Post treatment
  - Construction completed: April 20
  - Commissioning: June 1 - Ongoing

2.2 SWTP COMPONENTS

The SWTP consist of the two following components which are part of this construction summary:

- The SWTP including the evaporation units, the solid management system and the distillate water post-treatment; and
- Pipeline between SP1 to the SWTP and SWTP to CP1.

As-built drawings and final locations of the system components are available in Appendix A (as-built drawings) and B (survey drawings), respectively. Photographs illustrating the system and its compliance with the construction/permitting design and drawings can be found in Appendix C.

2.2.1 SWTP

The purpose of the SWTP is to remove total dissolved solids (TDS), which is also referred to as salinity, in underground saline water. The expected TDS in underground water varies from approximately 60 000 to 160 000 mg/L. The treated water will be discharged into CP1. The equipment has an operational flow rate of 120 m^3/d. It is expected that the SWTP will be in use 24 hours, 7 days per week.

2.2.1.1 PROCESS SUMMARY

Water is pumped from the underground sump to the saline storage ponds or partially into the SWTP. Water then flows into the two SaltMaker S125 units. The SaltMaker uses a Humidification-Dehumidification (HDH) cycle to concentrate saline water and produce freshwater. The use of a humidified air cycle enables operation at temperatures below 90^{o}C and pressures near atmospheric (1 bar).

Three products are generated during the process: distilled water, a salt slurry and a high-salinity blowdown.

The distilled water is treated in an oxidation reactor for nitrite removal, followed by a reverse osmosis (RO) step used to remove ammonia. The RO permeate is then discharged into CP1. The RO brine containing high ammonia concentration is stored in a tank and oxidized with calcium hypochlorite before being cycled back to the two SaltMaker S125 units.

The salt slurry is discharged into a big bag rack. Free water is drained from the bag and recycled to the SaltMaker. The expected solid content into the big bag after drainage is estimated at approximately 80%.

The blowdown is a by-product containing high concentrations of nitrate. Evaporation efficiency depends on the viscosity of the water which can be affected by the high concentrations of nitrate that can occur within the SaltMaker due to its high degree of solubility. Nitrate accumulates within the system as a consequence of the different streams being recirculated.

General arrangement (GA) and Piping and Instrumentation diagram (P&ID) are presented in Appendix D.

2.2.1.2 PROCESS UTILITIES

Three water heaters are required to heat water to approximately 80°C (first effect of the SaltMaker unit). Heat plate exchangers are used to transfer heat between the water to be treated and the thermal source. The thermal units are diesel driven.

The service water system is mainly based on reusing distilled water produced within the plant. A 21 m^3 clean water reserve tank is being used for storage.

2.2.1.3 REAGENTS

The following reagents will be used at the SWTP:

- sulfamic acid
- calcium hypochlorite
- trisodium phosphate
- sodium meta-bisulfite
- caustic soda
- Antifoam
- Antisclant
- Biocide
- Corrosion inhibitor
- Cleaning chemicals.

Most of the chemicals are supplied in liquid form (and dosed using a dosing skid pump directly into the process) except for the sulfamic acid, calcium hypochlorite, sodium meta-bisulfite and trisodium phosphate which must be prepared manually before dosing. The solutions made with these products are prepared according to the MSDS provided by the suppliers.

The application for each of these reagents is detailed in the Operation and Maintenance Manual (OMM). The updated MSDS are available in the Appendix E.

2.2.1.4 WATER QUALITY

The following table presents result of water quality testing during commissioning and start-up. The target water quality objectives as presented in the design report are not met yet for the ammonia and nitrate due to the fact that the post-treatment commissioning is not finished. After commissioning, the treatment target should be met.

Note that even if the post treatment is not finalized or commissioned, water is discharged into CP1.

Table 3 presents the water quality objective of the SWTP according to the Design report.

Table 3: Treatment objective of the SWTP

Parameter (Total – mg/L)	Objective SWTP
Al	6
As	1
B	4
Cd	0.0003
Cl	2500
Cu	0.7
Cr	0.003
Hg	0.0001
N-NH4	35
Ni	1.3
N-NO2	0.2
N-NO3	2
P	0.1
Pb	0.6
Se	0.0025
TDS	1400
Th	0.003
CN tot	1.5
Zn	1.3
pH	5-8
TSS	<10
Temperature	<40 ^{o}C

The following table presents the water quality in the feed water of the SWTP and the treated water after the Saltmaker unit (note that the post treatment is not finished commissioned thus value differ from table 3).

Table 4: Feed and distilled quality during commissioning

SWTP Raw water

	2/25/2019	3/3/2019	3/10/2019	3/21/2019	3/25/2019	4/1/2019	4/7/2019	4/14/2019	4/21/2019
Total Ammonia-N	170	160	170	160	160	180	170	160	160
Total Dissolved Solids	62700	63400	65100	65000	64900	64300	64500	64200	63200
Total Phosphorus	0.21	0.13	0.18	0.18	0.18	<0.40	<0.40	0.42	0.14
Total Suspended Solids	42	45	79	46	20	41	100	230	160
Total Cyanide (CN)	0.07	0.078	0.084	0.073	0.098	0.061	0.066	0.073	0.072
Dissolved Chloride (Cl-)	35000	36000	38000	35000	36000	38000	36000	35000	39000
Nitrite (N)	7.57	7.93	7.76	7.85	7.74	7.63	7.69	7.79	7.46
Nitrate (N)	235	242	221	253	241	219	212	240	225

SWTP distilled water before post-treatment

	2/25/2019	3/3/2019	3/10/2019	3/21/2019	3/25/2019	4/1/2019	4/7/2019	4/14/2019	4/21/2019
Total Ammonia-N	33	26	46	28	-	23	39	11	62
Total Dissolved Solids	240	245	435	635	770	275	320	495	330
Total Phosphorus	0.02	< 0.020	0.021	< 0.020	-	<0.020	<0.020	0.029	0.035
Total Suspended Solids	2	2	2	2	3	2	<1	1	<1
Total Cyanide (CN)	0.025	0.018	0.033	0.025	0.02	0.019	0.027	0.013	0.035
Dissolved Chloride (Cl-)	67	81	150	230	370	110	81	150	170
Nitrite (N)	0.954	0.58	0.246	0.371	0.556	0.144	0.478	<0.010	0.221
Nitrate (N)	0.3	0.35	0.85	1.4	2.1	0.52	0.52	1.05	1.00

2.2.1.5 CONTROLS

The SWTP Pump is equipped with a variable frequency drive (VFD) that allows the flow to be modulated.

The SaltMaker system and post-treatment use a variety of sensors and automation hardware to achieve reliable plant operations. Sensors include temperature, pressure, flow, level, conductivity, and pH.

The electrical and control system for the post-treatment consists of a main control panel with multiple alternating current (AC) drives, switch gear, terminal blocks as well as the Programmable Logic Control

(PLC) and modules. AC drives allow variable speed on the feed pump, high pressure pumps, and RO recirculation pump. The drives allow the control system to make flow and pressure adjustments to maximize RO recovery and efficiency. The panel houses the Human Machine Interface (HMI), conductivity and pH transmitters for operators. All instrumentation and automation functions are carried out by the PLC based on signals from sensors.

The P&ID as built can be found in Appendix D.

2.2.2 PIPELINES

The following pipe were installed on site:

- Underground stope to SWTP: HDPE 4'' line, isolated and heat traced – 150 m;
- SWTP to Saline Pond: HDPE 4'' line, isolated and heat traced – 350 m;
- Saline pond to SWTP: HDPE 2'' line, isolated and heat traced – 375 m;
- SWTP to CP1: HDPE 1-1/2'' line, isolated and heat traced – 700 m.

Figure 2 presents the specification of each line.

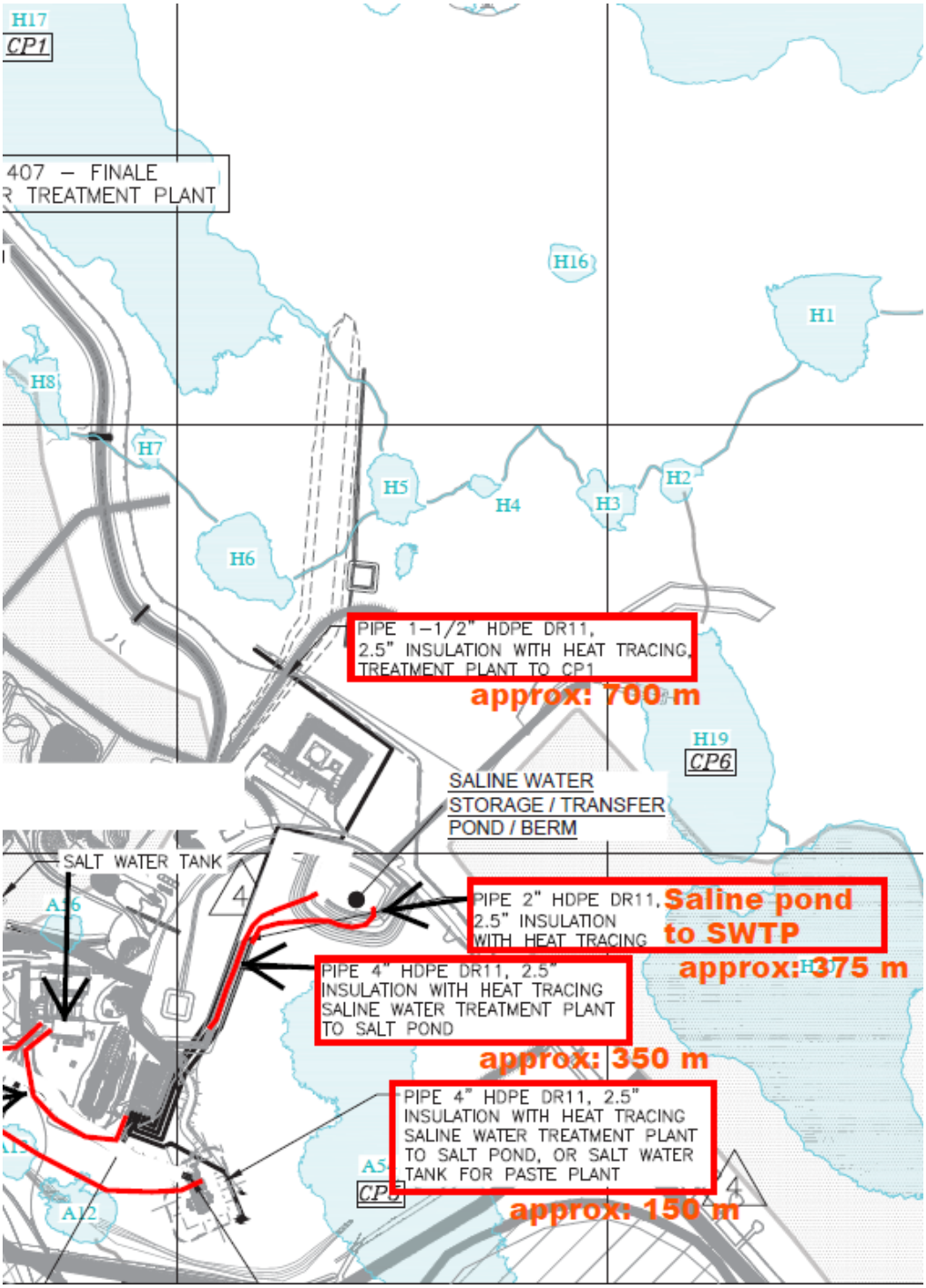


Figure 2 : Piping Installation

3 FIELD DECISIONS THAT DEVIATE FROM ORIGINAL DESIGN

This section documents variations from the original design which were approved by the designer and/or the field engineer on site for the entire effluent system. The changes listed herein do not affect the original water-management strategy.

Table 5: SWTP Construction Design Changes

Change	Reason
Primary air receiver moved	Original receiver location blocked HVAC ducting for air compressors
SM2 Solids Extraction Skid moved closer to SM1	Increased forklift access around building, especially in tight area near existing office.

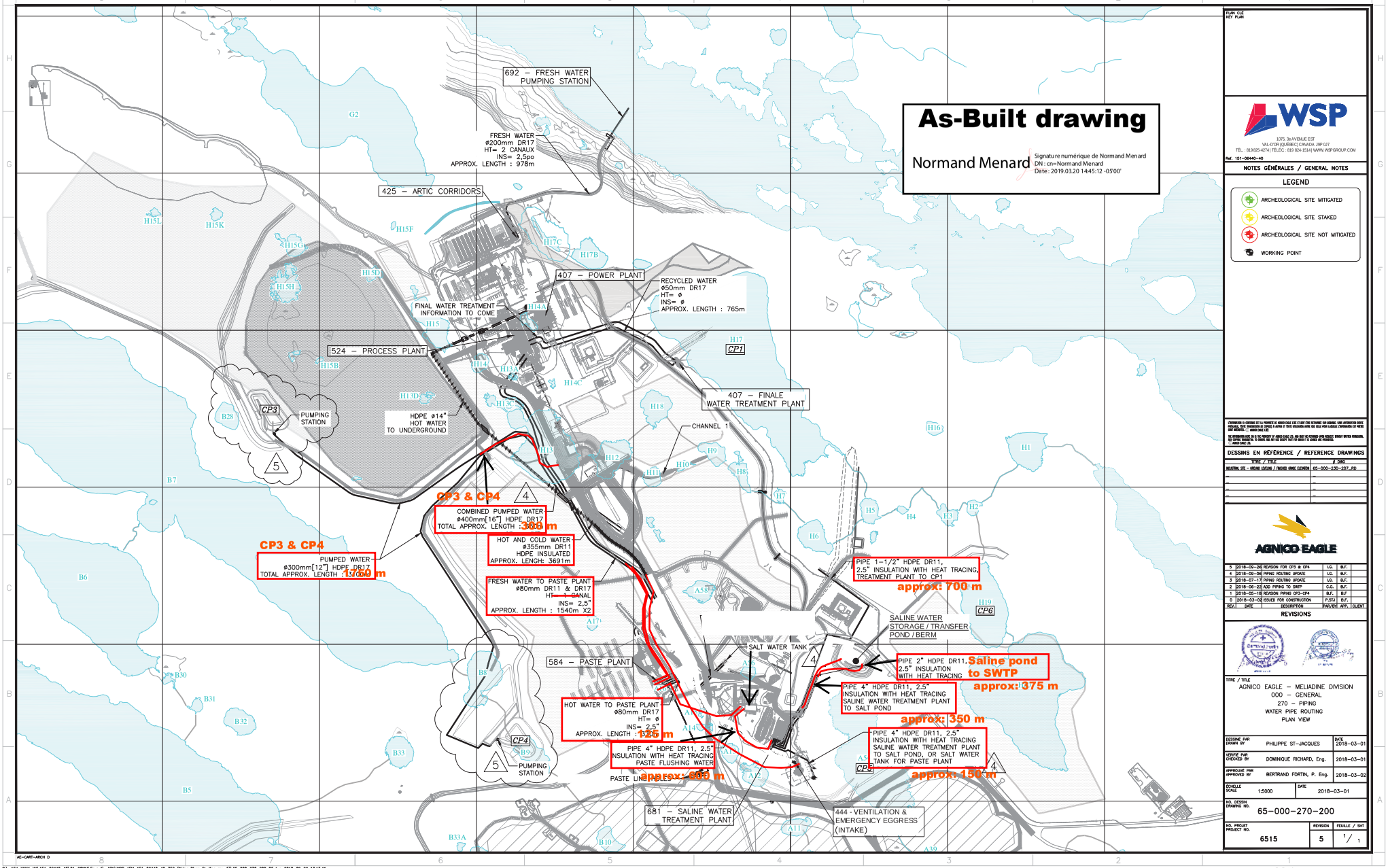
4 AS-BUILT DRAWINGS AND PHOTOGRAPHS

As-built drawings are presented in Appendix A. Survey drawings after the construction of the SWTP can be found in Appendix B. Photographs of the water management infrastructure during and after construction are shown in Appendix C. Finally, as built GA and P&ID are presented in Appendix D.

Appendix A

NO. DESSIN DRAWING NO. 65-000-270-200_R5

FORMAT ARCH D



As-Built drawing

Normand Menard

Signature numérique de Normand Menard
DN : cn=Normand Menard
Date: 2019.03.20 14:45:12 -05'00'

PLAN CLÉ
KEY PLAN

WSP
1075, 3e AVENUE EST
VAL-D'OR (QUÉBEC) CANADA J9P 0J7
TÉL : 819 825-4274 | TÉLÉC : 819 824-1514 | WWW.WSPGROUP.COM
Ref. 151-06440-40

NOTES GÉNÉRALES / GENERAL NOTES

LEGEND

- ARCHEOLOGICAL SITE MITIGATED
- ARCHEOLOGICAL SITE STAKED
- ARCHEOLOGICAL SITE NOT MITIGATED
- WORKING POINT

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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
INDUSTRIAL SITE – GROUND LEVELING / FINISHED GRADE ELEVATION	65-000-230-207_RD

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP. CLIENT
5	2018-09-26	REVISION FOR CP3 & CP4	LG.	B.F.
4	2018-09-06	PIPING ROUTING UPDATE	LG.	B.F.
3	2018-07-17	PIPING ROUTING UPDATE	LG.	B.F.
2	2018-06-22	ADD PIPING TO SWTP	C.G.	B.F.
1	2018-05-18	REVISION PIPING CP3-CP4	B.F.	B.F.
0	2018-03-02	ISSUED FOR CONSTRUCTION	P.STJ	B.F.

REVISIONS

TITRE / TITLE
AGNICO EAGLE – MELIADINE DIVISION
000 – GENERAL
270 – PIPING
WATER PIPE ROUTING
PLAN VIEW

DESSINÉ PAR DRAWN BY	PHILIPPE ST-JACQUES	2018-03-01
VERIFIÉ PAR CHECKED BY	DOMINIQUE RICHARD, Eng.	2018-03-01
APPROUVÉ PAR APPROVED BY	BERTRAND FORTIN, P. Eng.	2018-03-02
ÉCHELLE SCALE	1:5000	DATE 2018-03-01

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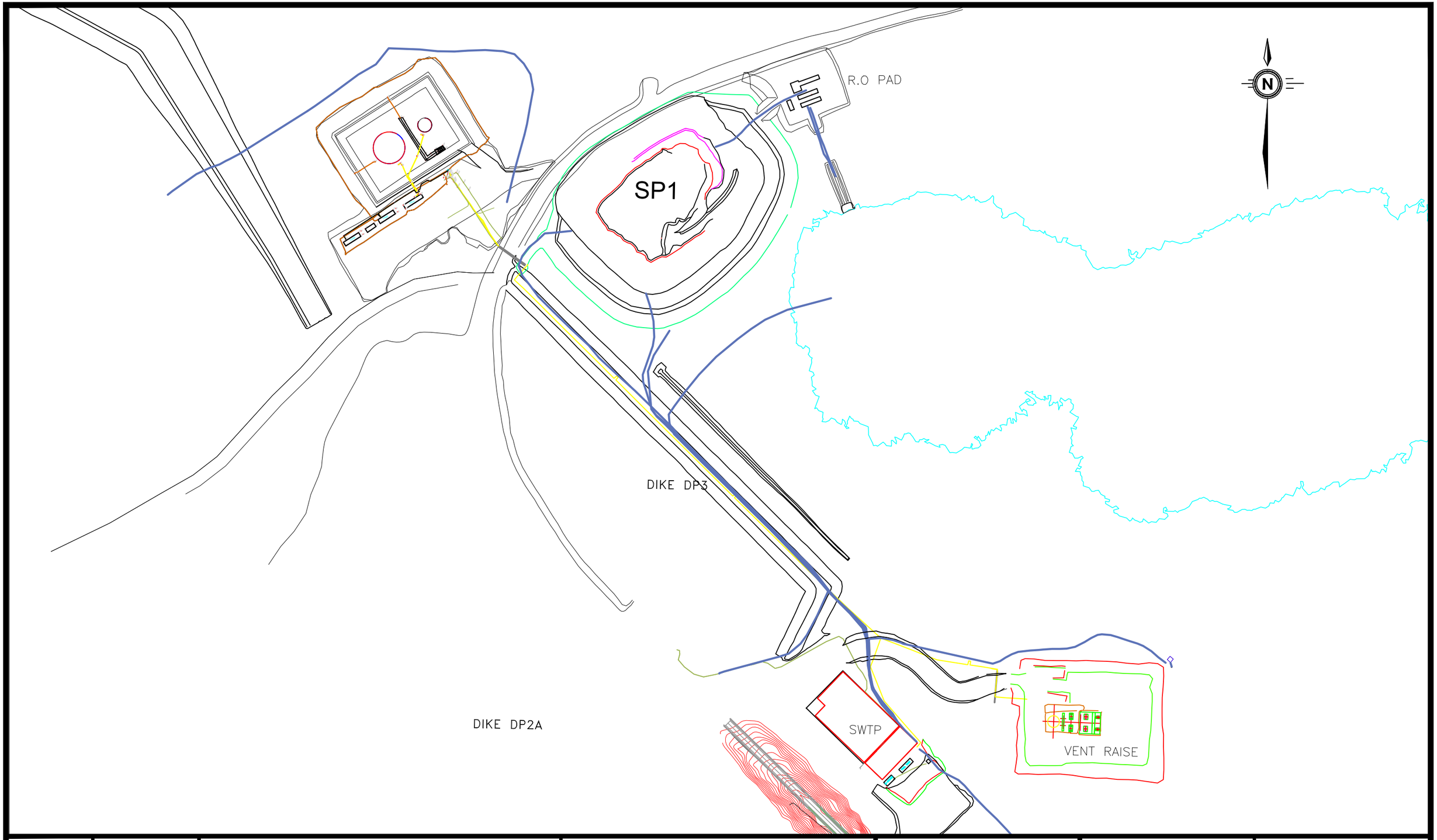
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FILE NO. 65-000-270-200_R5.dwg

Appendix B



HA HAMELARPENTAGE	Système de Coord.: UTM15 NAD83	No plan: 65-681-142-200-R0-ABD-SWTP	681 AB-SWTP	AGNICO EAGLE	Date des travaux : 2018-2019	Dessiné par: Y. Hamel
	Échelle: NA				Date d'envoi : 2019-03-24	Approuvé par: HAMEL ARP

Appendix C



Figure 1 - SM1 Installation



Figure 2 - SM1 Installation



Figure 3 - SM1 Installation



Figure 4 - SM1 Installation



Figure 5 - SM1 Mechanical Installation Complete



Figure 6 - Common Area Installation



Figure 7 - Common Area Installation



Figure 8 - Common Area Installation



Figure 9 - Common Area Installation



Figure 10 - Common Area Mechanical Installation Complete



Figure 11 - Common Area Mechanical Installation Complete



Figure 12 - SM2 Installation



Figure 13 - SM2 Installation



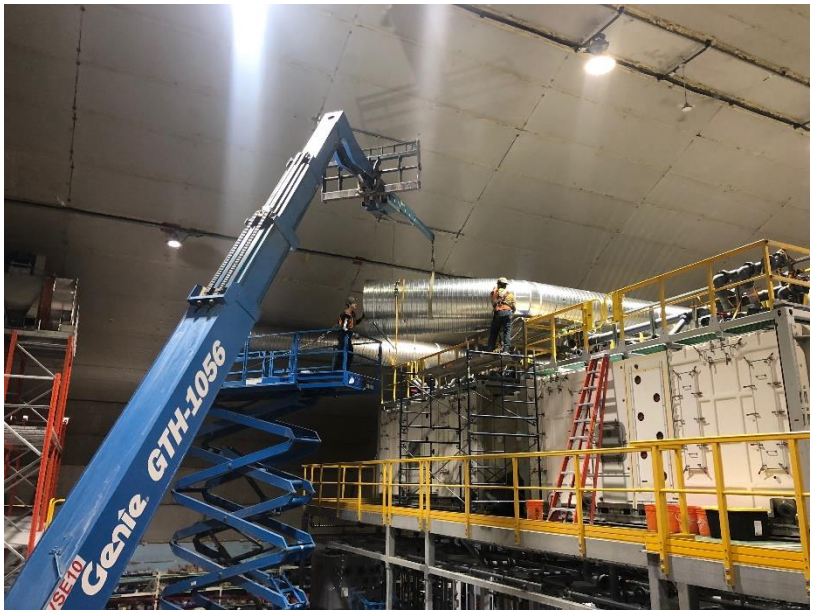


Figure 14 - SM1/SM2 Process Ducting Installation



Figure 15 - SM1/SM2 Process Ducting Installation



Figure 16 - SM2 Mechanical Installation Complete



Figure 17 - SM2 Mechanical Installation Complete

Appendix D

Client: Agnico Eagle Mines

Project: SaltMaker SM-AEM-01

The following engineering document package contains work completed under the guidance and supervision of professional engineers, P.Eng..

The package includes:

1) SW_EN_AEM-01_GAD SaltMaker GAD Revision H, dated 12-Feb-2019
2) Agnico Eagle Minds P&ID Drawing Package Revision Q, dated 12-Feb-2019
3) System 100: Post Treatment RO P&ID Revision 3, Project Number 17041-100D, Nav Number: 49-0462, dated 23-Jan-2018

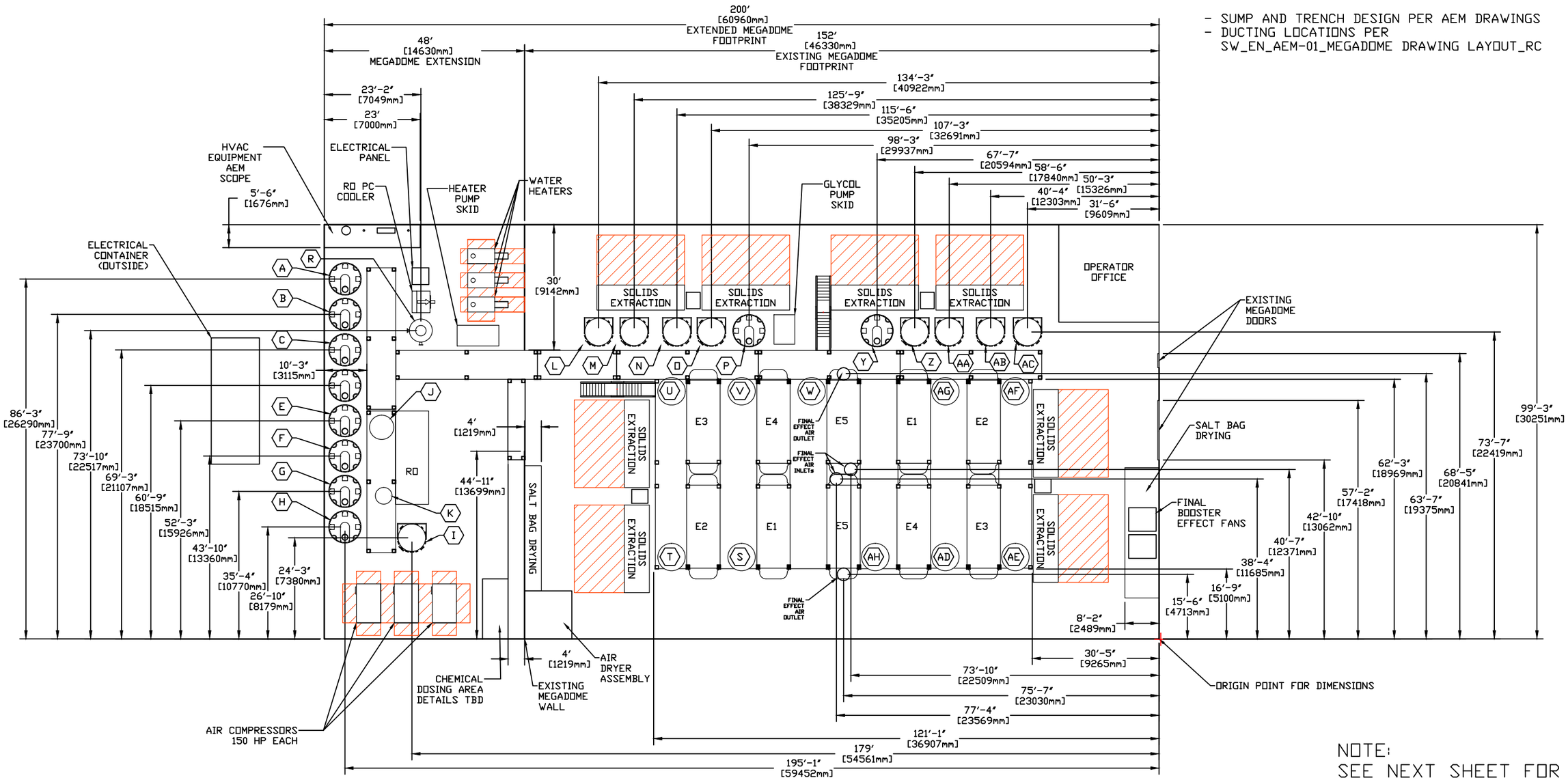
REGISTERED PROFESSIONAL ENGINEER
B.S SPARROW
LICENSEE

12-FEB-2019

PERMIT TO PRACTICE
SALTWORKS TECHNOLOGIES INC.
Signature Benjamin Sparrow
Date 12-FEB-2019
PERMIT NUMBER: P 1239
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
K.K.H. TSIN
LICENSEE
NT/NU

12-FEB-2019



NOTE:
SEE NEXT SHEET FOR TANK FOOTPRINTS AND LOADS

LABEL	DESCRIPTION	STYLE	MATERIAL	VOLUME (m3)
A	RO PRE CONDITIONER (PC)	FLAT BOTTOM	HDPE	21
B	NITRITE DESTRUCTION	FLAT BOTTOM	HDPE	21
C	SM1 RAW FEED	30 DEG CONE BOTTOM	HDPE	24
D	SM2 RAW FEED (IF REQUIRED)	30 DEG CONE BOTTOM	HDPE	24
E	CLEAN RESERVE	FLAT BOTTOM	HDPE	21
F	TREATED WATER	FLAT BOTTOM	HDPE	21
G	HIGH SOLUBILITY BLOW DOWN	30 DEG CONE BOTTOM	HDPE	24
H	RO BRINE FLUSH	30 DEG CONE BOTTOM	HDPE	24

LABEL	DESCRIPTION	STYLE	MATERIAL	VOLUME (m3)
I	AMMONIA DESTRUCTION	45 DEG CONE BOTTOM	FRP	7.6
J	RO FEED	FLAT BOTTOM	HDPE	
K	RO CIP	FLAT BOTTOM	HDPE	
L	SM1 CIP	45 DEG CONE BOTTOM	FRP	7.6
M	SM1 CIP	45 DEG CONE BOTTOM	FRP	7.6
N	SM1 EFFECT HOLD 2	45 DEG CONE BOTTOM	FRP	7.6
O	SM1 EFFECT HOLD 1	45 DEG CONE BOTTOM	FRP	7.6
P	SM1 SYSTEM HOLD	30 DEG CONE BOTTOM	HDPE	24

LABEL	DESCRIPTION	STYLE	MATERIAL	VOLUME (m3)
~~Q~~	~~CALCIUM EXTRACTION~~	~~45 DEG CONE BOTTOM~~	~~FRP~~	~~3.6~~
R	PRIMARY COMPRESSED AIR RECEIVER	VERTICAL RECEIVER	STEEL	11
S	EFFECT 1 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
T	EFFECT 2 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
U	EFFECT 3 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
V	EFFECT 4 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
W	EFFECT 5 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
~~X~~	~~CALCIUM EXTRACTION~~	~~45 DEG CONE BOTTOM~~	~~FRP~~	~~3.6~~

LABEL	DESCRIPTION	STYLE	MATERIAL	VOLUME (m3)
Y	SM2 SYSTEM HOLD	30 DEG CONE BOTTOM	HDPE	24
Z	SM2 EFFECT HOLD 1	45 DEG CONE BOTTOM	FRP	7.6
AA	SM2 EFFECT HOLD 2	45 DEG CONE BOTTOM	FRP	7.6
AB	SM2 CIP	45 DEG CONE BOTTOM	FRP	7.6
AC	SM2 CIP	45 DEG CONE BOTTOM	FRP	7.6
AD	EFFECT 4 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
AE	EFFECT 3 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
AF	EFFECT 2 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6

LABEL	DESCRIPTION	STYLE	MATERIAL	VOLUME (m3)
AG	EFFECT 1 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6
AH	EFFECT 5 RECIRCULATION TANK	45 DEG CONE BOTTOM	FRP	3.6

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

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LTR	DATE	DESCRIPTION	REV. BY:
H	12-FEB-2019	PRIMARY COMPRESSED AIR RECEIVER AND RO PC COOLER MOVED. ELECTRICAL PANEL ADDED; AS BUILT UPDATE	AMB
G	23-JULY-2018	MEGADOME EXTENSTION TANKS, AIR COMPRESSORS AND HVAC EQUIPMENT LOCATIONS UPDATED. SUMP READDED.	AMB
F	13-JULY-2018	TANK LOCATIONS UPDATED TO AS BUILT. RELEASED FOR CONSTRUCTION.	AMB
E	11-MAY-2018	STAIR LOCATION MOVED. UPDATED POSITIONS FOR PIPE RACKS, AIR SYSTEM AND UPDATED CONFIGURATION FOR SALT EXTRACTION	AMB

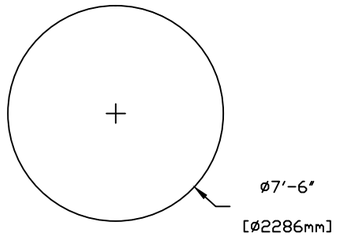
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TOLERANCES: ± 1 INCHES
FRACTIONAL: ± 1/16 INCHES
ANGULAR: MACH: ± 1°
BEND: ± 1°
TWO DECIMAL PLACE: ± 0.01
THREE DECIMAL PLACE: ± 0.001

TITLE: SALTMAKER GAD PLANT VIEW LAYOUT

PROJECT: SM-AEM-01		CUSTOMER: AEM	REVISION H
PREPARED BY: REC	DATE: 27-OCT-2017	DRAWING NO:	SW_EN_AEM-01_GAD
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APPROVED BY:	DATE:	SHEET:	1 OF 5

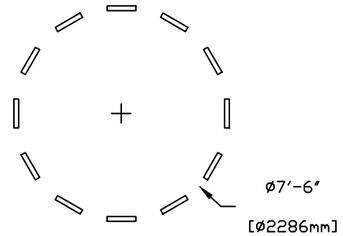
FLAT BOTTOM -
HDPE - 21m3

MAX LOAD:
71 000 LBS [32 205 KG]



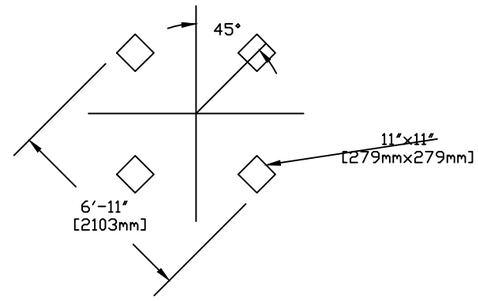
30 DEG CONE BOTTOM -
HDPE - 24m3

MAX LOAD: 85 000 LBS
[38 555 KG] ON 12 FEET



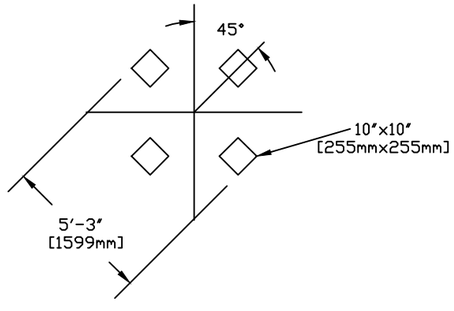
45 DEG CONE BOTTOM -
FRP - 7.6m3

MAX LOAD 31 000 LBS
[14 061 KG] ON 4 FEET



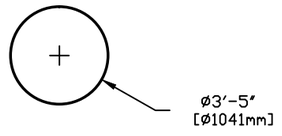
45 DEG CONE BOTTOM -
FRP - 3.6m3

MAX LOAD 15 000 LBS
[6 804 KG] ON 4 FEET



VERTICAL RECEIVER -
STEEL - 11m3

MAX LOAD 3 600 LBS
[1 633 KG] ON 41" DIAMETER
BASE RING ~1/4" THICK



NOTE:
ALL LOADS ARE NON FACTORED

Saltworks
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Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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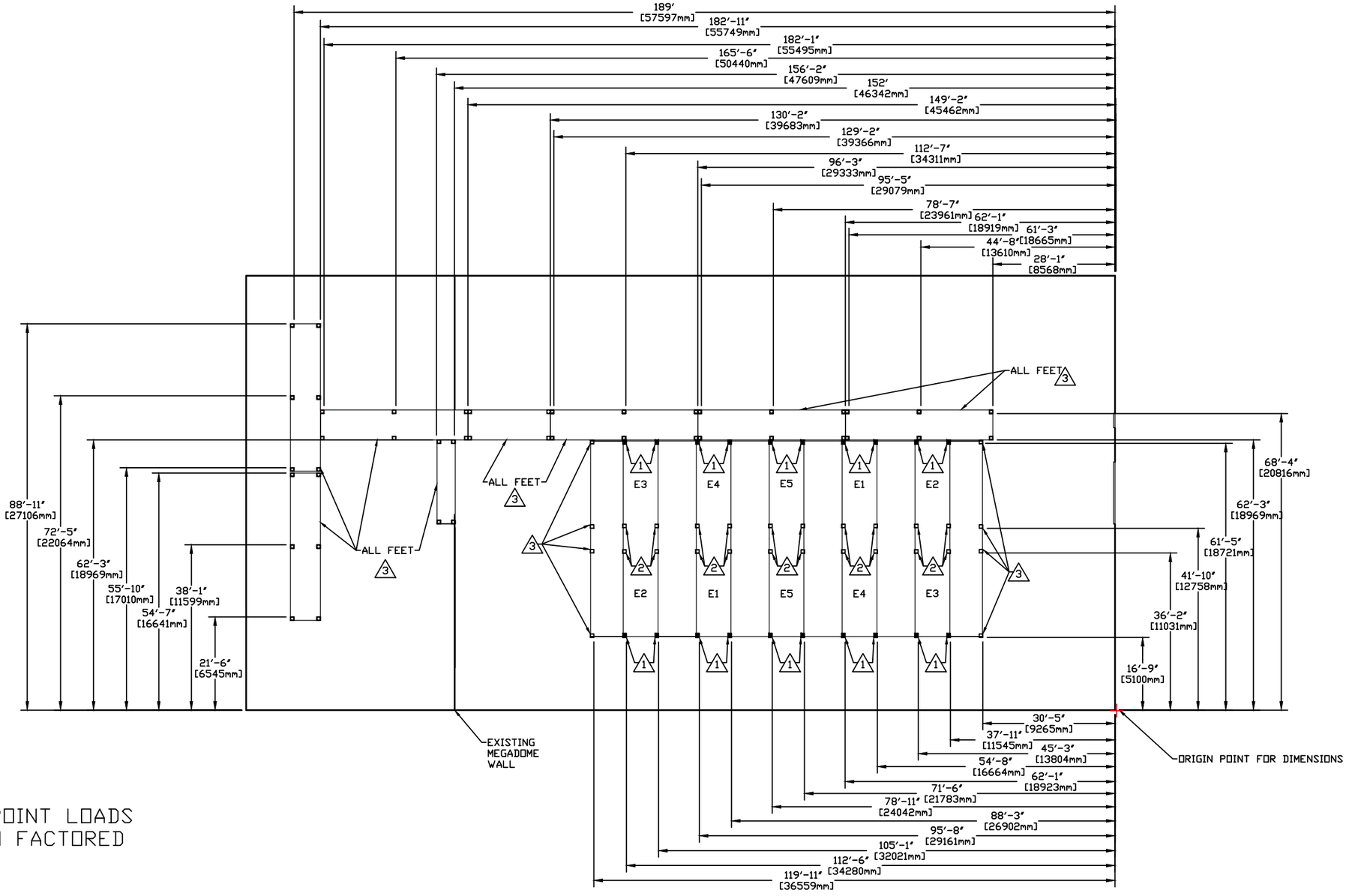
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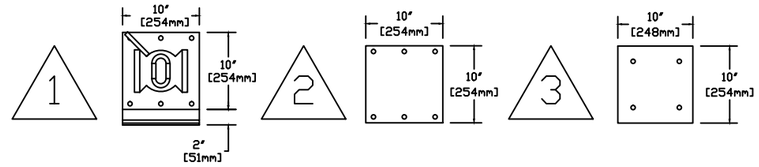
TITLE: SALTMAKER GAD TANK FOOTPRINTS AND LOADST

PROJECT: SM-AEM-01		CUSTOMER: AEM	REVISION H
PREPARED BY: REC	DATE: 27-OCT-2017	DRAWING NO:	SW_EN_AEM-01_GAD
CHECKED BY:	DATE:	JOB/CO NO:	6515-S-265-069
APPROVED BY:	DATE:	SHEET:	2 OF 5



NOTE:
- ALL POINT LOADS ARE NON FACTORED

LABEL	DESCRIPTION	LOAD	TOTAL QTY
1	BOP CONTAINER TWIST LOCK BASE PLATE	15 000 LBS [6 804 KG] PER TWIST LOCK	20
2	BOP CONTAINER CENTER SUPPORT	15 000 LBS [6 804 KG] PER SUPPORT	20
3	WORK PLATFORM SUPPORT COLUMN	5 000 LBS [2268 KG] PER SUPPORT	52



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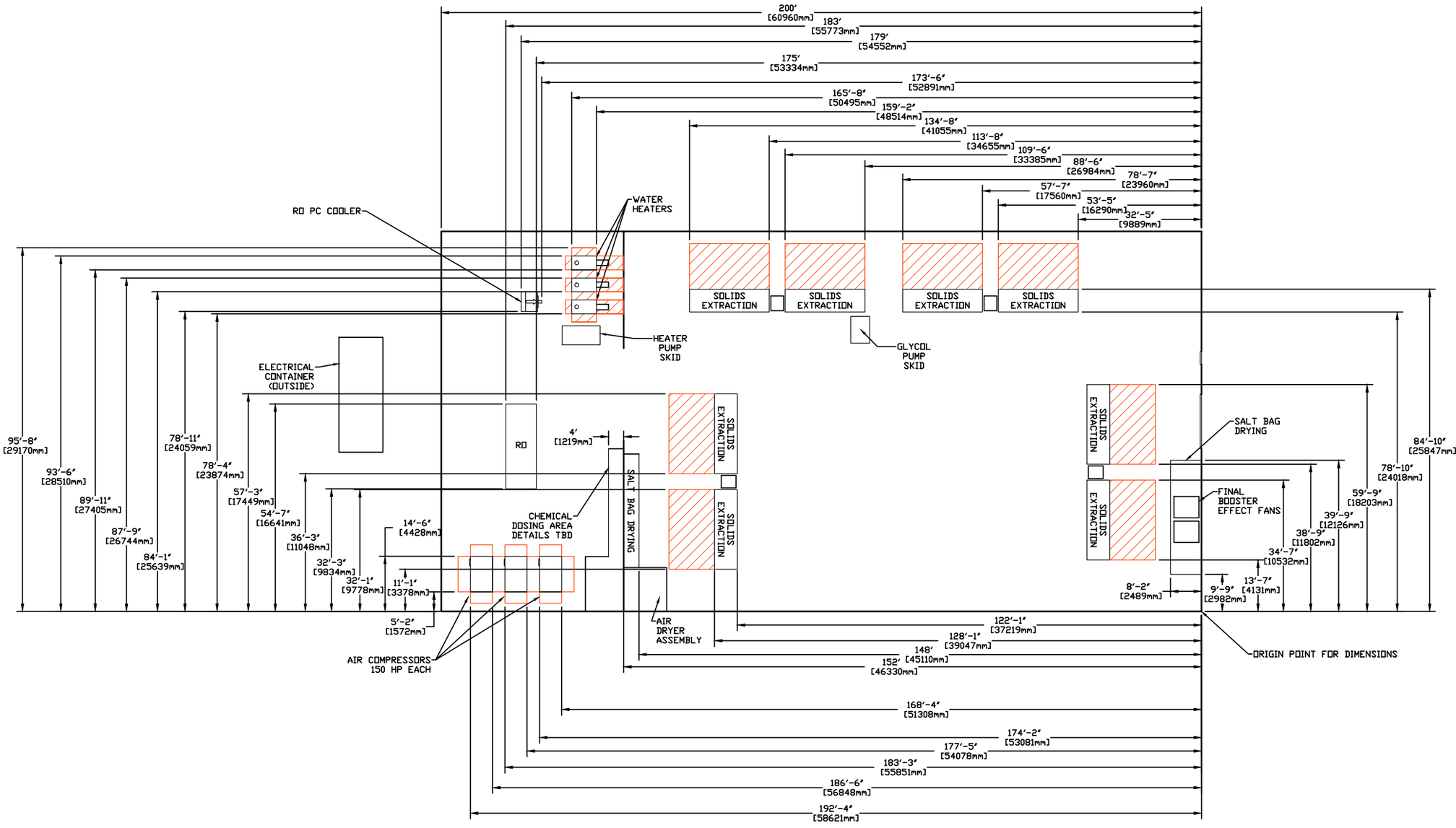
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THREE DECIMAL PLACE: ± 0.001

TITLE: SALTMAKER GAD PLANT FRAME AND PLATFORM POINT LOADS

PROJECT: SM-AEM-01		CUSTOMER: AEM	REVISION H
PREPARED BY: REC	DATE: 27-OCT-2017	DRAWING NO:	SW_EN_AEM-01_GAD
CHECKED BY:	DATE:	JOB/CO NO:	6515-S-265-069
APPROVED BY:	DATE:	SHEET:	3 OF 5



NOTE:
- ALL POINT LOADS ARE NON FACTORED

DESCRIPTION	LOAD
SOLIDS EXTRACTION	20 000 LBS [9 072 KG]
SALT BAG DRYING	WILL BE STANDARD PALLET RACKING
AIR COMPRESSORS	7 050 LBS [3 198 KG]
RO	20 000 LBS [9 072 KG]
HEATER PUMP SKID	TBD (APPROX 5 000 LBS / 2 268 KG)
WATER HEATERS	7 000 LBS [3 175 KG]
RO PC COOLER	1 000 LBS [454 KG]

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TITLE: SALTMAKER GAD — PLANT EQUIPMENT POINT LOADS

PROJECT: SM-AEM-01		CUSTOMER: AEM	REVISION: H
PREPARED BY: REC	DATE: 27-OCT-2017	DRAWING NO:	SW_EN_AEM-01_GAD
CHECKED BY:	DATE:	JOB/CO NO:	6515-S-265-069
APPROVED BY:	DATE:	SHEET:	4 OF 5

SaltMaker Site Requirements	
All specifications are for a single SaltMaker installation unless noted otherwise	
Capacity	1X (2X) SaltMaker: 66 m^3/day (132 m3/day) Saline Water
Electrical	See SW_EN_ELEC_AEM_LOADS_RD1 for details
Communications	Cat6 or Cat5e Ethernet cable connection enabling access to site SCADA system and internet access at 25Mbps upload/download speeds
Compressed Air	Built into plant Instrument air dried to: -40°C Dew Point Process air dried to: 4°C Dew Point
Feedwater	Saline water feed at 4X capacity for "slug feed" 206-275 kPa (30-40 psi) minimum to feed SW Feed tank 2" ANSI flange connection point SW PLC controls AEM feed pumps ON/OFF with local override
Treated Water Discharge	80% of "Capacity" discharged as treated water, 20% to atmosphere for cooling 206-275 kPa (30-40 psi) either continuously or batched 2" ANSI flange connection point
Solids Removal	Depends on inlet total dissolved solids (TDS), roughly: "Capacity" * TDS/1E6 5,000 kg - 13,000 kg per day removed via bulk salt bags 5 - 25 bags / day
High Solubility Blowdown Water	1% of total plant inlet volume removed as liquid via tote
Building Ventilation & Freeze Protection	AEM to provide freeze protection, and sufficient ventilation for standard industrial building occupancy in addition to combustion air requirements for diesel fired hot water heaters outlined below
Final Effect Inlet / Outlet Duct Requirements for Each SaltMaker	Detailed design of ducting to be finalized with AEM and Megadome Manufacturer. Sizes of ducts below are best estimates, and may be adjusted during the detailed design process. SaltMaker Final Effect Air Intake (process air for one (1) SaltMaker only): 36 in diameter duct Material: Galvanized steel or equivalent SaltMaker Final Effect Air Discharge (process air for one (1) SaltMaker only): 36 inch diameter duct 22,000 cfm, approximately 25°C, 95% relative humidity (+/- 20%). Material: SS304 or equivalent Saltworks notes exhaust air freezing risk. AEM advised Saltworks that atmospheric conditions will carry away moisture. AEM noted that changes to the final effect exhaust could be made if a problem emerged.
Thermal	Total nameplate hot water heater output: 2999kW Fuel: #2 Fuel Oil Temperature: Minimum 20°F (-6.6°C) All fuel lines and oil filters must be sized to provide pump suction capacities, not max operating capacities. Hot Water Heater 1 (Unilux 350Z): Burner Pump Suction Capacity: 105 GPH (397.5 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Burner Max Operating Capacity: 33.7 GPH (127.6 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Hot Water Heater 2 (Unilux 350Z): Burner Pump Suction Capacity: 105 GPH (397.5 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Burner Max Operating Capacity: 33.7 GPH (127.6 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Hot Water Heater 3 (Unilux 500Z): Burner Pump Suction Capacity: 135 GPH (511.0 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Burner Max Operating Capacity: 56.0 GPH (212.0 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Combined 3 Water Heaters Total: Burner Pump Suction Capacity: 345 GPH (1306.0 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port Burner Max Operating Capacity: 123.4 GPH (465.6 l/hr). Maximum 10" W.C. Suction Pressure (Vacuum) at oil pump suction port
Diesel Fired Burner Combustion Air Requirements	Single Hot Water Heater (plant idle + building heat): 730 scfm air at 18°C - 29°C Single SaltMaker: 1460 scfm air at 18°C - 29°C Two SaltMakers: 2920 scfm air at 18°C - 29°C
Diesel Fired Burner Exhaust Requirements	Single Hot Water Heater: 12 - 20 inch inner diameter exhaust stack (diameter may changed depending on total length of exhaust stack) Single SaltMaker: 2 x 12 - 20 inch diameter exhaust stacks (diameter may changed depending on total length of exhaust stacks) Two SaltMakers: 3 x 12 -20 inch diameter exhaust stacks (diameter may changed depending on total length of exhaust stacks)
Building Containment	8" curb around entire perimeter of building Sump installed in low points on floor. Sized to allow sump pump and allow cleanout of pit as required for servicing Trench drain along length of building. Location of trench drain to be determined based on low points in existing floor.
Sump Discharge	Sump return to feed pond via XX" ANSI connection. Details to be confirmed with AEM
Assembly	AEM to provide equipment required to lift all components of the SaltMaker into place. Saltworks notes assembly risk to AEM lifting frames in place within the Megadome. AEM to plan machinery on site capable and if needed the rent roof would be removed. Saltworks proceeded with layout design on this basis.

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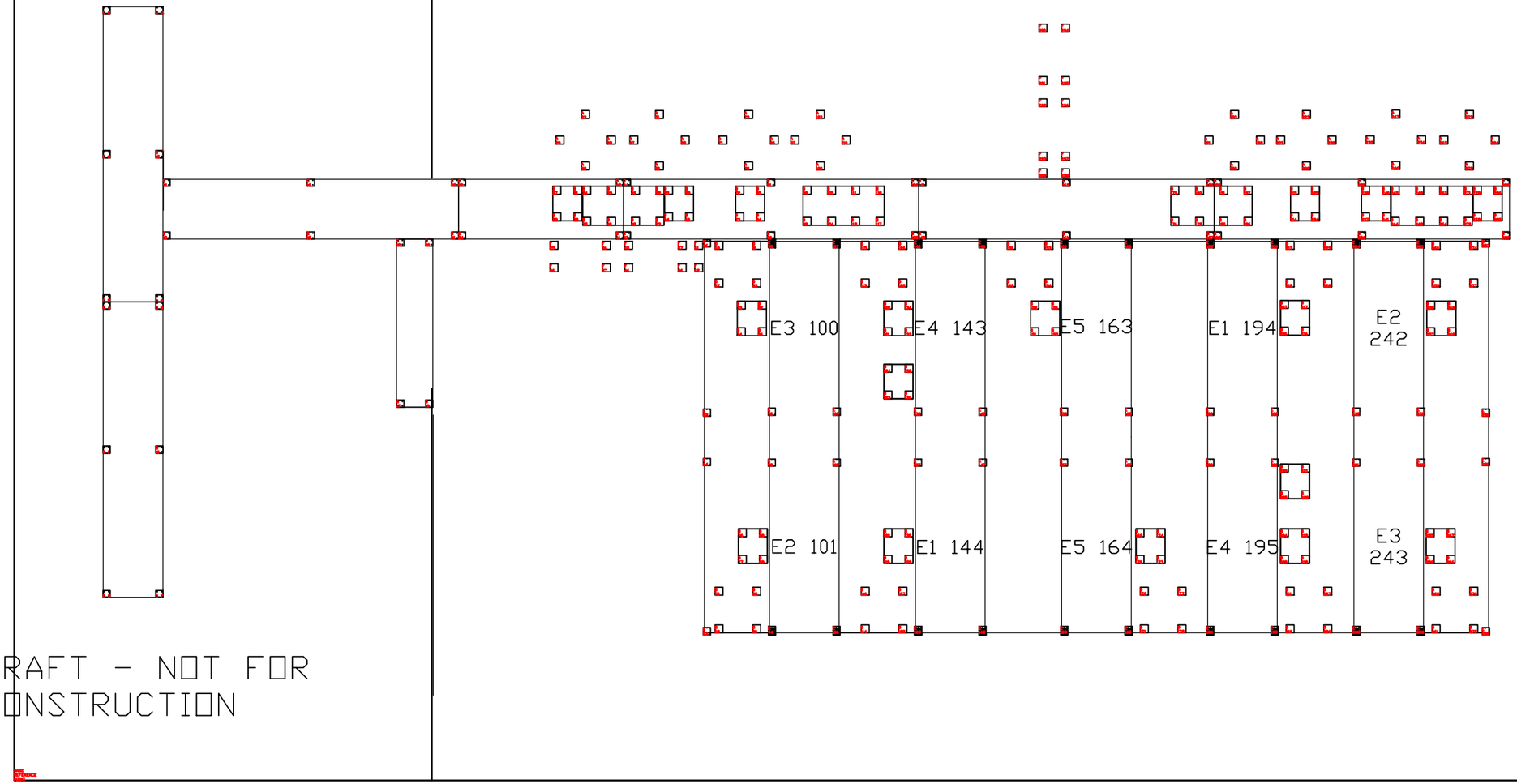
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TITLE: SALTMAKER GAD PLANT EQUIPMENT POINT LOADS

PROJECT: SM-AEM-01		CUSTOMER: AEM	REVISION: H
PREPARED BY: REC	DATE: 27-OCT-2017	DRAWING NO:	SW_EN_AEM-01_GAD
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DRAFT - NOT FOR CONSTRUCTION

189'
[57597mm]

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N	06–JUL–2018	AS MARKED BY REVISION CLOUDS	JLAU
O	17–SEP–2018	AS MARKED BY REVISION CLOUDS	JLAU
P	16–NOV–2018	AS MARKED BY REVISION CLOUDS	MLOW
Q	12–FEB–2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO

TITLE: COVER SHEET

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 1–SEP–2017	DWG. NO: COVER SHEET	
CHECKED BY: MLOW	DATE: 5–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

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□□	S□ □□N□SM□A□M□□1□PID□SM1□D□ □ □1□□	□□1□SO□IDS□□□TRACTION
□□	S□ □□N□SM□A□M□□1□PID□SM1□D□ □ □1□□	□□□SO□IDS□□□TRACTION
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SHEET NO.	DRAWING NO.	DESCRIPTION
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□□ AS□ORI□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: DRAWING LIST 1	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
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□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	P□□□□PR□□□NTION□P□MP□AIR
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Richmond, BC, Canada, V6W 1A8
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 01-SEP-2017

CHECKED BY: MLOW DATE: 05-SEP-2017

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: DRAWING LIST 2

JOB/CO NO: (JOB NO.)

SHEET: # OF #

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
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SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

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□A□□□SI□□
S□□□□NTIA□N□M□□R
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VALVE SIZE CONVERSION

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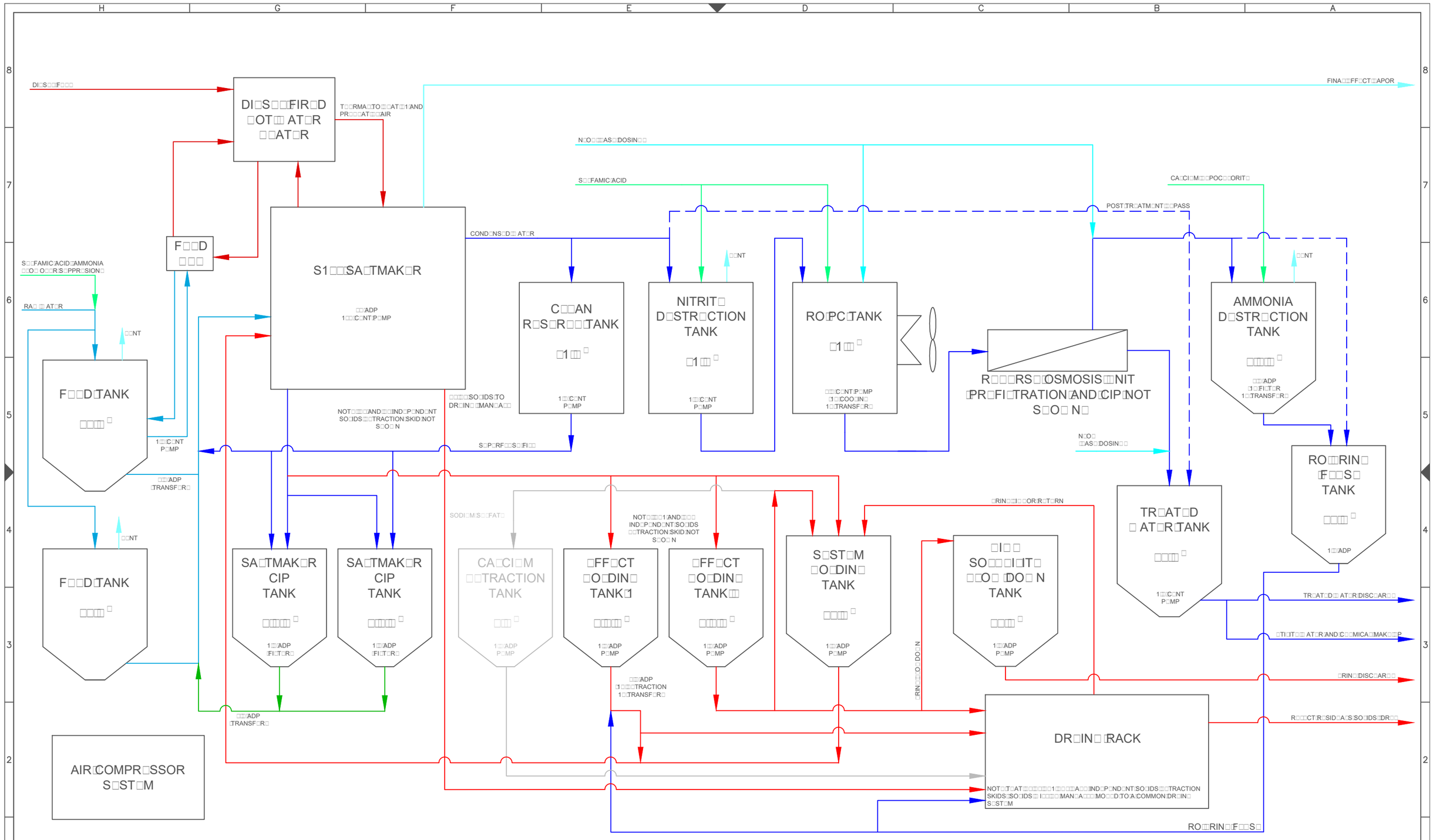
VALVE TYPE CONVERSION

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1	Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□FOR□T□□P□RPOS□AND□□□T□□□NTIT□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:
			N	06–JUL–2018	PINCH VALVE LEGEND ADDED	JLAU
			O	17–SEP–2018	NO CHANGES	–
			P	16–NOV–2018	NO CHANGES	–
			Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: LEGEND

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE: 01–SEP–2017	DWG. NO:	LEGEND	
CHECKED BY:	MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	# OF #	



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13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
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P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 000: MASTER PFD

PROJECT: SALTMAKER GEN III
CUSTOMER: AGNICO EAGLE MINES
REVISION: Q

PREPARED BY: PREPPED BY DATE: PREPPED DATE
CHECKED BY: CHECKED BY DATE: CHECKED DATE
APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: SW_EN_SM_AEM-01_PID_COMMON_DWG_000
JOB/CO NO: (JOB NO.)
SHEET: 1 OF117

LEVEL 2

LEVEL 1

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E2BR - EFFECT 2 BRINE (75°C)

E3BR - EFFECT 3 BRINE (60°C)

E4BR - EFFECT 4 BRINE (45°C)

E5BR - EFFECT 5 BRINE (30°C)

CIP□□C□□AN□IN□P□AC□

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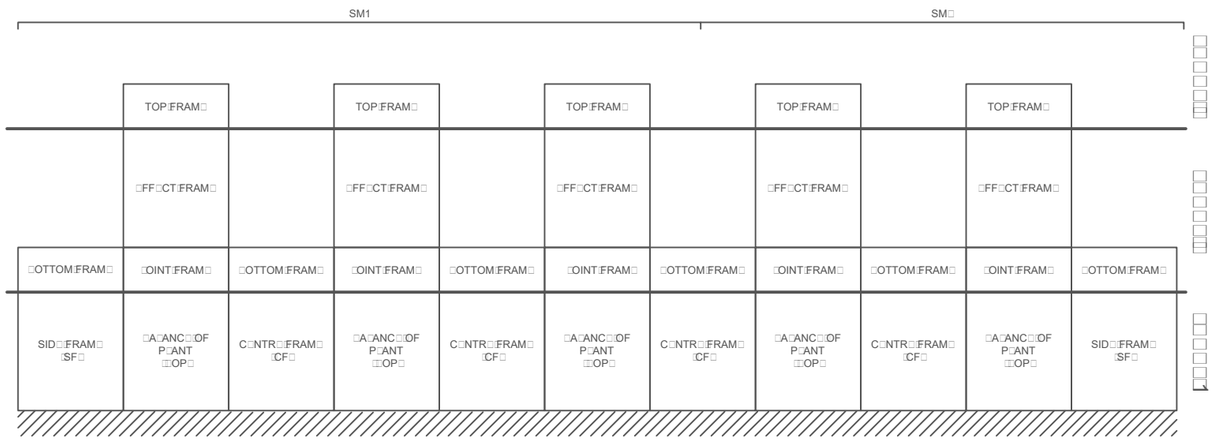
DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
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P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

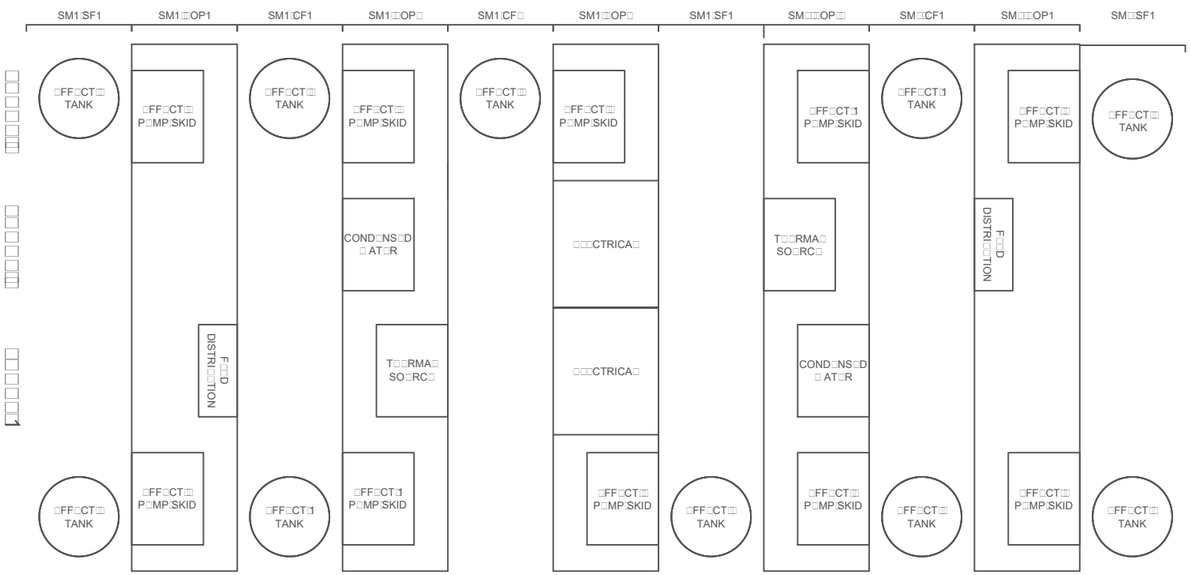
TITLE: (COMMON) 010: PROCESS FLOW DIAGRAM

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_010	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 2 OF 117	

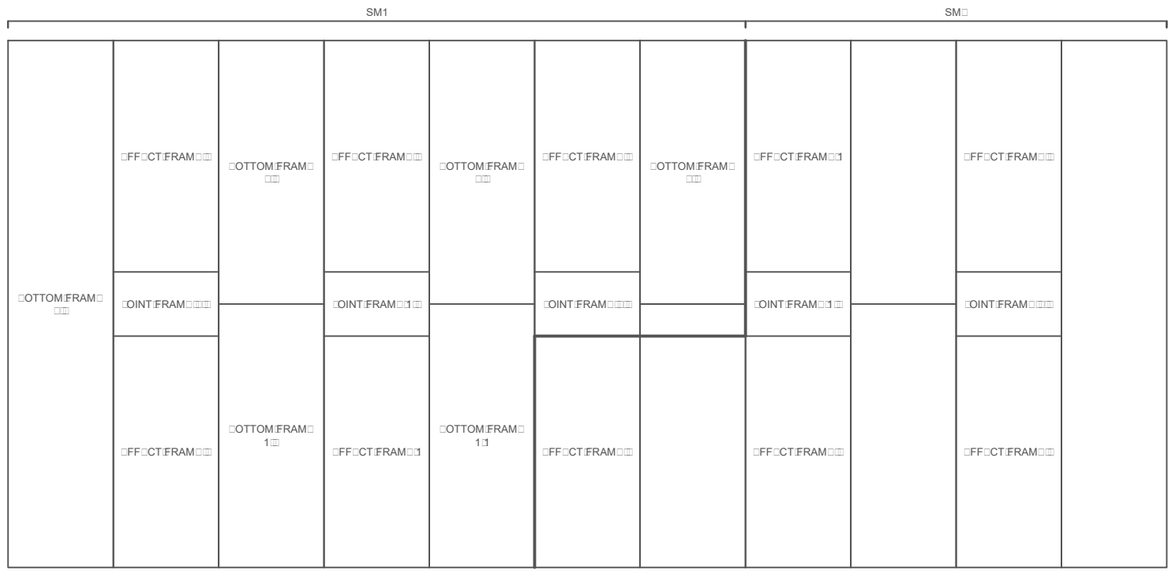
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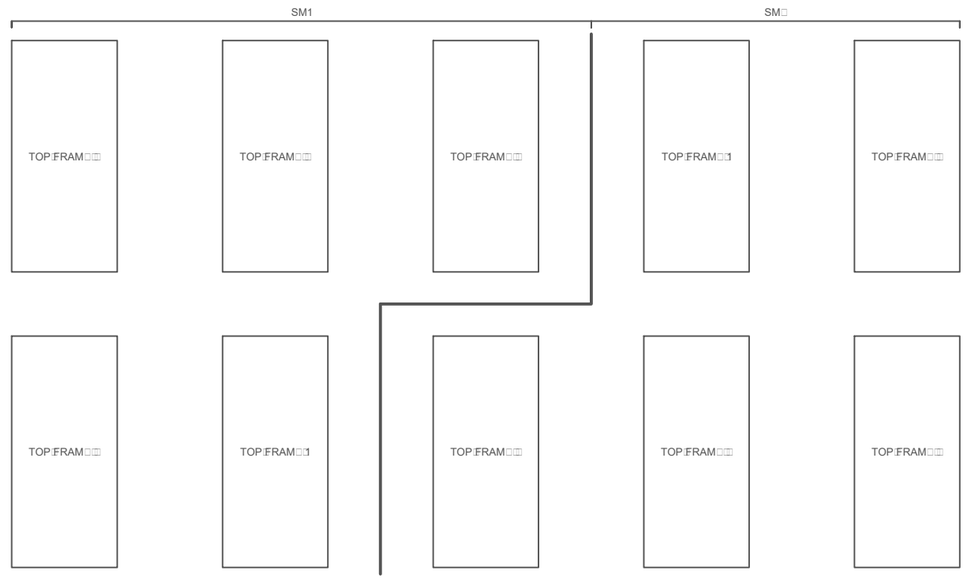
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Saltworks	DRAWING STATUS: AS BUILT
13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	T□IS□DOC□M□NT□M□□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□DN□□□FOR□T□□□P□RPOS□□AND□□□□T□□□□NTIT□□FOR □ □IC□□IT□□ AS□OR□□INA□□□□S□□PP□□□D□□T□□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□□R□P□RSON□OR□□NTIT□□OR□□S□□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□□ IT□O□T□T□□□PRIOR□□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□□ **DO NOT SCALE DRAWING**

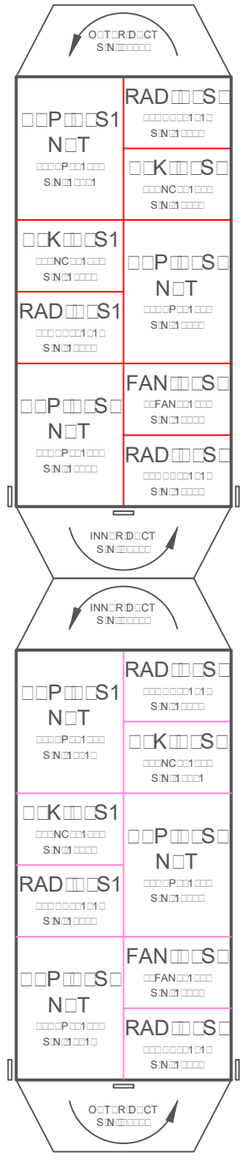
LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 020: CONTAINER LAYOUT

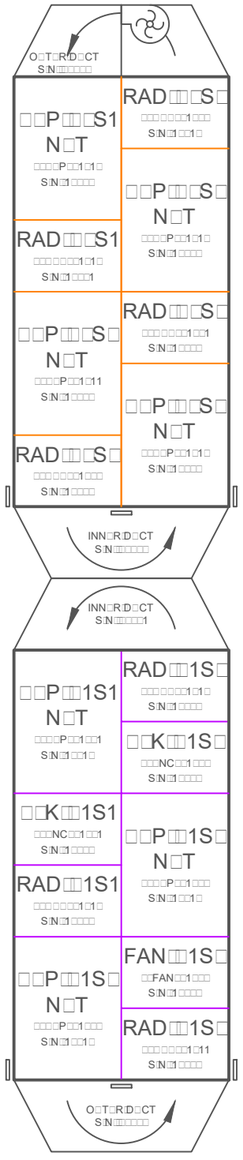
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_020	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 3 OF117	

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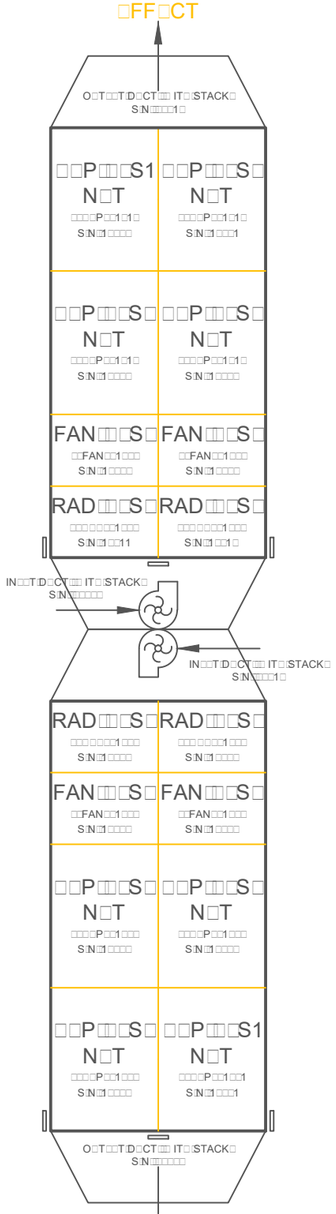
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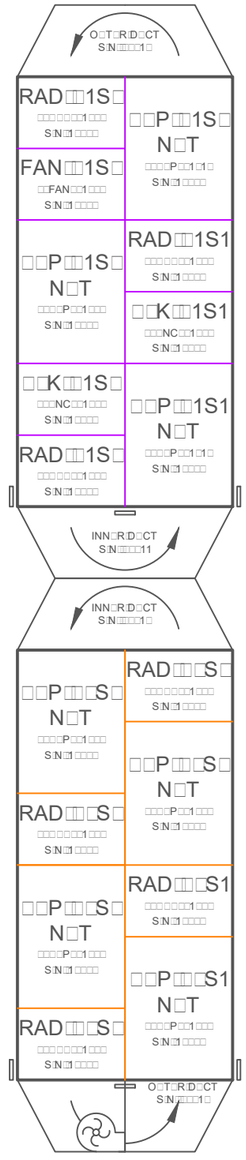
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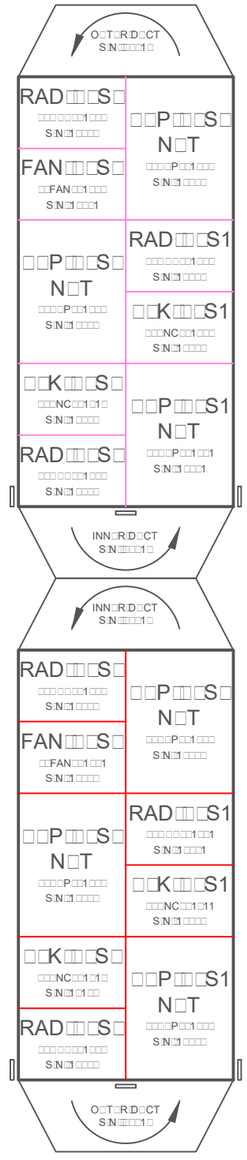
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Richmond, BC, Canada, V6W 1A8
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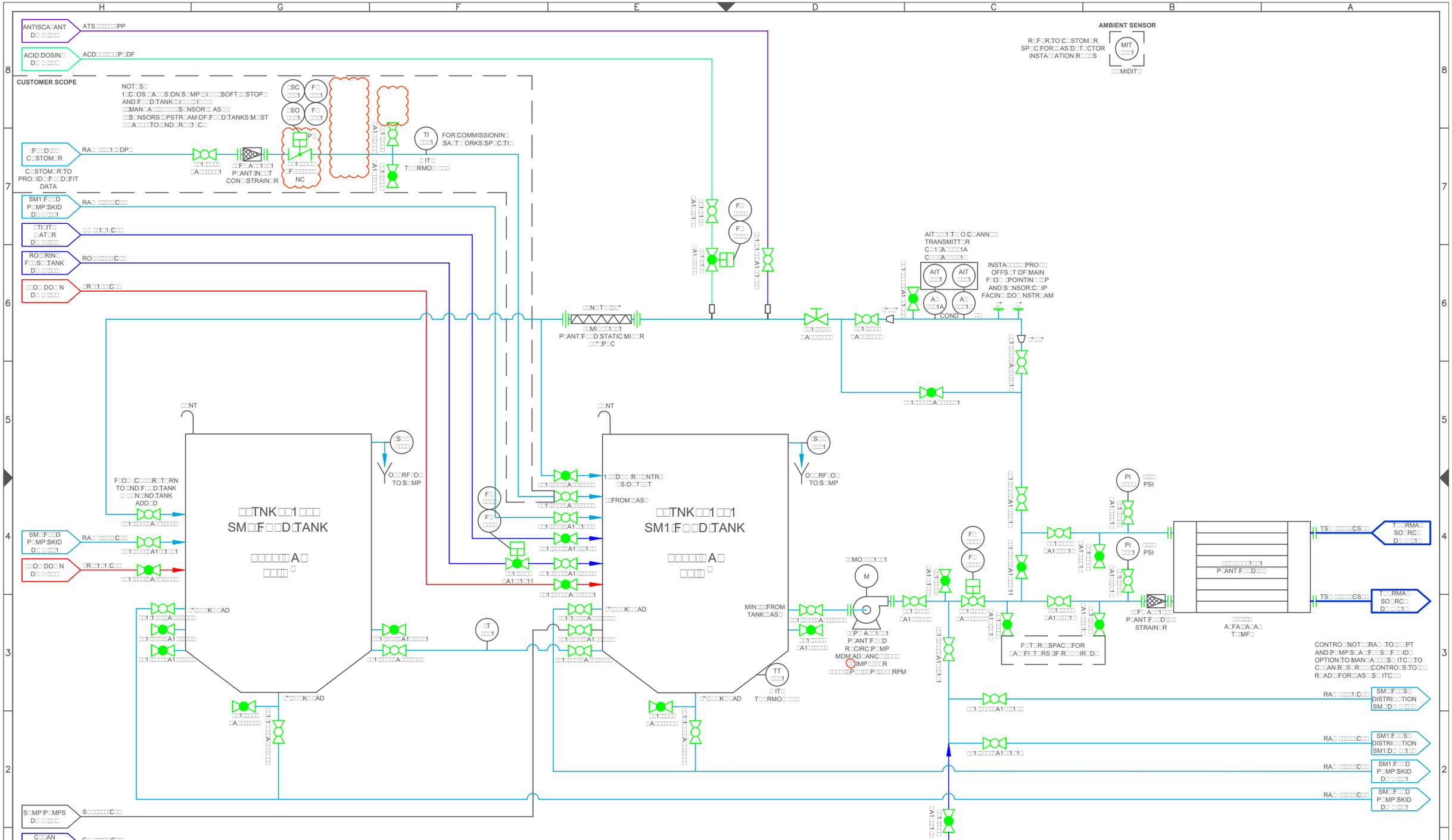
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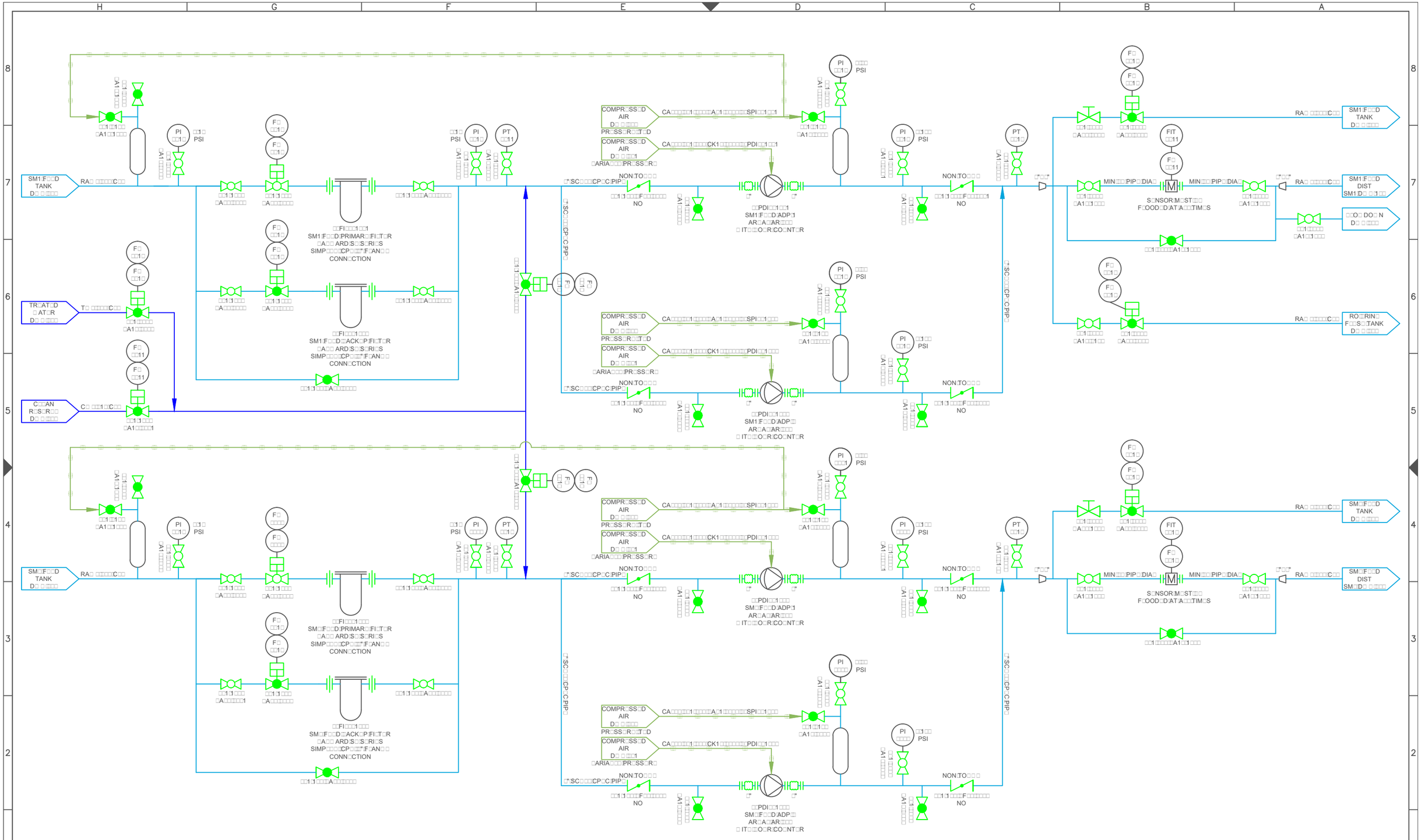
DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
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O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: 030: MODULE LAYOUT

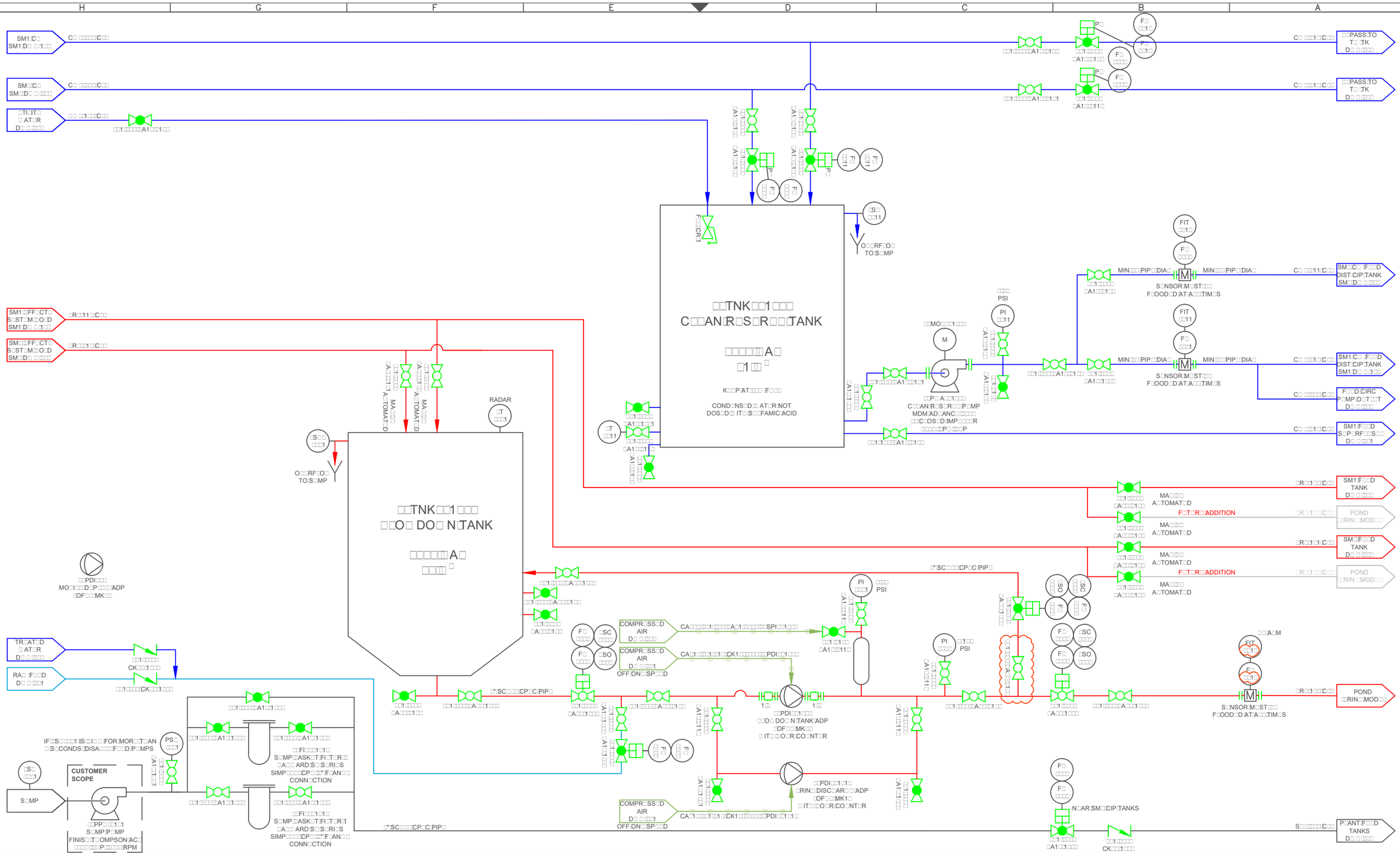
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_COMMON_DWG_030	
CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 4 OF117	


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		N	06–JUL–2018	NO CHANGES	–
		O	17–SEP–2018	NO CHANGES	–
		P	16–NOV–2018	ADDITION OF MBV FOR BD FLUSH	MLOW
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 041: PLANT FEED PUMP SKIDS			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_041	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 6 OF117	


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LOCATED INSIDE CHEMICAL AREA

INSIDE BOP1

ACID SOLIDS ADDITION

TRAILER MOUNTED DUST COLLECTOR

SYSTEM 11 000 CFM

11 000 CFM

SM1 ACID DIP TANK

SM1 ACID DIP TANK

NITRITE DESTRUCT

SM1 ACID DIP TANK

(COMMON) 060: ACID DOSING SYSTEM

AS BUILT

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	AS BUILT UDDATE	JLAU
O	17-SEP-2018	ADDED DUST EXTRACTOR	–
P	16-NOV-2018	NO CHANGES	JLAU
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

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PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 01-SEP-2017

CHECKED BY: MLOW DATE: 05-SEP-2017

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: SW_EN_SM_AEM-01_PID_COMMON_DWG_060

JOB/CO NO: (JOB NO.)

SHEET: 8 OF117

LOCATED INSIDE CHEMICAL AREA

INSIDE BOP1

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LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 061: BASE DOSING SYSTEM

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE: 01-SEP-2017	DWG. NO:	SW_EN_SM_AEM-01_PID_COMMON_DWG_061	
CHECKED BY:	MLOW	DATE: 05-SEP-2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	9 OF117	

LOCATED INSIDE CHEMICAL AREA | INSIDE BOP1

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LOCATED INSIDE CHEMICAL AREA | INSIDE BOP1

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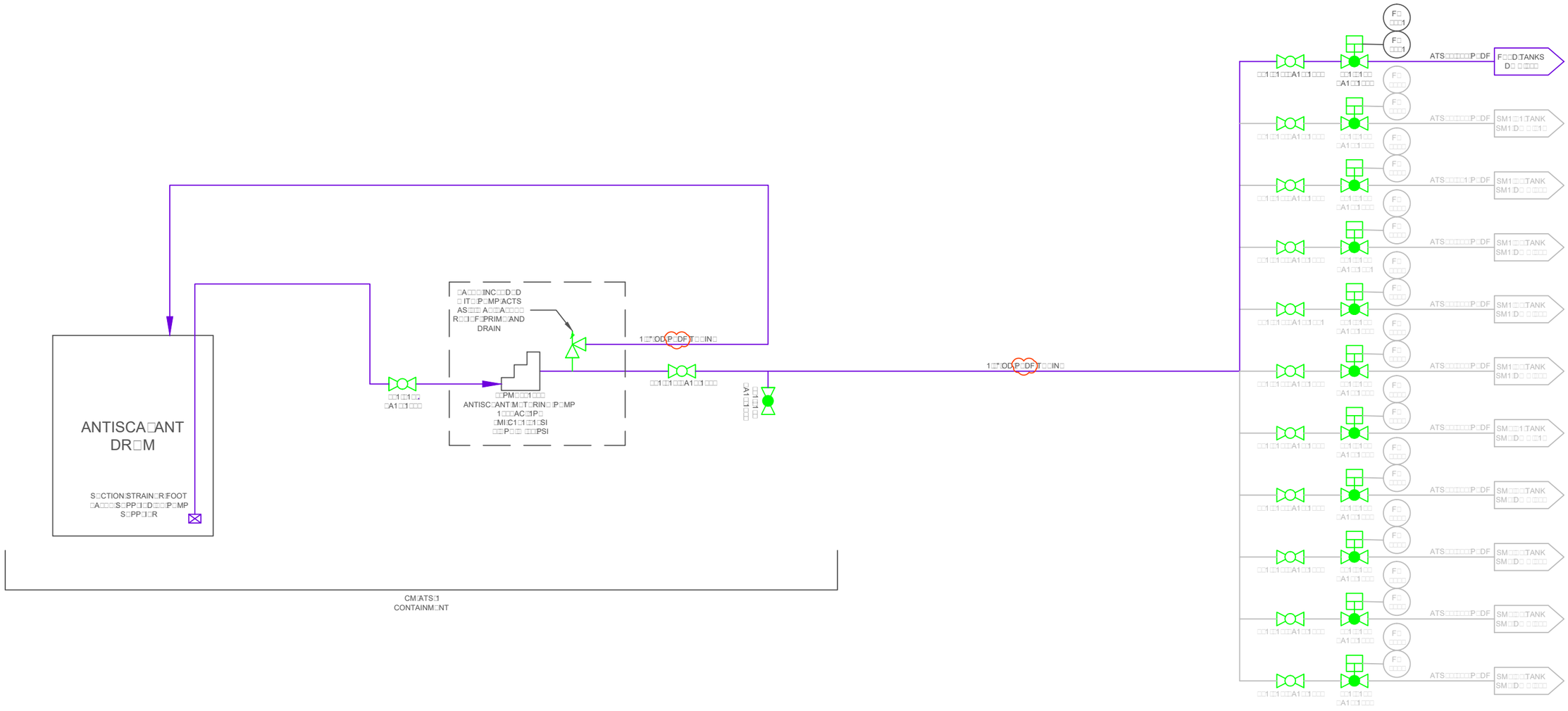
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	DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	AS BUILT UPDATES	JLAU
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 063: ANTIFOAM DOSING SYSTEM

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_063	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 11 OF117	



Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□AND□□□T□□□NTIT□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING						

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	UPDATED LINE MATERIAL FROM PP TO PVDF	MLOW
Q	12-FEB-2019	UPDATED LINE MATERIAL FROM PP TO PVDF; AS BUILT UPDATE	DKAO

TITLE: (COMMON) 064: ANTISCALANT DOSING SYSTEM			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_COMMON_DWG_064	
CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 12 OF117	

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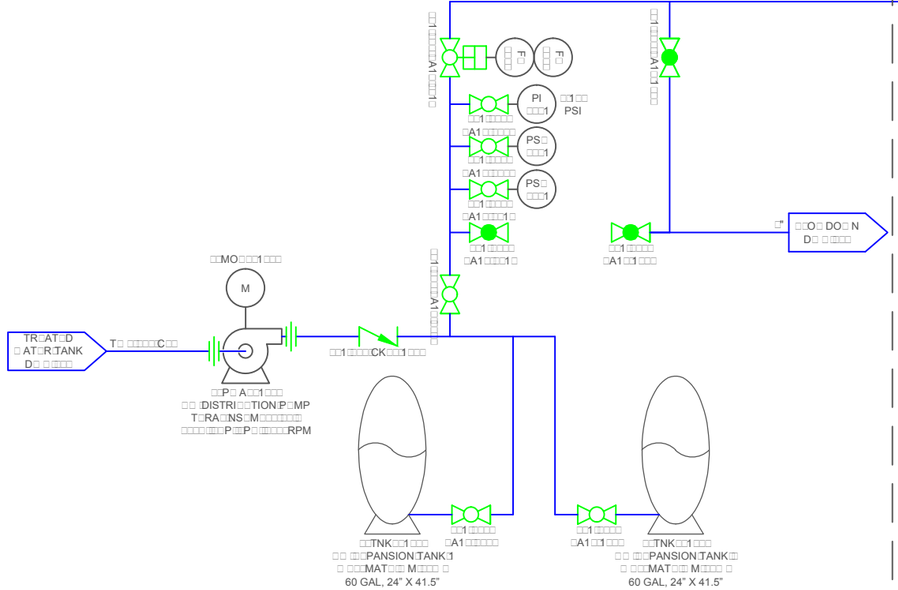
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	ADDED CHECK VALVE	JLAU
P	30–OCT–2018	UPDATED PER MECH DESIGN	JLAU
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 070: UTILITY WATER DISTRIBUTION

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_070	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 13 OF117	

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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	AS BUILT UPDATES, PINCH VALVES ADDED	JLAU
O	17–SEP–2018	AS BUILT UPDATES, ADDED STATIC MIXER LENGTH AND MATERIAL	JLAU
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 320: NITRITE DESTRUCTION AND RO PRE–CONDITIONING SYSTEM

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 15–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_320	
CHECKED BY: CHECKED BY	DATE: CHECKED DATE	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 51 OF117	

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Saltworks	DRAWING STATUS: AS BUILT	LTR	DATE	DESCRIPTION	REV. BY:	TITLE: (COMMON) 321: AMMONIA DESTRUCTION SYSTEM		
13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	T□IS:DOC□M□NT□M□ODI□S:D□SI□NS:AND:INFORMATION:T□AT:AR□PROPRI□TAR□:TO SA□T□ ORKS□IT:IS:TO:□□□□S□D:ON□□:FOR:T□□P□RPOS□AND□□□T□□□NTIT□:FOR □□IC□IT□ AS:OR□INA□□□S□PP□I□D□T□□DOC□M□NT:MA□NOT□□□D□P□ICAT□D:OR DISC□OS□D:TO:OT□□R:P□RSON:OR□NTIT□□OR□S□D:FOR:MAN□FACT□R□□OF:T□□IT□M IN:PART:OR:IN□ □O□□□ IT□O□T:T□□PRIOR□ RITT□N:P□RMISSION:OF:SA□T□ ORKS□	N	06–JUL–2018	FAN ADDED, PINCH VALVES ADDED	JLAU	PROJECT: SALTMAKER GEN III	CUSTOMER: AGNICO EAGLE MINES	REVISION Q
	DO NOT SCALE DRAWING	O	17–SEP–2018	UPDATED FAN TAG	–	PREPARED BY: JLAU	DATE: 15–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_321
		P	16–NOV–2018	NO CHANGES	–	CHECKED BY: CHECKED BY	DATE: CHECKED DATE	JOB/CO NO: (JOB NO.)
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Tel: 604.628.6508 Fax: 604.676.2463
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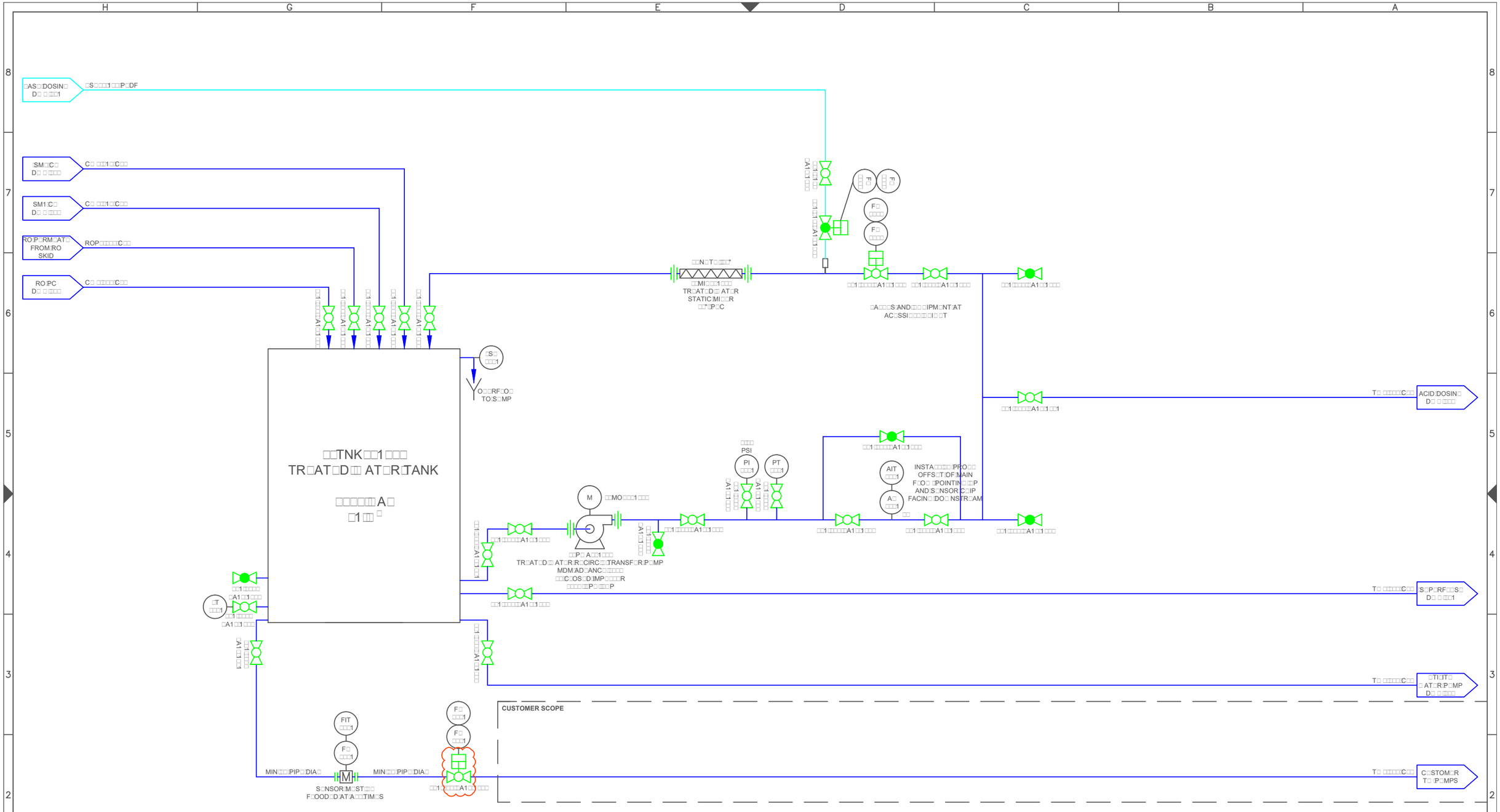
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 322: RO BRINE FLUSH TANK

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 03–AUG–17	DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_322	
CHECKED BY: CHECKED BY	DATE: CHECKED DATE	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 53 OF117	



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N	06–JUL–2018	PROCESS UDPATES	JLAU
O	17–SEP–2018	AS BUILT UPDATES	JLAU
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 323: TREATED WATER TANK

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 15–SEP–2017

CHECKED BY: CHECKED BY DATE: CHECKED DATE

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: SW_EN_SM_AEM–01_PID_COMMON_DWG_323

JOB/CO NO: (JOB NO.)

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N	06–JUL–2018	AS MARKED BY REVISION CLOUDS	JLAU
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P	16–NOV–2018	AS MARKED BY REVISION CLOUDS	MLOW
Q	12–FEB–2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO

TITLE: COVER SHEET

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 1–SEP–2017	DWG. NO: COVER SHEET	
CHECKED BY: MLOW	DATE: 5–SEP–2017	JOB/CO NO: (JOB NO.)	
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□□ AS□ORI□INA□□□S□PP□I□D□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: DRAWING LIST 1	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
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□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	P□□□□PR□□□NTION□P□MP□AIR
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13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	04-SEP-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY:	JLAU	DATE:	01-SEP-2017
CHECKED BY:	MLOW	DATE:	05-SEP-2017
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE

DWG. NO: DRAWING LIST 2

JOB/CO NO: (JOB NO.)

SHEET: # OF #

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
F□□ID
SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
AR□A□COD□□
□A□□□SI□□
S□□□□NTIA□N□M□□R
□A□□□T□P□

VALVE SIZE CONVERSION

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□□□	□	1
□□□	□	□
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VALVE TYPE CONVERSION

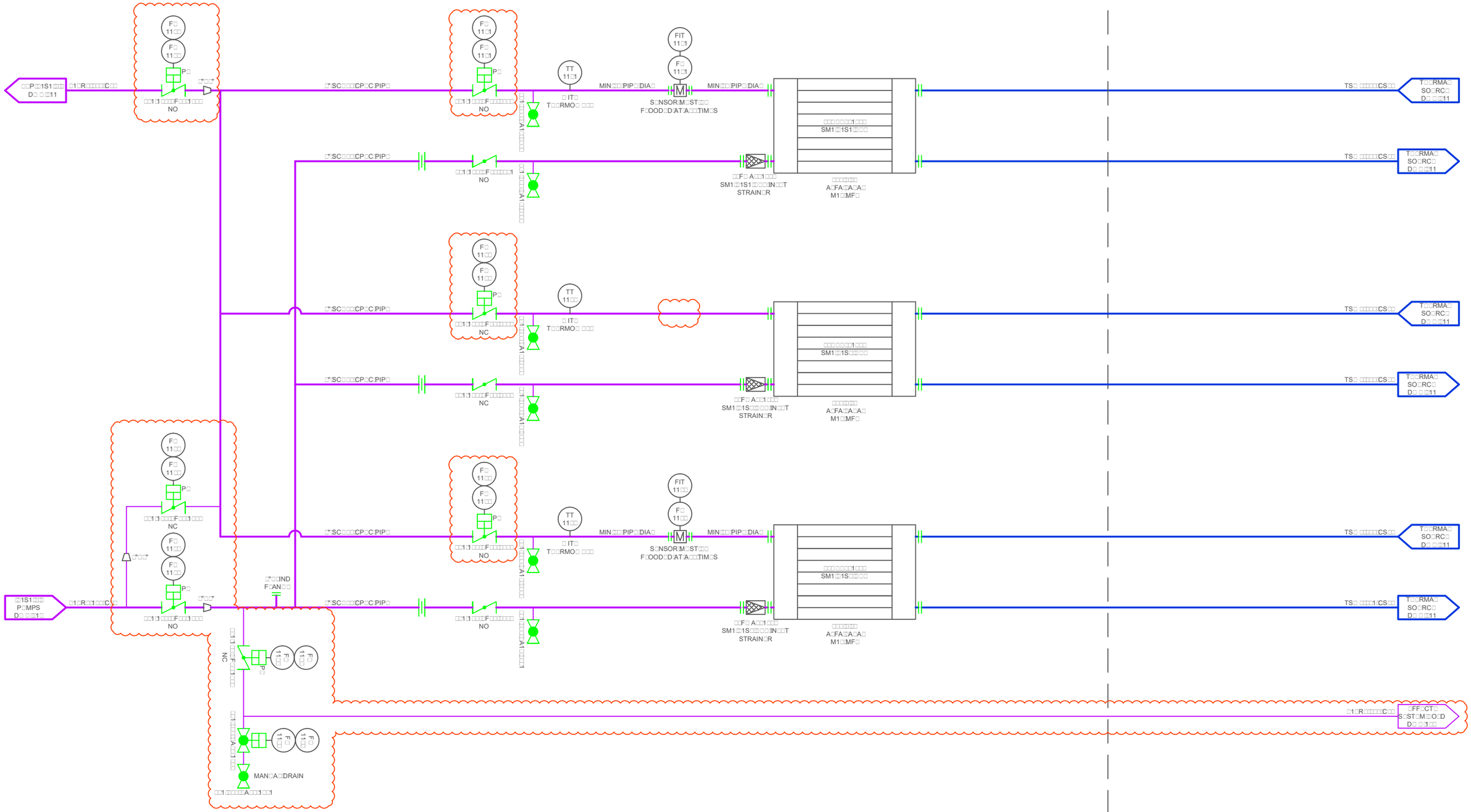
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1	Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TOSA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□FOR□T□□P□RPOS□AND□□□T□□□NTIT□FOR□ □IC□IT□ AS□ORI□INA□□□S□PP□I□D□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:
			N	06–JUL–2018	PINCH VALVE LEGEND ADDED	JLAU
			O	04–SEP–2018	NO CHANGES	–
			P	16–NOV–2018	NO CHANGES	–
			Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: LEGEND

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE: 01–SEP–2017	DWG. NO:	LEGEND	
CHECKED BY:	MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	# OF #	

INSIDE BOP | OUTSIDE BOP - FROM BOILER SKID

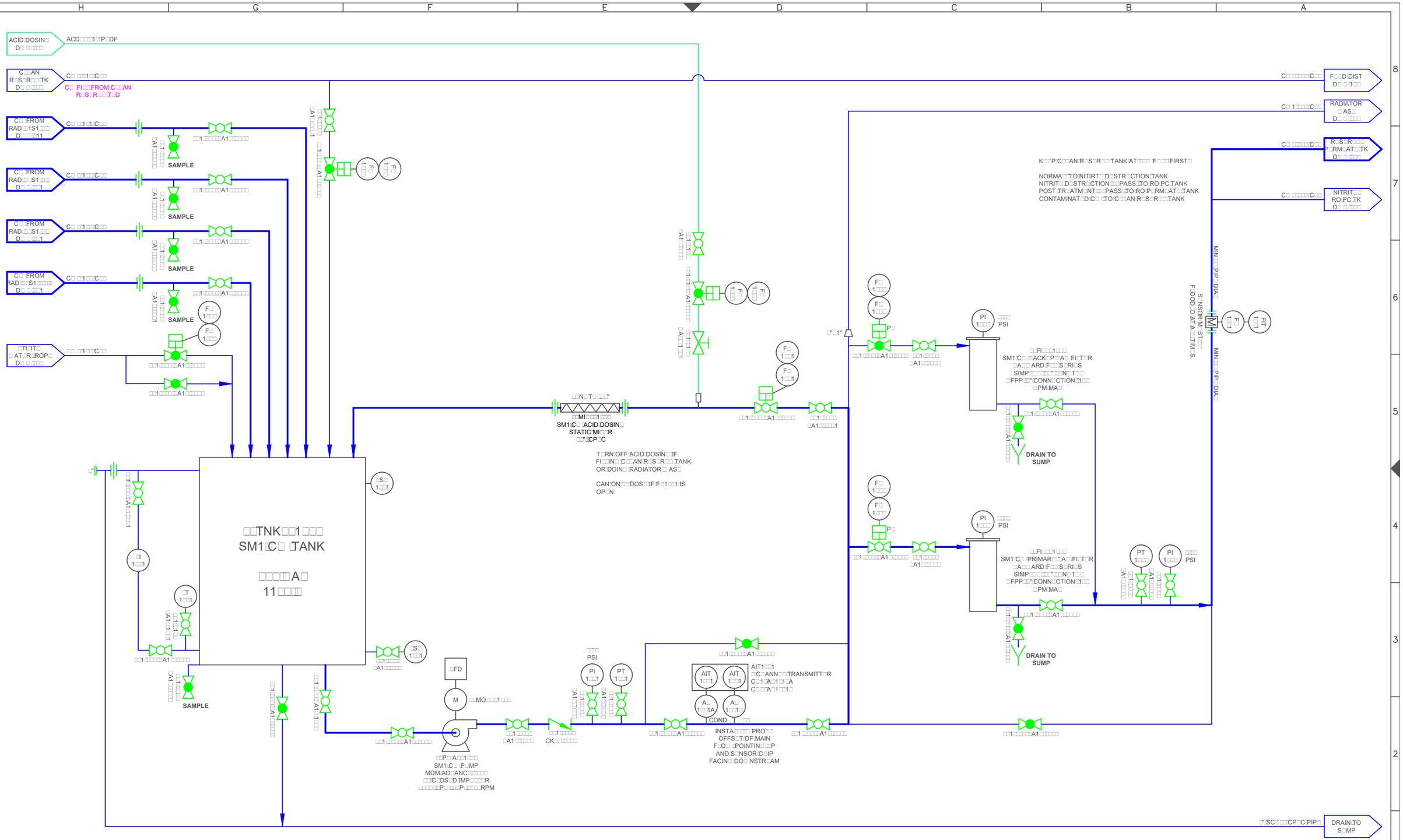


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		O	04–SEP–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
DO NOT SCALE DRAWING		Q	12–FEB–2019	ADDED HEX BACKFLUSH SYSTEM; AS BUILT UPDATE	DKAO

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13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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TITLE: (SM1) 110: THERMAL SOURCE PRIMARY HEAT EXCHANGER

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
		REVISION	Q
PREPARED BY:	PH	DATE:	01–SEP–2017
CHECKED BY:	MLOW	DATE:	05–SEP–2017
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_110		
JOB/CO NO:	(JOB NO.)		
SHEET:	14 OF117		



Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T IS DOC M NT M ODI S D SI NS AND INFORMATION T AT AR PROPRI TAR TO SA T ORKS IT IS TO S D ON FOR T P RPOS AND T NTIT FOR IC IT AS ORI INA S PP I D T DOC M NT MA NOT D P ICAT D OR DISC OS D TO OT R P RSON OR NTIT OR S D FOR MAN FACT R OF T IT M IN PART OR IN O T T PRIOR RITT N P RMISSION OF SA T ORKS **DO NOT SCALE DRAWING**	LTR	DATE	DESCRIPTION	REV. BY:
		N	06–JUL–2018	PINCH VALVES ADDED	JLAU
		O	04–SEP–2018	ADDED STATIC MIXER LENGTH AND MATERIAL	JLAU
		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 120: CONDENSED WATER SYSTEM

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_120	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

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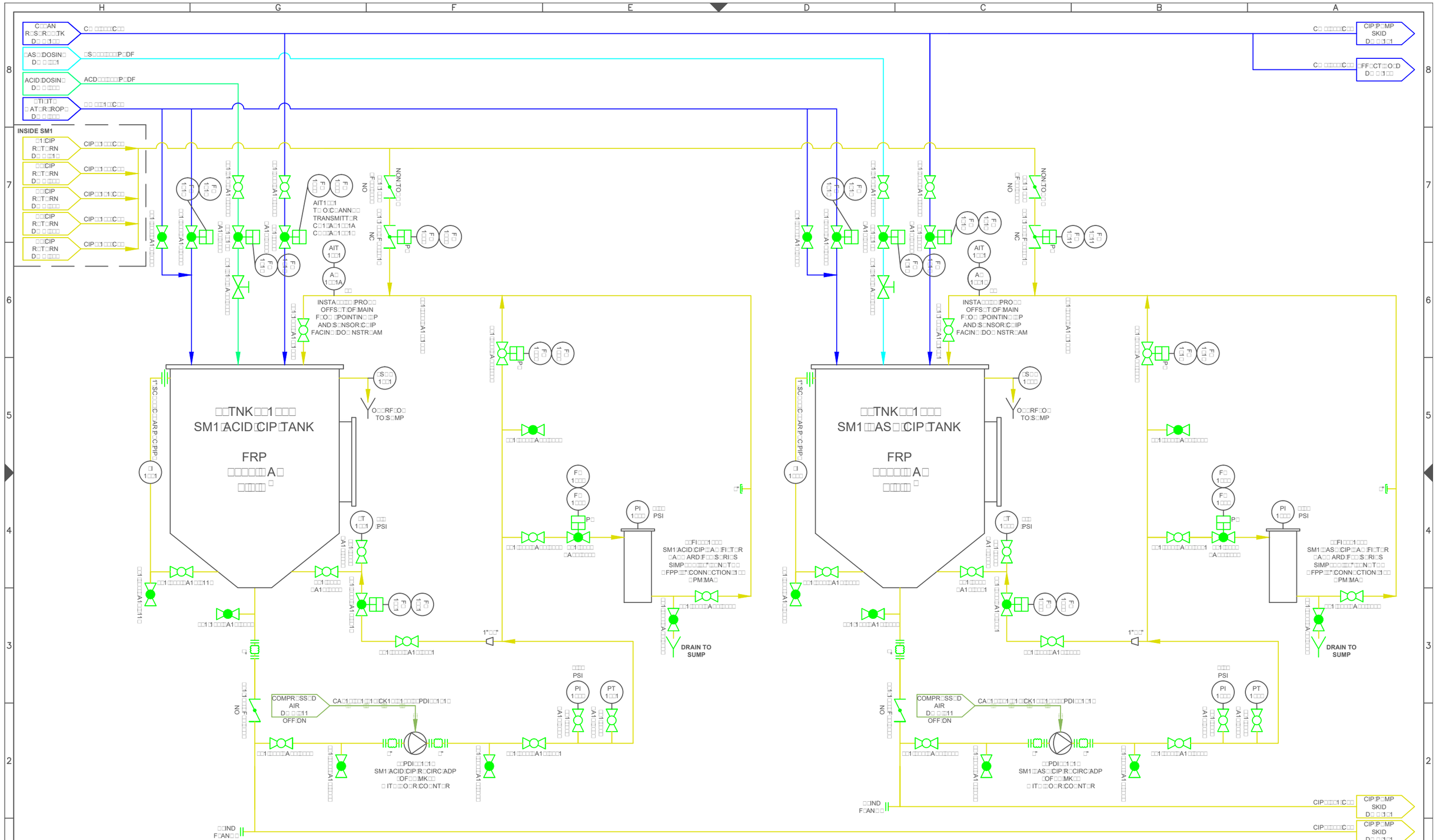
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DO NOT SCALE DRAWING

TITLE: (SM1) 130: FEED DISTRIBUTION

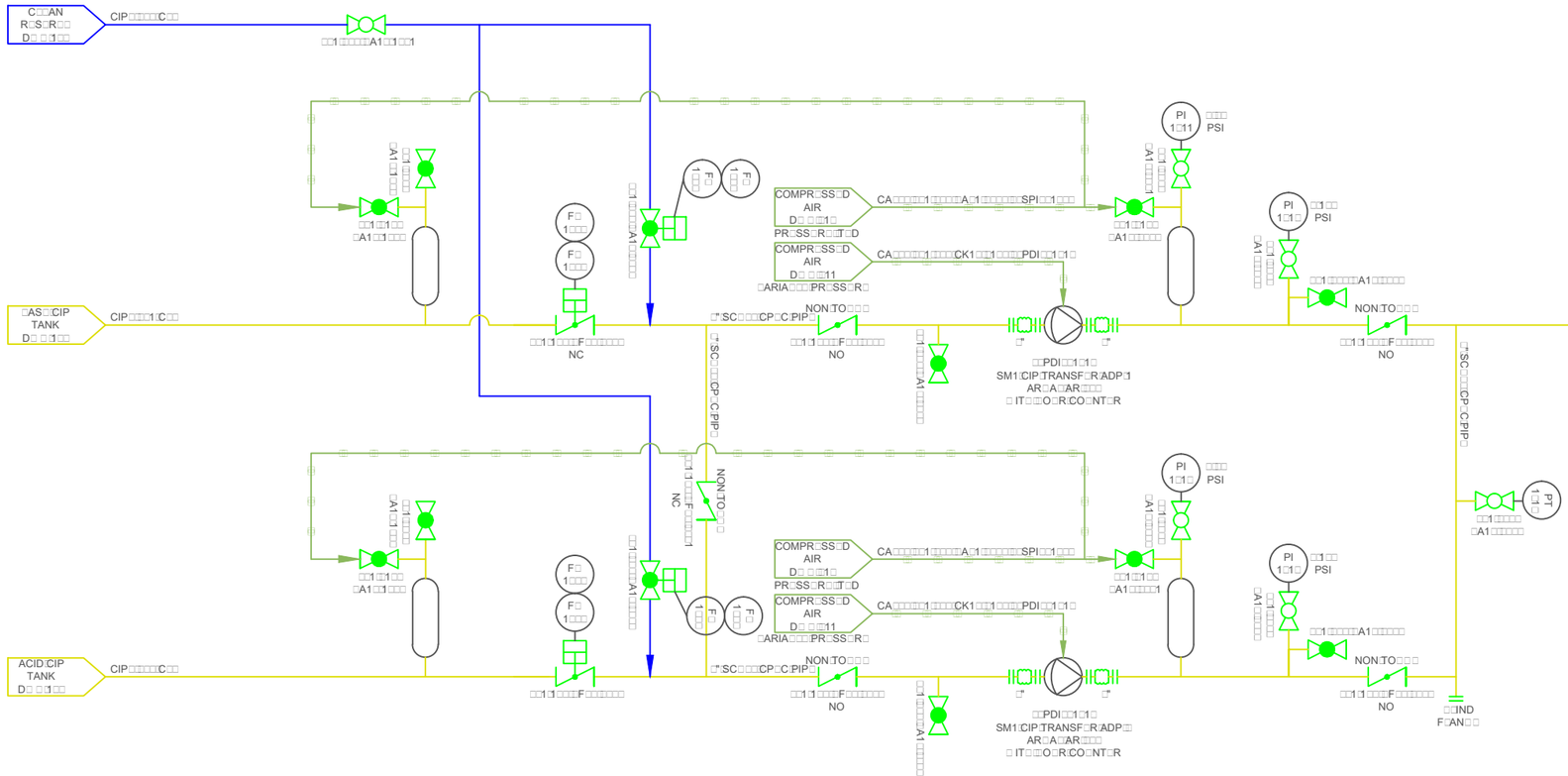
PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q		
PREPARED BY:	JLAU	DATE:	01–SEP–2017
DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_130		
CHECKED BY:	MLOW	DATE:	05–SEP–2017
JOB/CO NO:	(JOB NO.)		
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
SHEET:	16 OF117		



Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS:	LTR	DATE	DESCRIPTION	REV. BY:
AS BUILT	N	06–JUL–2018	PINCH VALVES ADDED	JLAU
	O	04–SEP–2018	NO CHANGES	–
	P	16–NOV–2018	NO CHANGES	–
DO NOT SCALE DRAWING	Q	12–FEB–2019	AS BUILT UPDATE	DKAO

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_150	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 17 OF117	



1	Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □□IC□□IT□ AS□ORI□INA□□□S□PP□T□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:
			N	06–JUL–2018	NO CHANGES	–
			O	04–SEP–2018	NO CHANGES	–
			P	16–NOV–2018	NO CHANGES	–
			Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 151: CIP PUMP SKID			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_151	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 18 OF117	

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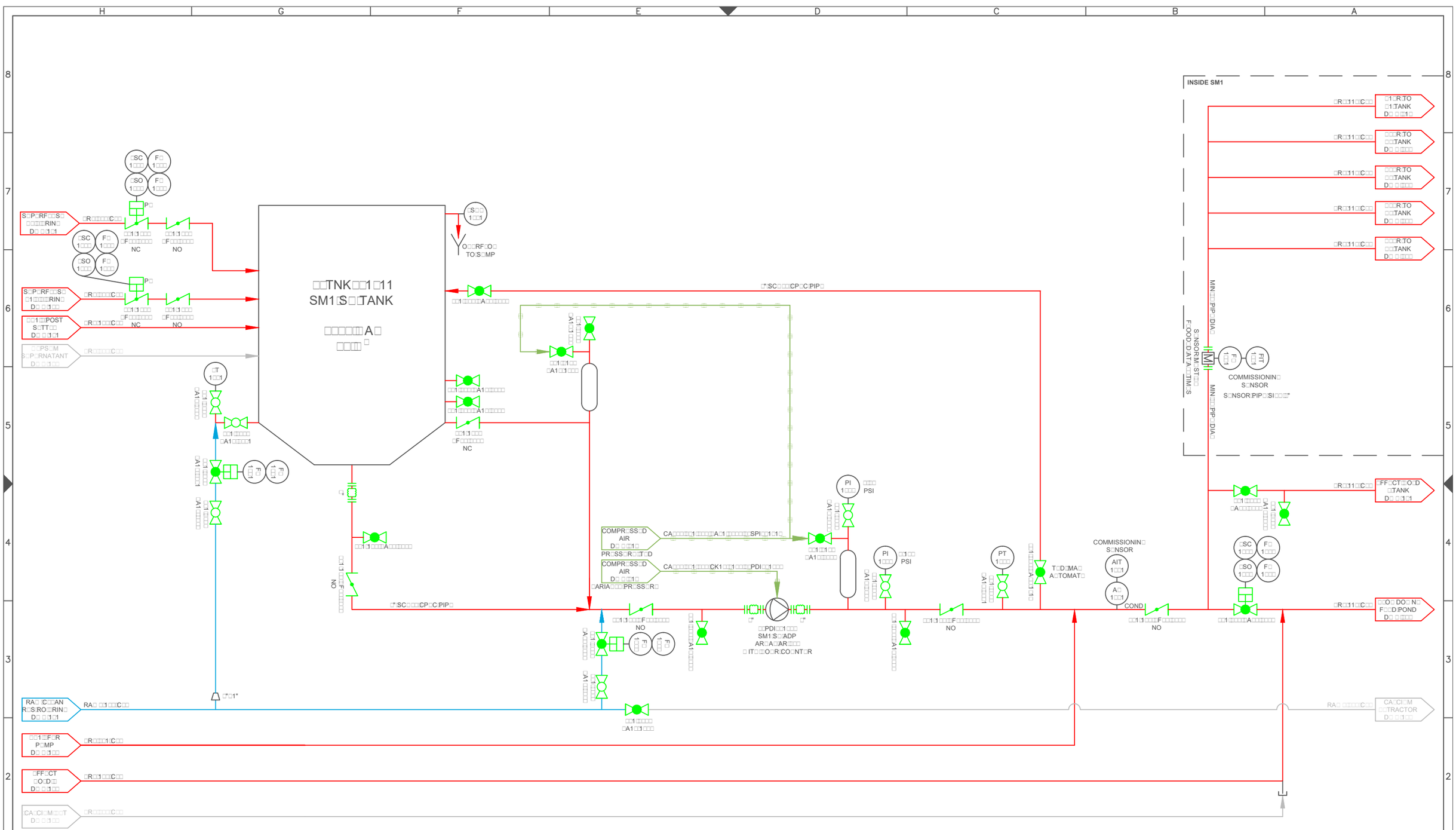
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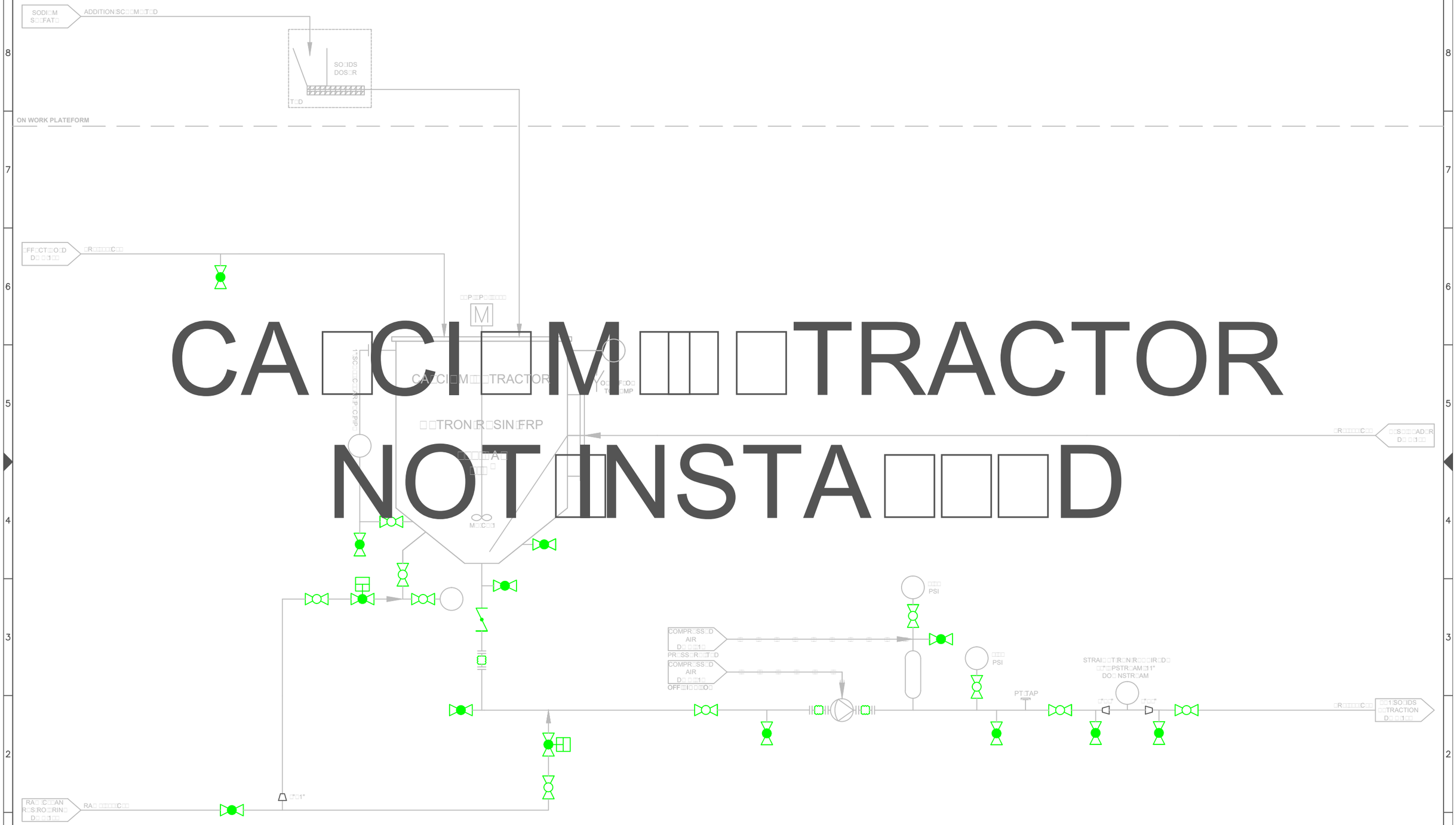
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 163: CALCIUM EXTRACTOR

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_163	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 22 OF117	

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Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING					

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	PINCH VALVES ADDED, AS BUILT UDPATES	JLAU
O	04-SEP-2018	UPDATED HEADER FLOW DIRECTION TO MATCH AS BUILT	JLAU
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 164: EH1 SOLIDS EXTRACTION

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_SM1_DWG_164	
CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 23 OF117	

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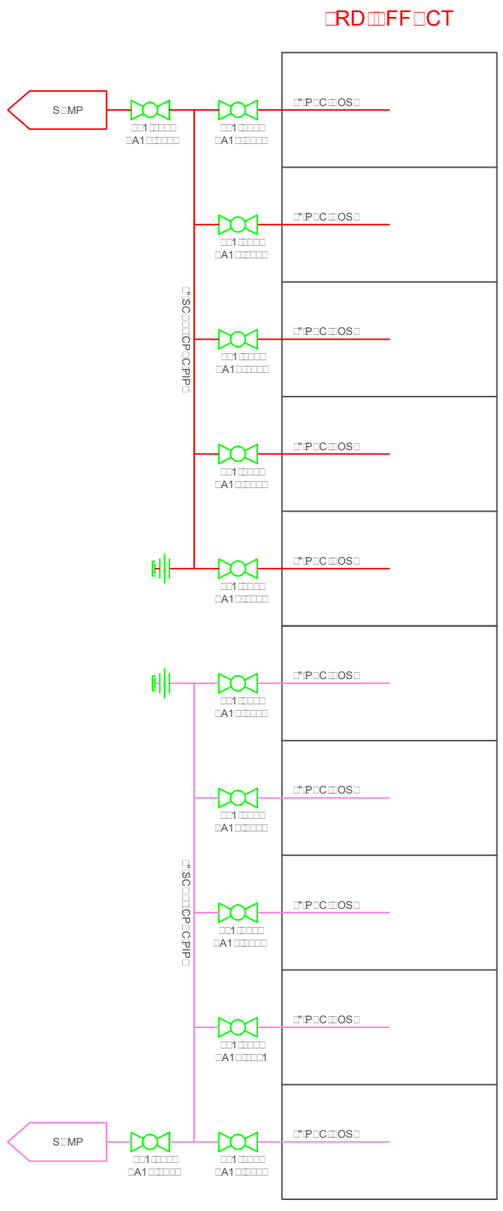
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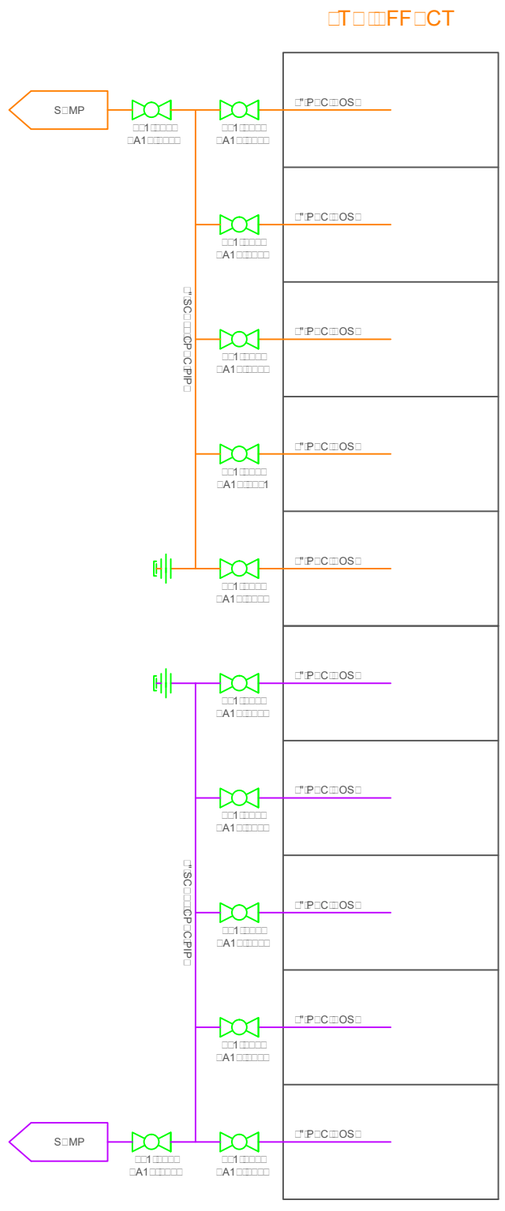
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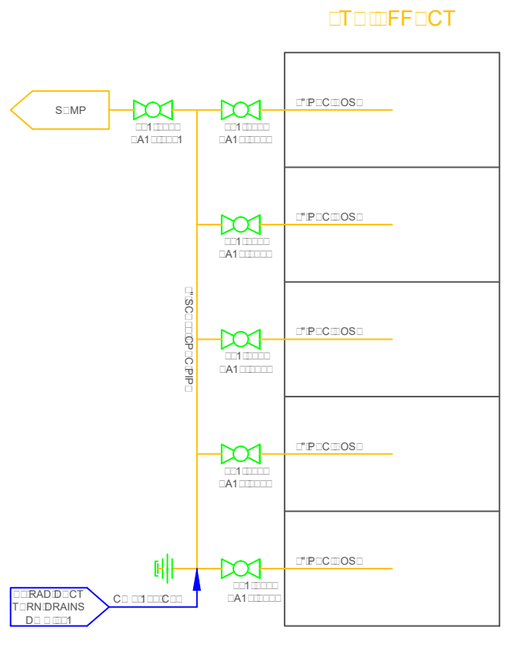
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LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	04-SEP-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 180: DRIP TRAY

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE: 01-SEP-2017	DWG. NO:	SW_EN_SM_AEM-01_PID_SM1_DWG_180	
CHECKED BY:	MLOW	DATE: 05-SEP-2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	25 OF117	

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TITANIUM RADIATOR MANIFOLD

TITANIUM FOAM CONTROL SPRAY MANIFOLD

INNER DUCT

OUTER DUCT

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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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TITLE: (SM1) 211: EFFECT 1 MODULES

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 01–SEP–2017

CHECKED BY: MLOW DATE: 05–SEP–2017

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_211

JOB/CO NO: (JOB NO.)

SHEET: 27 OF 117

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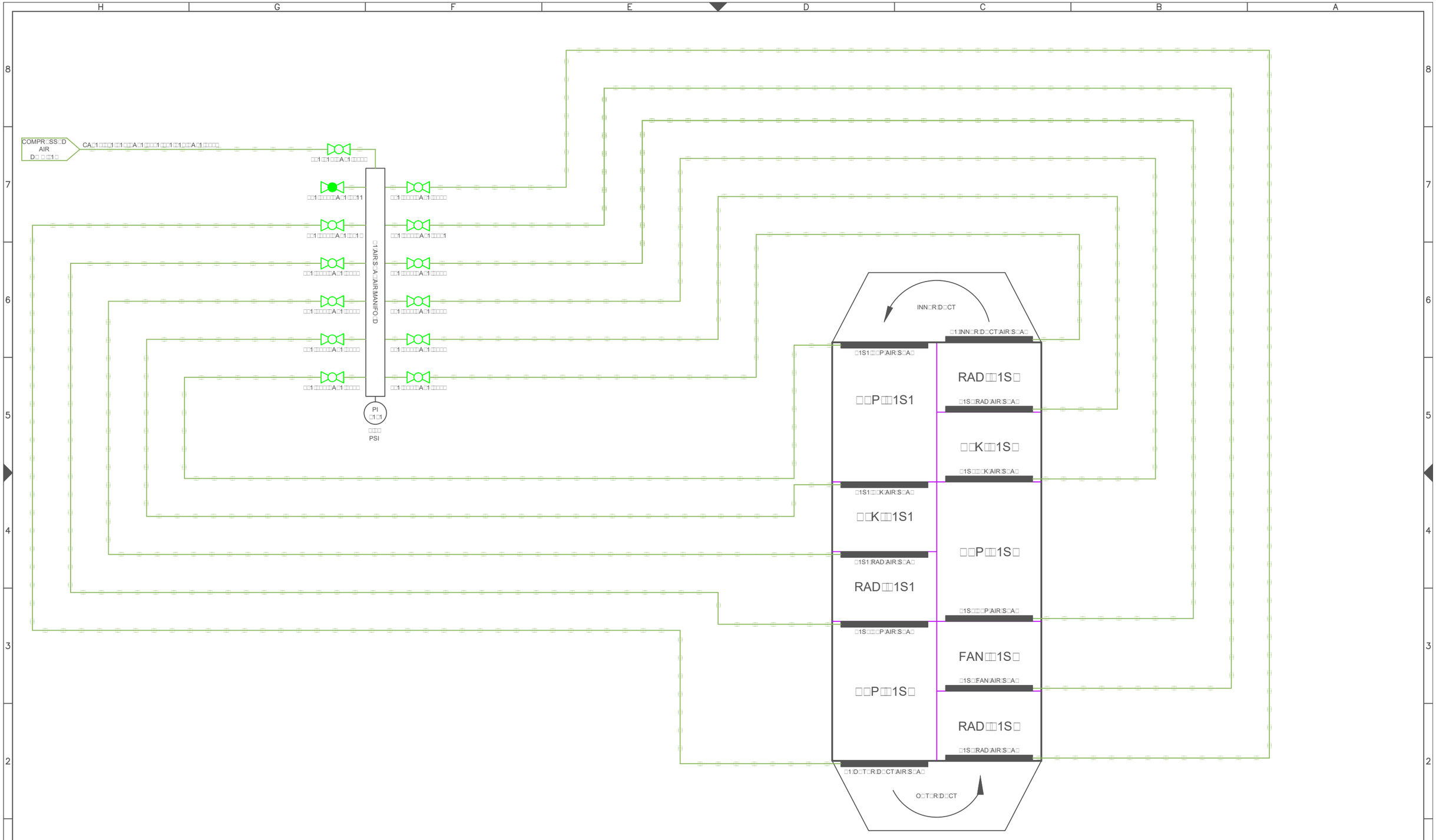
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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 213: EFFECT 1 PUMP SEAL FLUSH

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_213	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 28 OF117	



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		N	02–FEB–2018	UPDATED MANIFOLD	JLAU
		O	04–SEP–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE:	(SM1) 214: EFFECT 1 AIR SEALS		
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_214
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	29 OF117

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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	PINCH VALVES ADDED, P3 BOOSTER TAGS UPDATED	JLAU
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

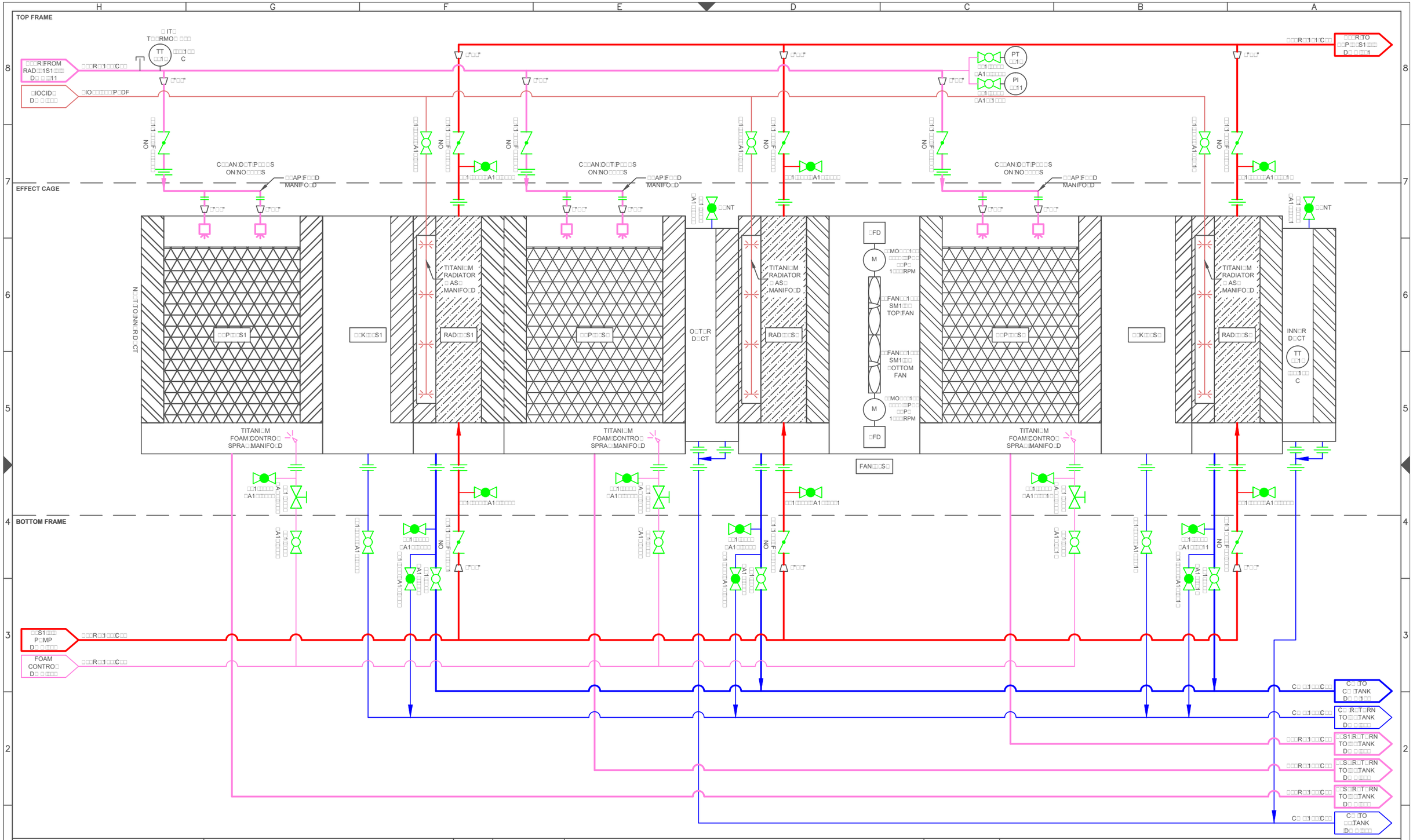
TITLE: (SM1) 220: EFFECT 2 TANK AND PUMPS

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_220	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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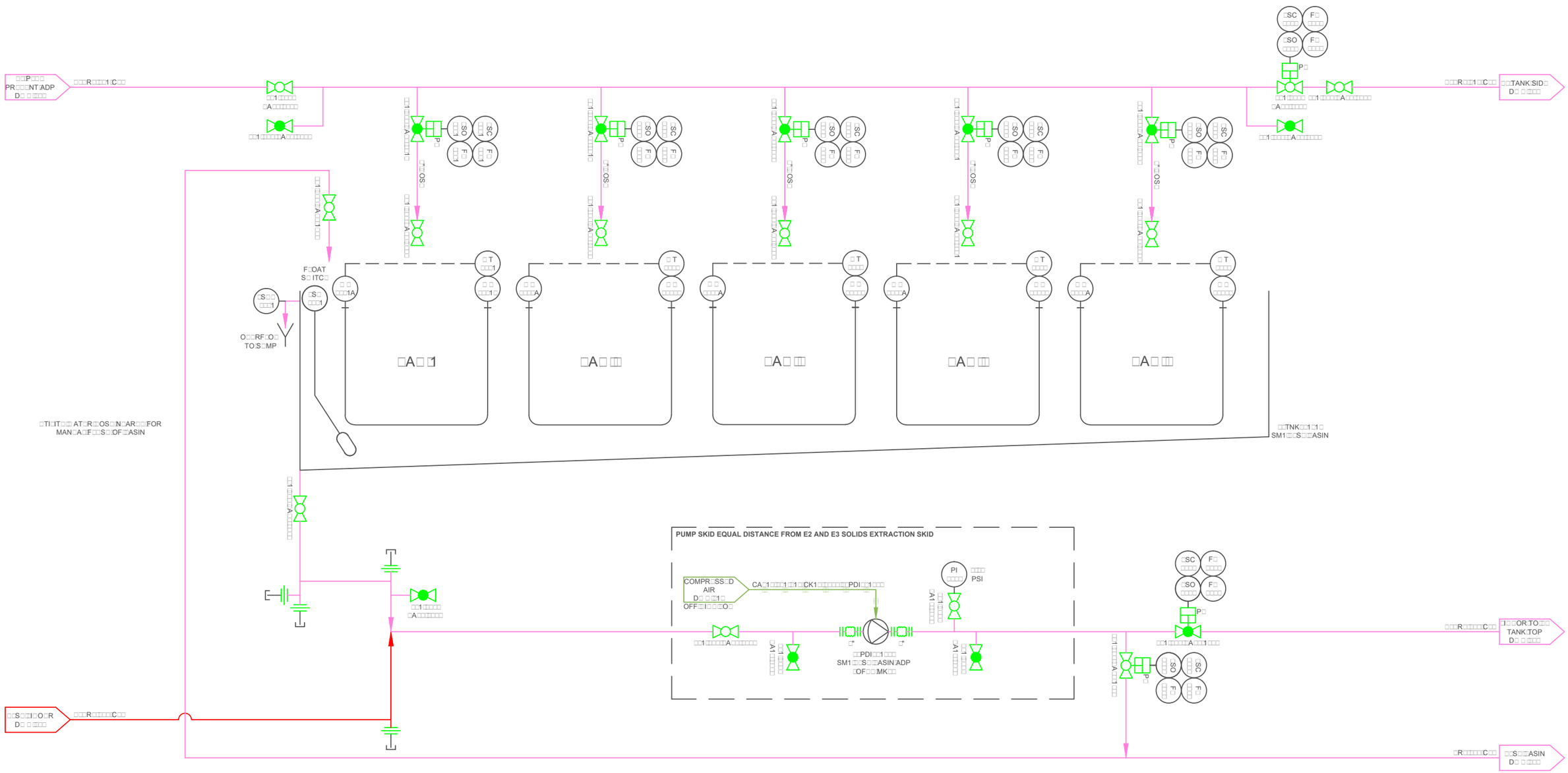
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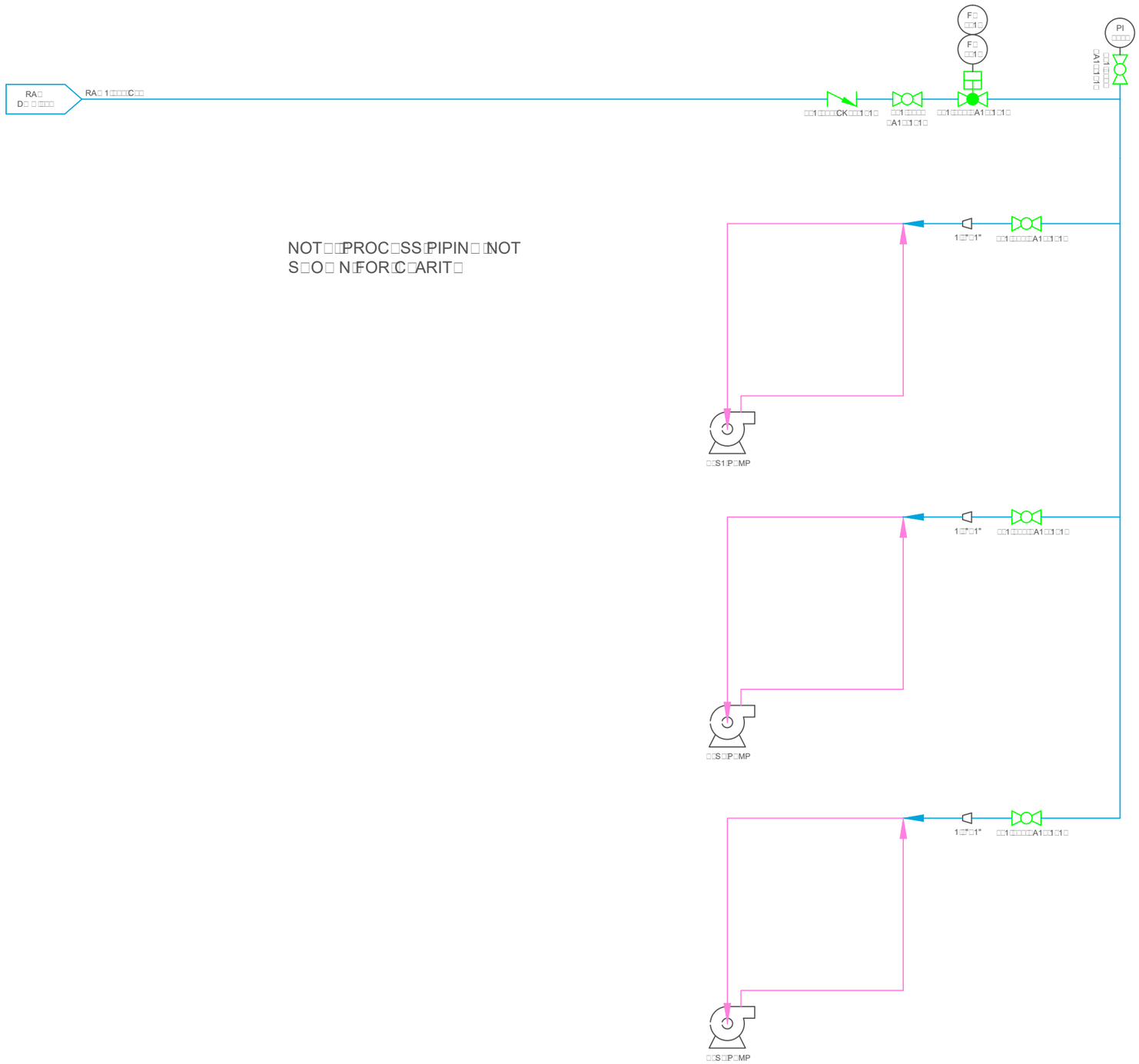


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		N	02–FEB–2018	NO CHANGES	–
		O	04–SEP–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 221: EFFECT 2 MODULES			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_221	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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DRAWING STATUS: AS BUILT

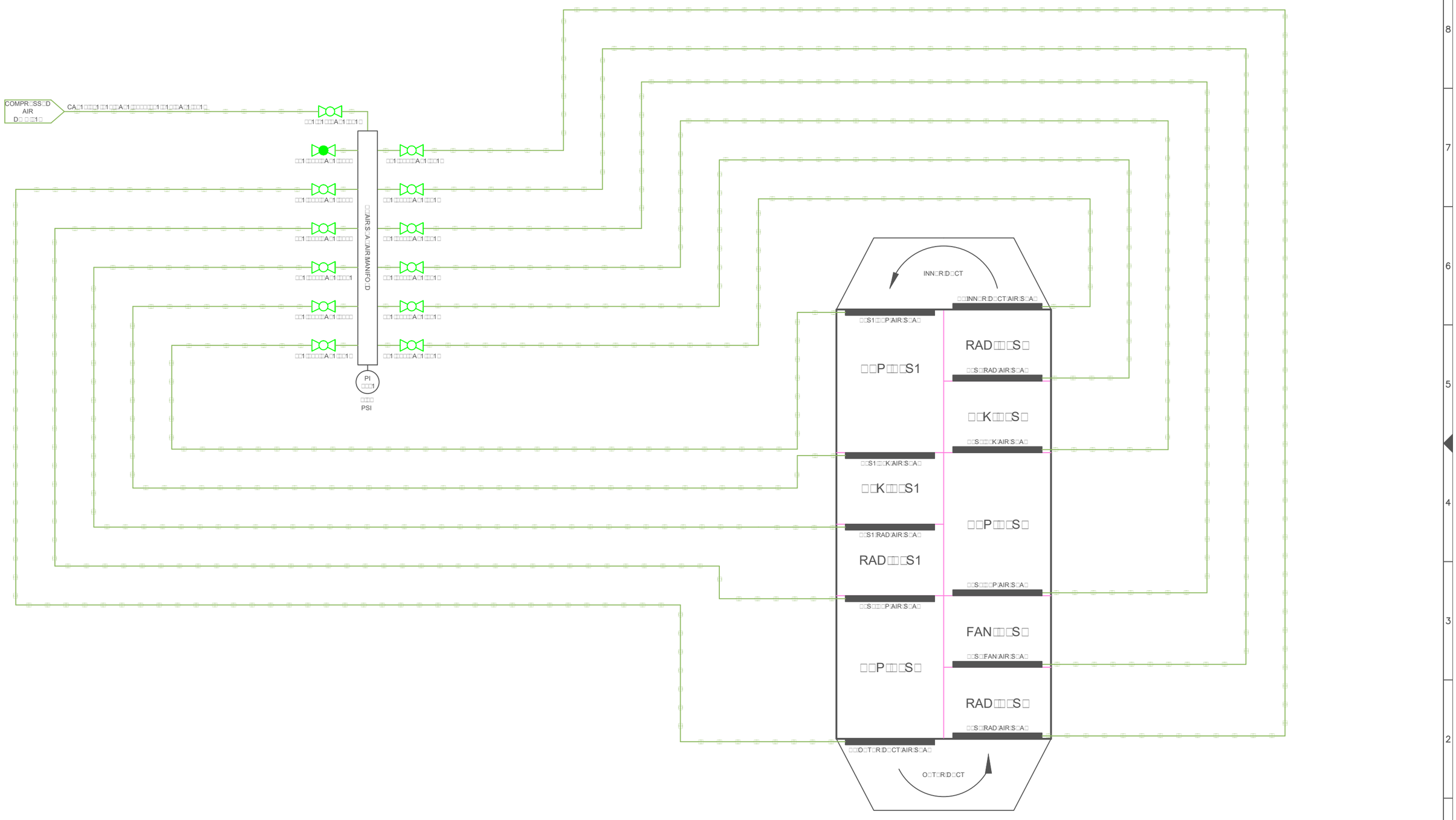
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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 223: EFFECT 2 PUMP SEAL FLUSH

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_223	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 33 OF117	



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DRAWING STATUS: AS BUILT

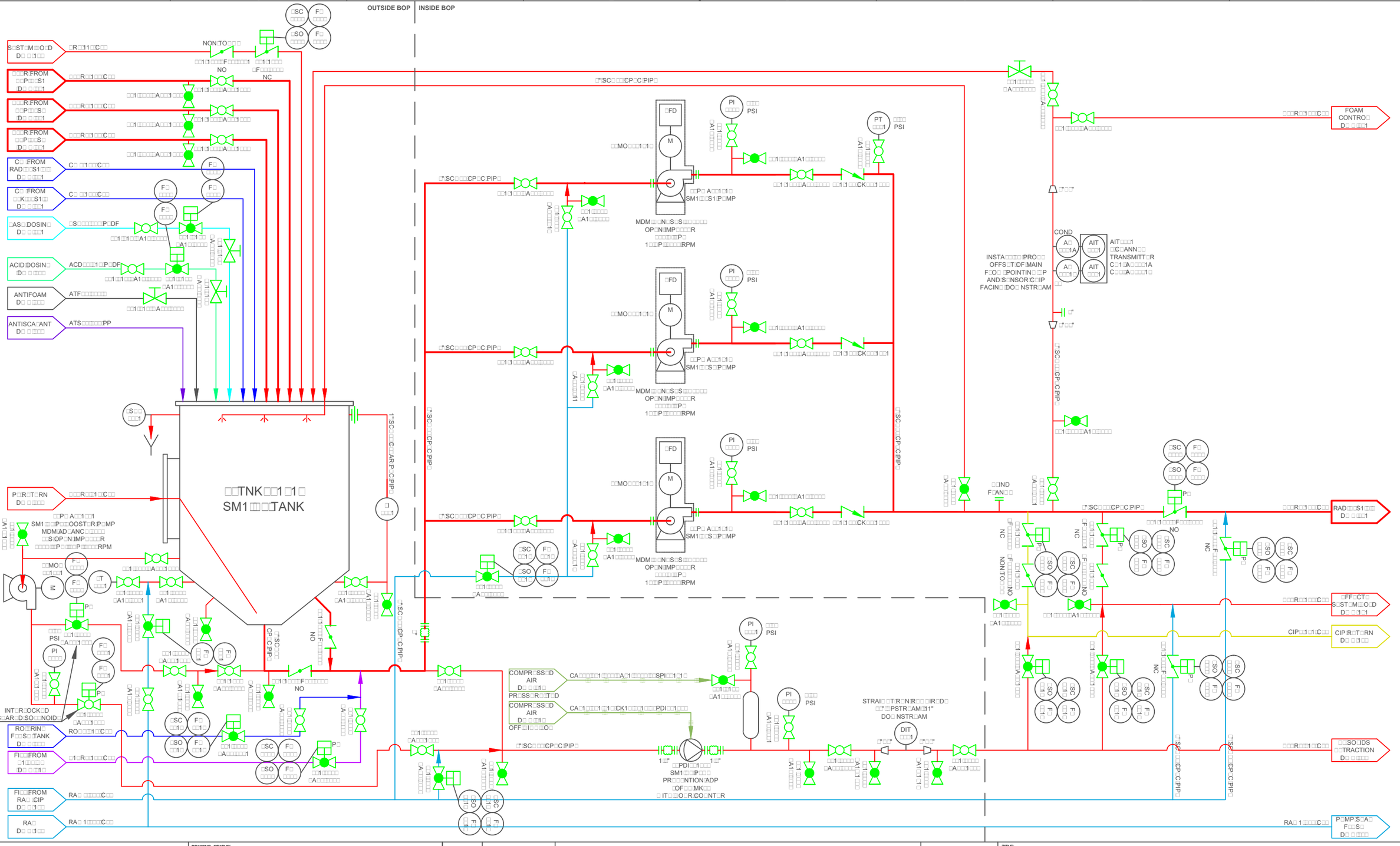
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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	UPDATED MANIFOLD	JLAU
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 224: EFFECT 2 AIR SEALS

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_224
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	34 OF117


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TITANIUM FOAM CONTROL SPRAY MANIFOLD

INNER DUCT

OUTER DUCT

(SM1) 231: EFFECT 3 MODULES

PROJECT:	SALTMAKER GEN III
CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q
PREPARED BY:	JLAU
DATE:	01–SEP–2017
DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_231
CHECKED BY:	MLOW
DATE:	05–SEP–2017
JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY
DATE:	APPROVED DATE
SHEET:	36 OF117

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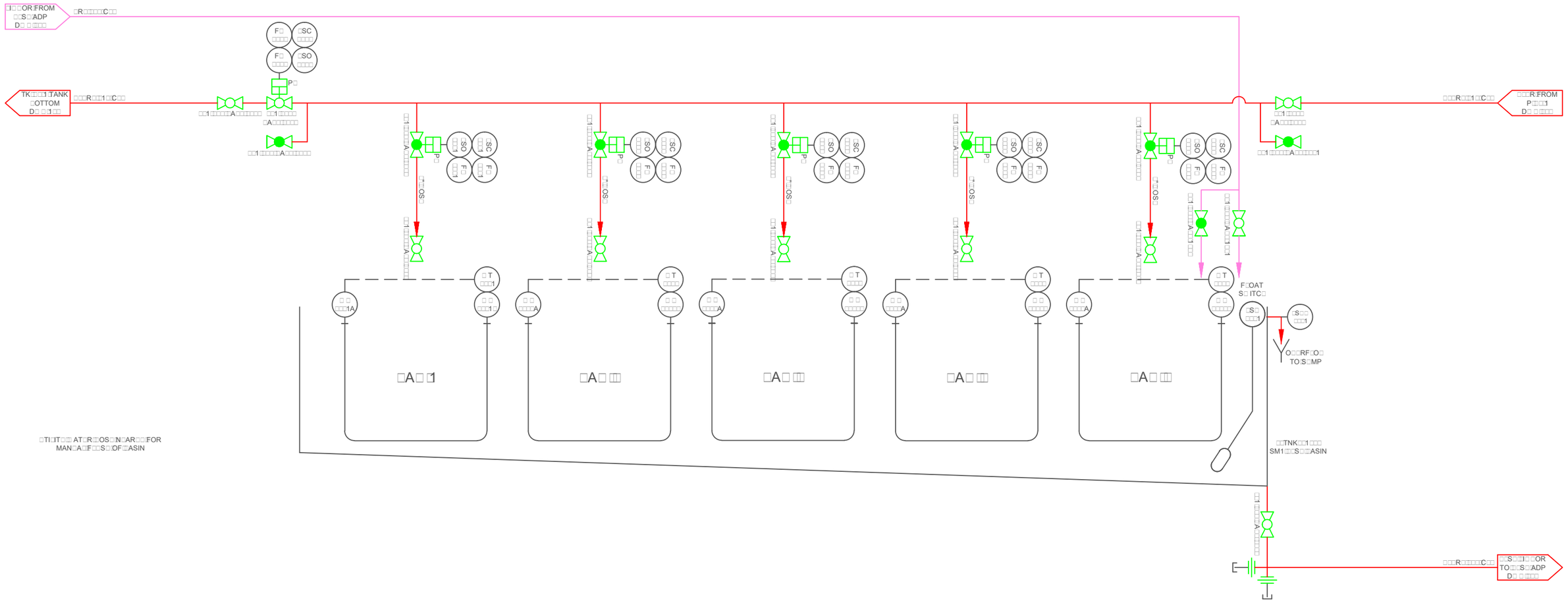
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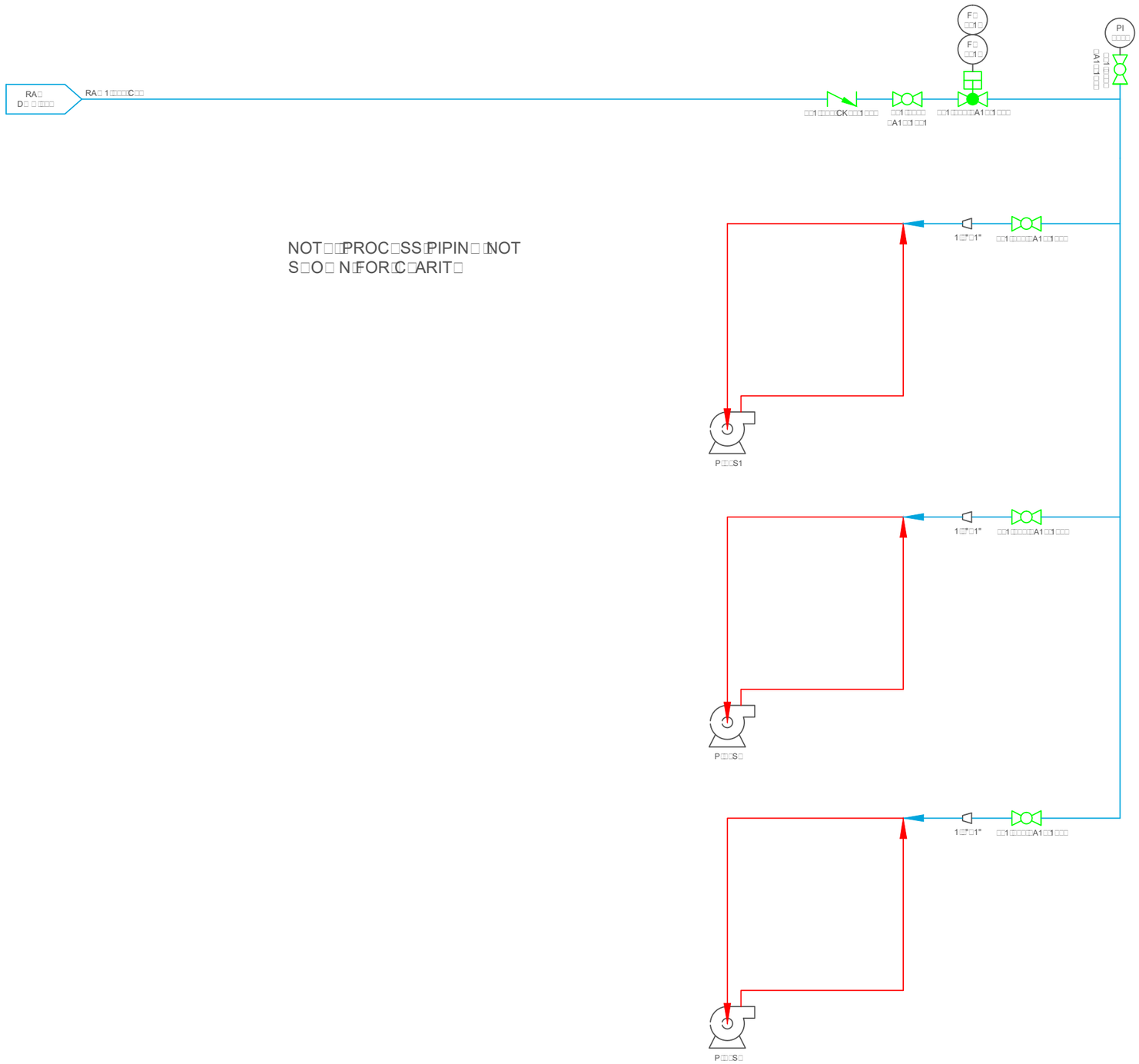
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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

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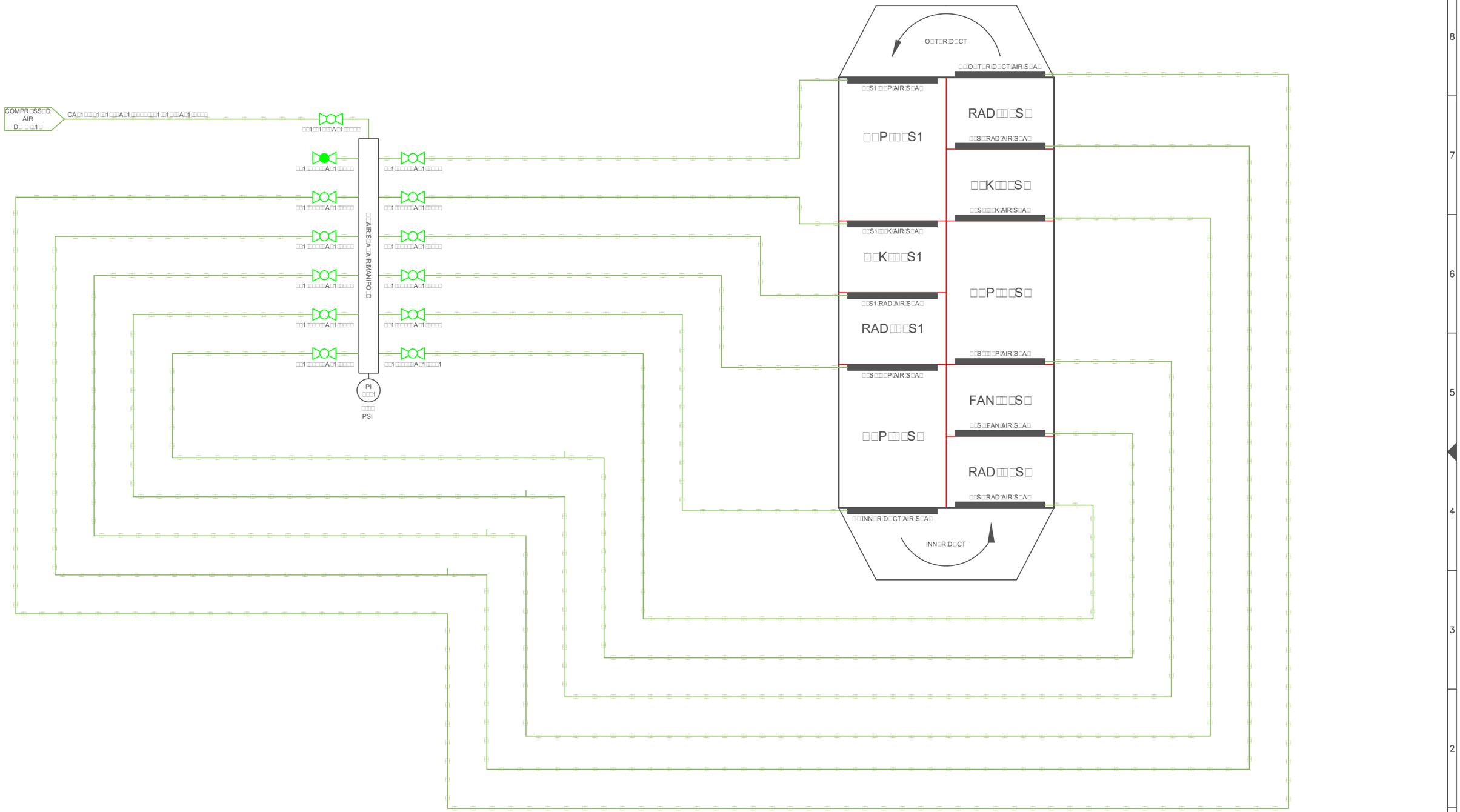
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N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 233: EFFECT 3 PUMP SEAL FLUSH

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_233	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 38 OF117	


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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 241: EFFECT 4 MODULES

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_241	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 41 OF117	

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Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

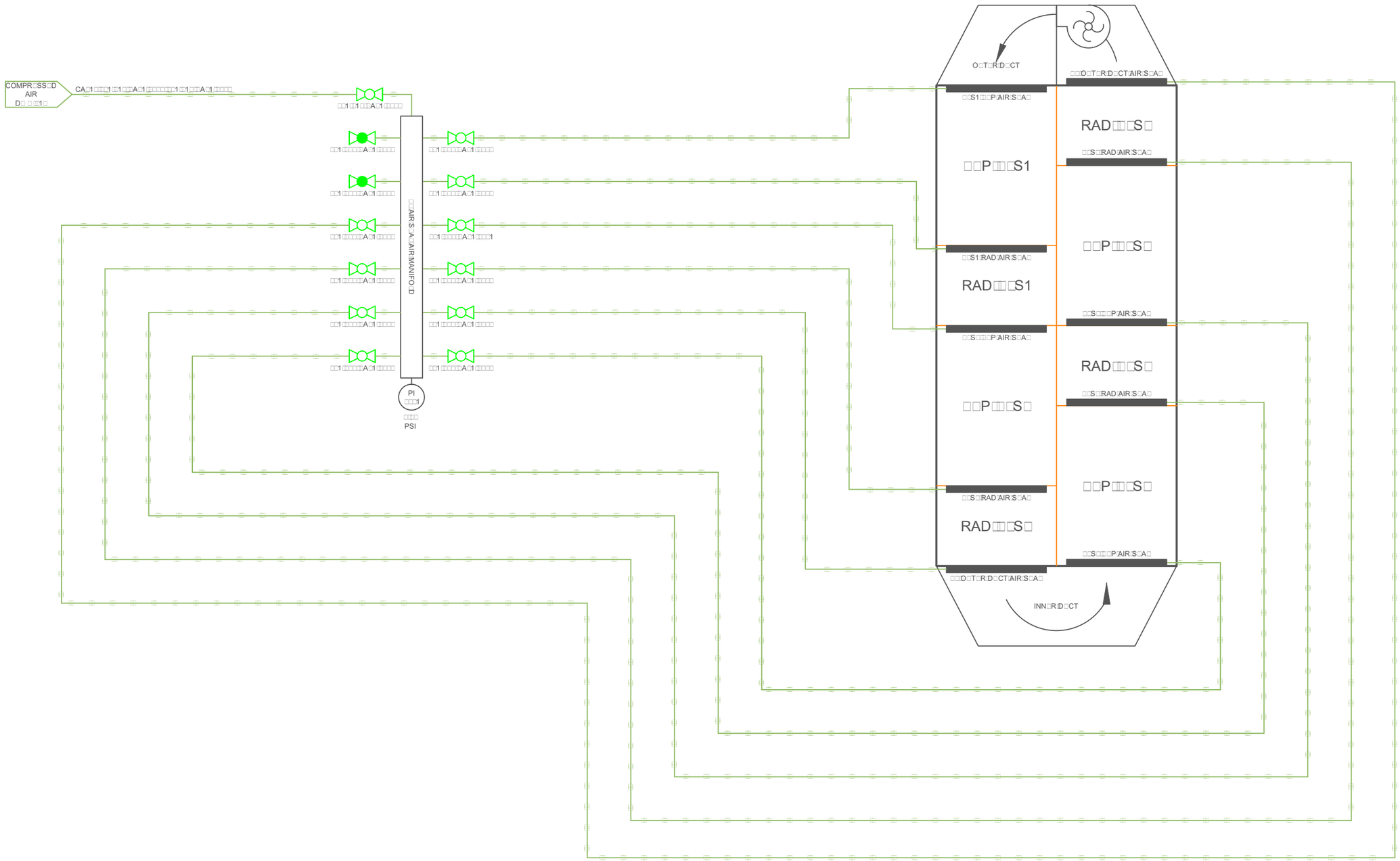
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 243: EFFECT 4 PUMP SEAL FLUSH

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_243	
CHECKED BY:	MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	42 OF117	



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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	UPDATED MANIFOLD	JLAU
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 244: EFFECT 4 AIR SEALS

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q		
PREPARED BY:	JLAU	DATE:	01–SEP–2017
DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_244		
CHECKED BY:	MLOW	DATE:	05–SEP–2017
JOB/CO NO:	(JOB NO.)		
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
SHEET:	43 OF117		

OUTSIDE BOP

INSIDE BOP

□□TNK□□1□1□
SM1□□□TANK

(SM1) 250: EFFECT 5 TANK AND PUMPS

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O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

PROJECT: SALTMAKER GEN III
CUSTOMER: AGNICO EAGLE MINES
REVISION: Q
PREPARED BY: JLAU DATE: 01–SEP–2017
CHECKED BY: MLOW DATE: 05–SEP–2017
APPROVED BY: APPROVED BY DATE: APPROVED DATE
DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_250
JOB/CO NO: (JOB NO.)
SHEET: 44 OF117

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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 251: EFFECT 5 MODULES

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 01–SEP–2017

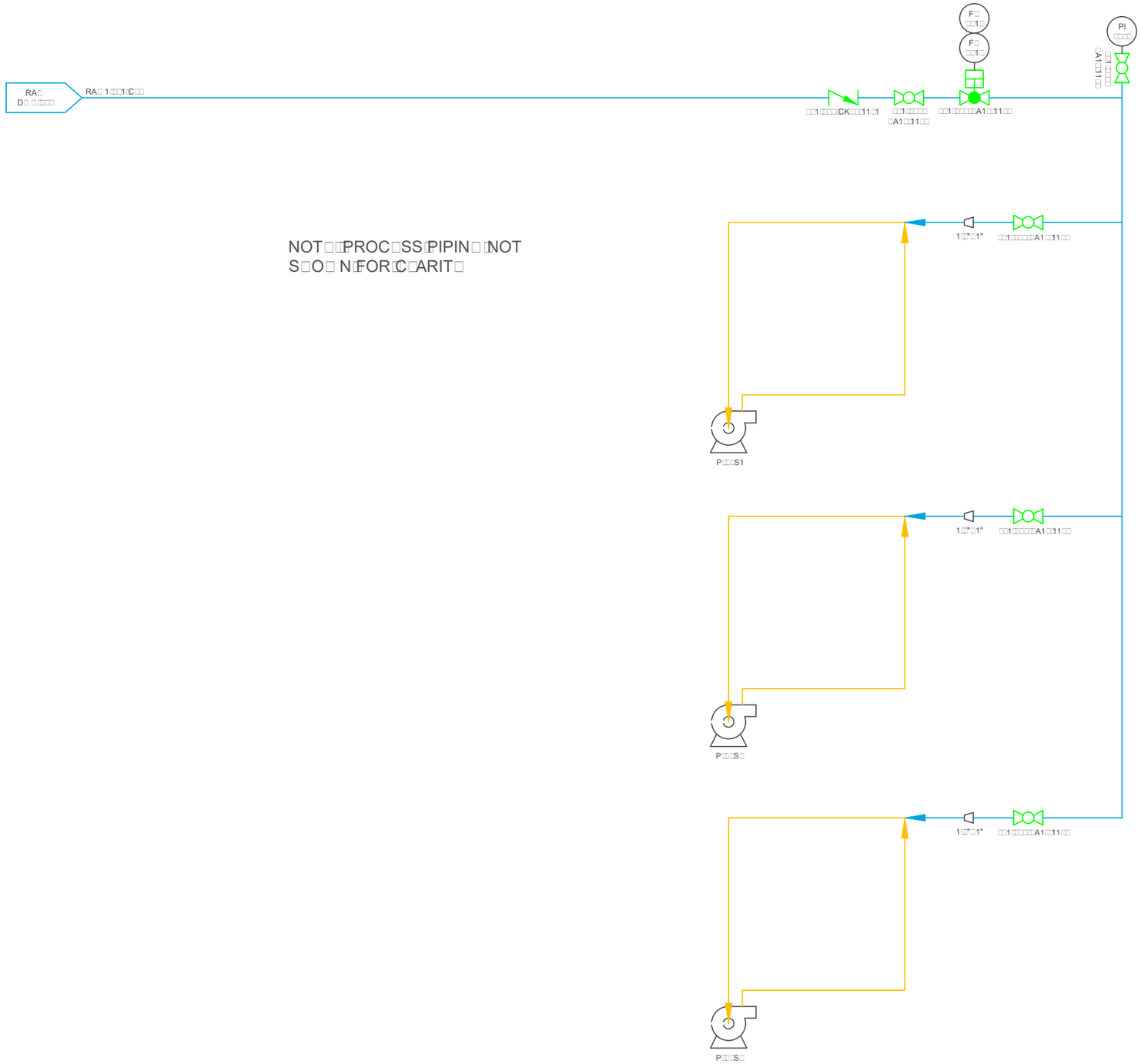
CHECKED BY: MLOW DATE: 05–SEP–2017

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_251

JOB/CO NO: (JOB NO.)

SHEET: 45 OF117



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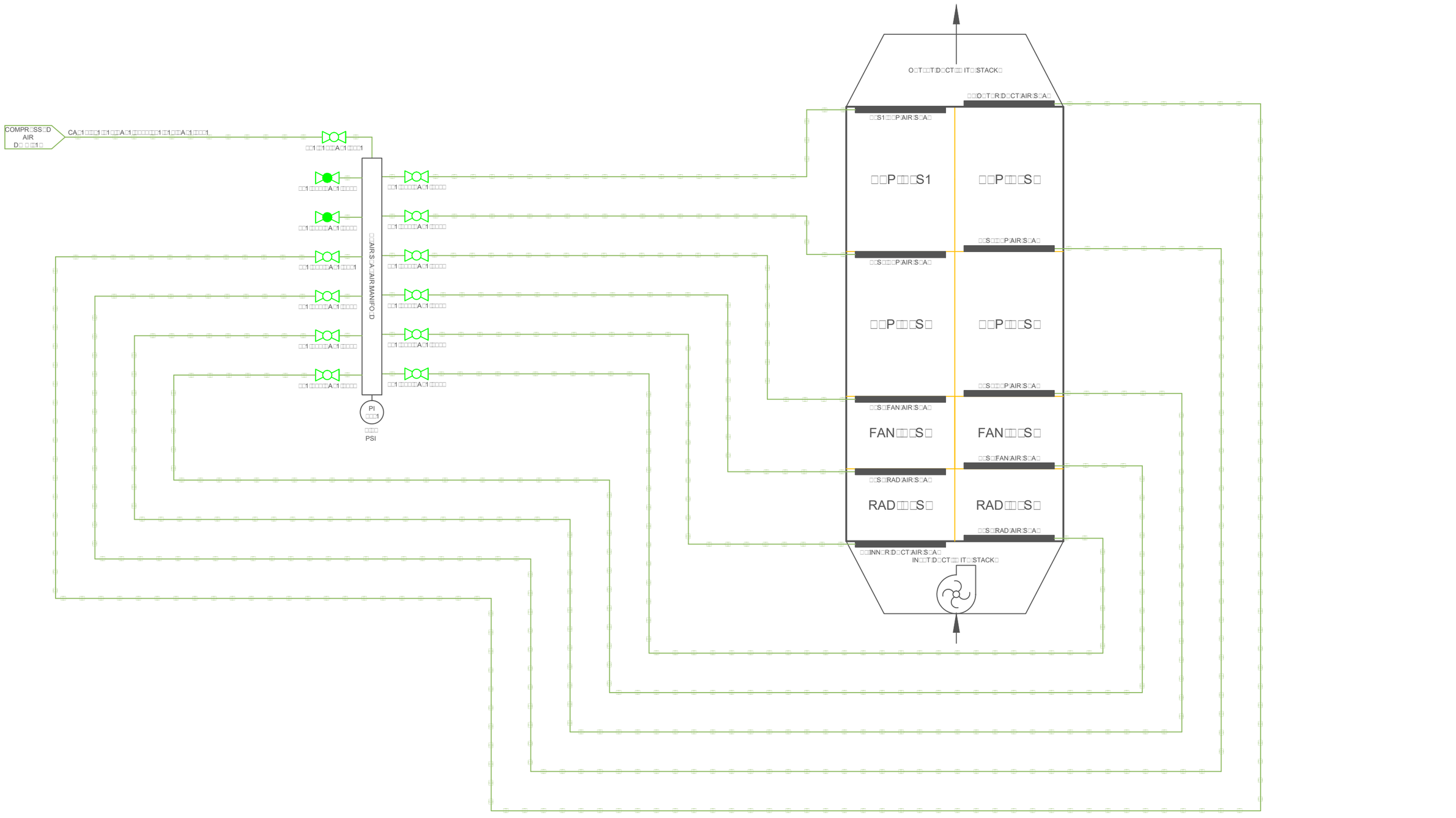
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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 253: EFFECT 5 PUMP SEAL FLUSH

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM1_DWG_253	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 46 OF117	



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LTR	DATE	DESCRIPTION	REV. BY:
N	02–FEB–2018	UPDATED MANIFOLD	JLAU
O	04–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 254: EFFECT 5 AIR SEALS

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q		
PREPARED BY:	JLAU	DATE:	01–SEP–2017
DWG. NO:	SW_EN_SM_AEM–01_PID_SM1_DWG_254		
CHECKED BY:	MLOW	DATE:	05–SEP–2017
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	Q	12–FEB–2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO
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TITLE: COVER SHEET

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 1–SEP–2017	DWG. NO: COVER SHEET	
CHECKED BY: MLOW	DATE: 5–SEP–2017	JOB/CO NO: (JOB NO.)	
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1□	S□ □□N□SM□A□M□□1□PID□SM1□D□ □ □11□	T□□RMA□SO□RC□□PRIMAR□□□□AT□□□C□AN□□RS
1□	S□ □□N□SM□A□M□□1□PID□SM1□D□ □ □1□□	COND□NS□D□□ AT□R□S□ST□M
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SHEET NO.	DRAWING NO.	DESCRIPTION
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□□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□1	AMMONIA□D□STR□CTION□S□ST□M
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		COMPR□SS□D□AIR□SM1
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Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□□T□□□□NTIT□□FOR □□IC□□IT□□ AS□ORI□INA□□□□S□PP□□D□□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:
		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO
		N	06–JUL–2018	NO CHANGES	–
		O	04–SEP–2018	NO CHANGES	–

TITLE: DRAWING LIST 1			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: DRAWING LIST 1	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
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□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	P□□□□PR□□□NTION□P□MP□AIR
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Richmond, BC, Canada, V6W 1A8
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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: DRAWING LIST 2	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT / pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL, FAL

LINE NUMBERING

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SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
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VALVE SIZE CONVERSION

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VALVE TYPE CONVERSION

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13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	PINCH VALVE LEGEND ADDED	JLAU
O	04–SEP–2018	NO CHANGES	–

TITLE: LEGEND

PROJECT: SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017		DWG. NO: LEGEND	
CHECKED BY: MLOW	DATE: 05–SEP–2017		JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE		SHEET: # OF #	

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	Q	12–FEB–2019	ADDED HEX BACKFLUSH SYSTEM; AS BUILT UPDATE	DKAO	
DO NOT SCALE DRAWING	N	06–JUL–2018	NO CHANGES	–	
	O	04–SEP–2018	NO CHANGES	–	

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13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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TITLE: (SM2) 510: THERMAL SOURCE PRIMARY HEAT EXCHANGER

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: PH	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_510	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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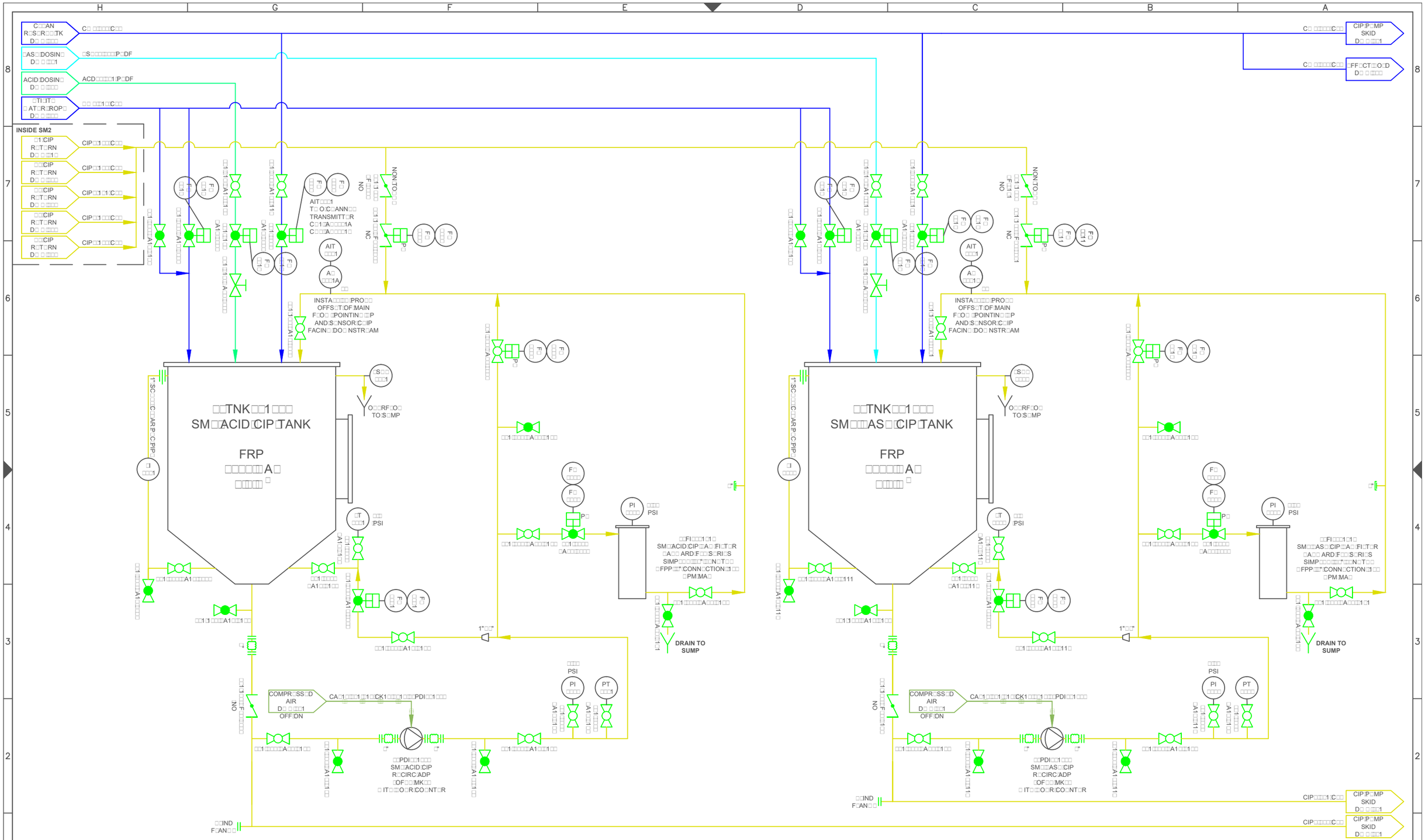
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

LTR	DATE	DESCRIPTION	REV. BY:
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO
N	06-JUL-2018	PINCH VALVES ADDED	JLAU
O	04-SEP-2018	NO CHANGES	–

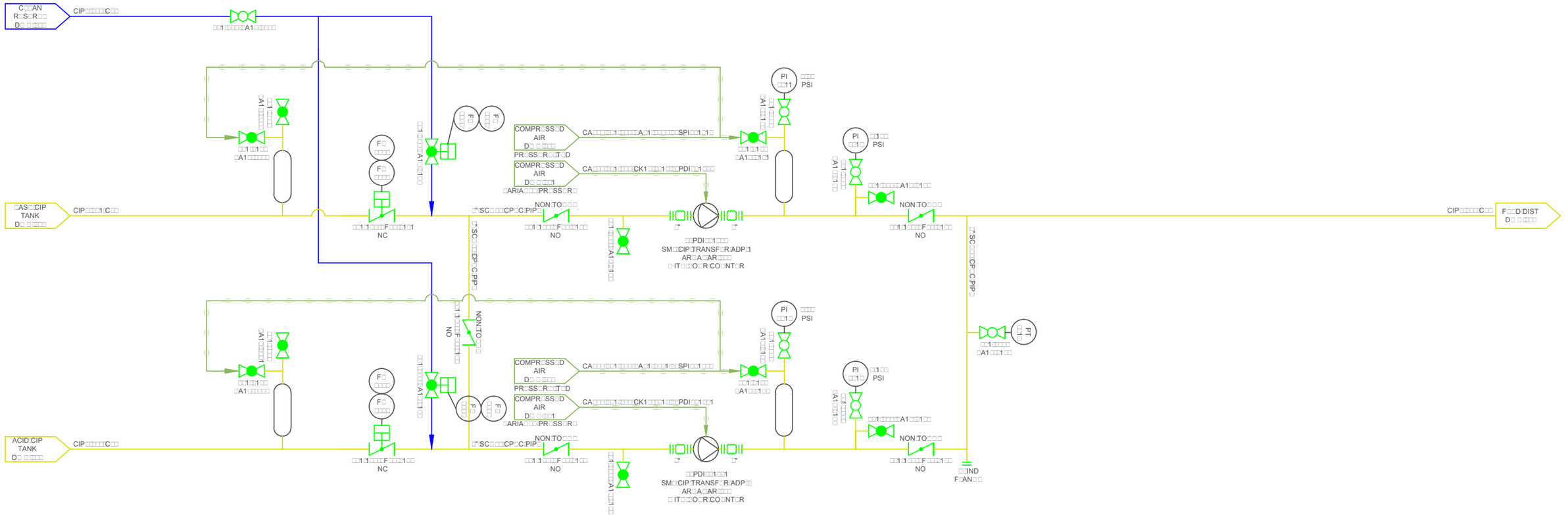
DRAWING STATUS: AS BUILT

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TITLE: (SM2) 550: CIP TANKS

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_SM2_DWG_550	
CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 87 OF117	



Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□TO SA□T□ ORKS□IT□IS□TO□□□S□D□ON□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□FOR □□IC□IT□ AS□ORI□INA□□□S□PP□T□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:	TITLE: (SM2) 551: CIP PUMP SKID PROJECT: SALTMAKER GEN III CUSTOMER: AGNICO EAGLE MINES REVISION: Q PREPARED BY: JLAU DATE: 01–SEP–2017 CHECKED BY: MLOW DATE: 05–SEP–2017 APPROVED BY: APPROVED BY DATE: APPROVED DATE DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_551 JOB/CO NO: (JOB NO.) SHEET: 88 OF117
		P	16–NOV–2018	NO CHANGES	–	
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO	
		N	06–JUL–2018	NO CHANGES	–	
		O	04–SEP–2018	NO CHANGES	–	

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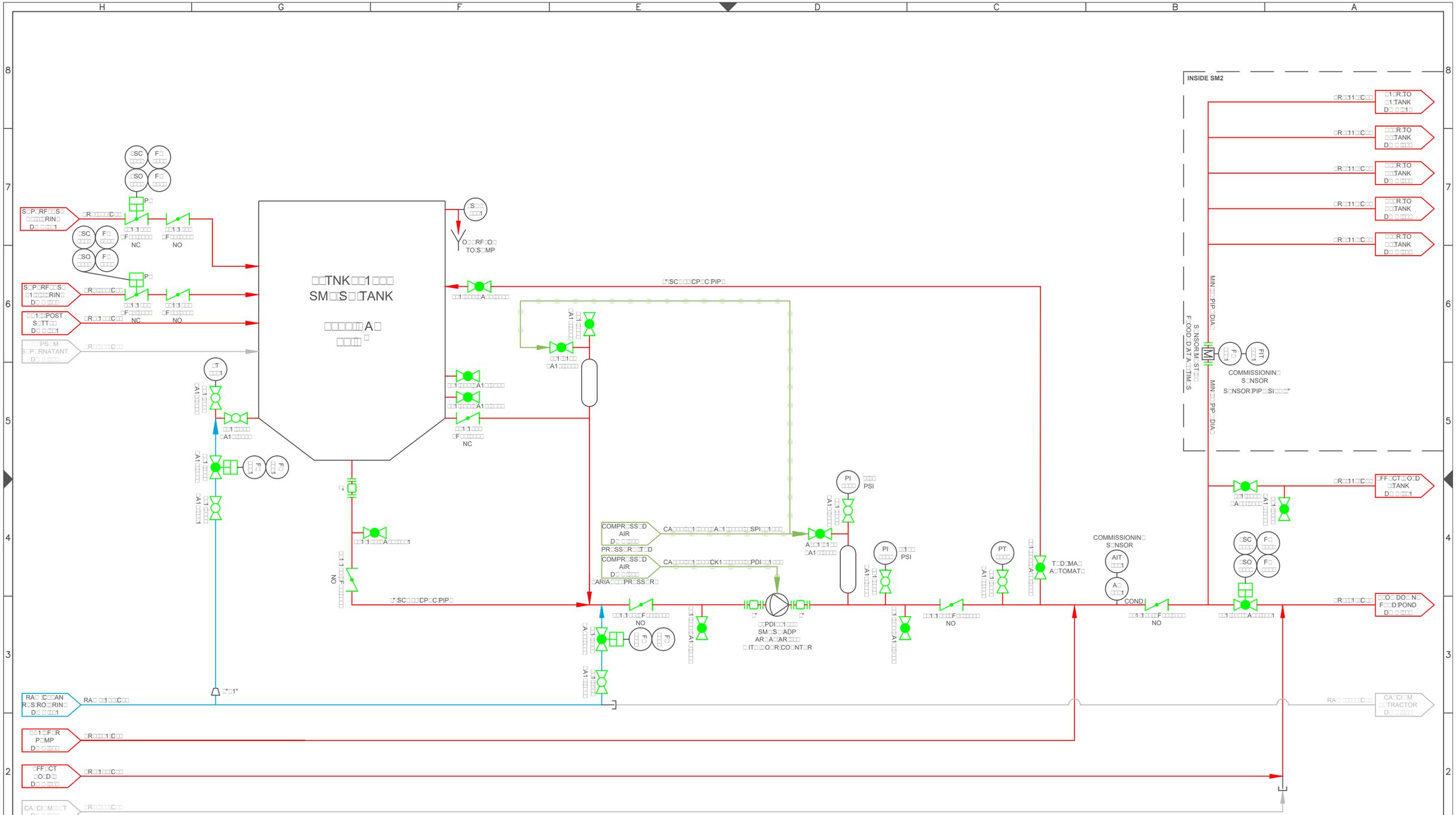
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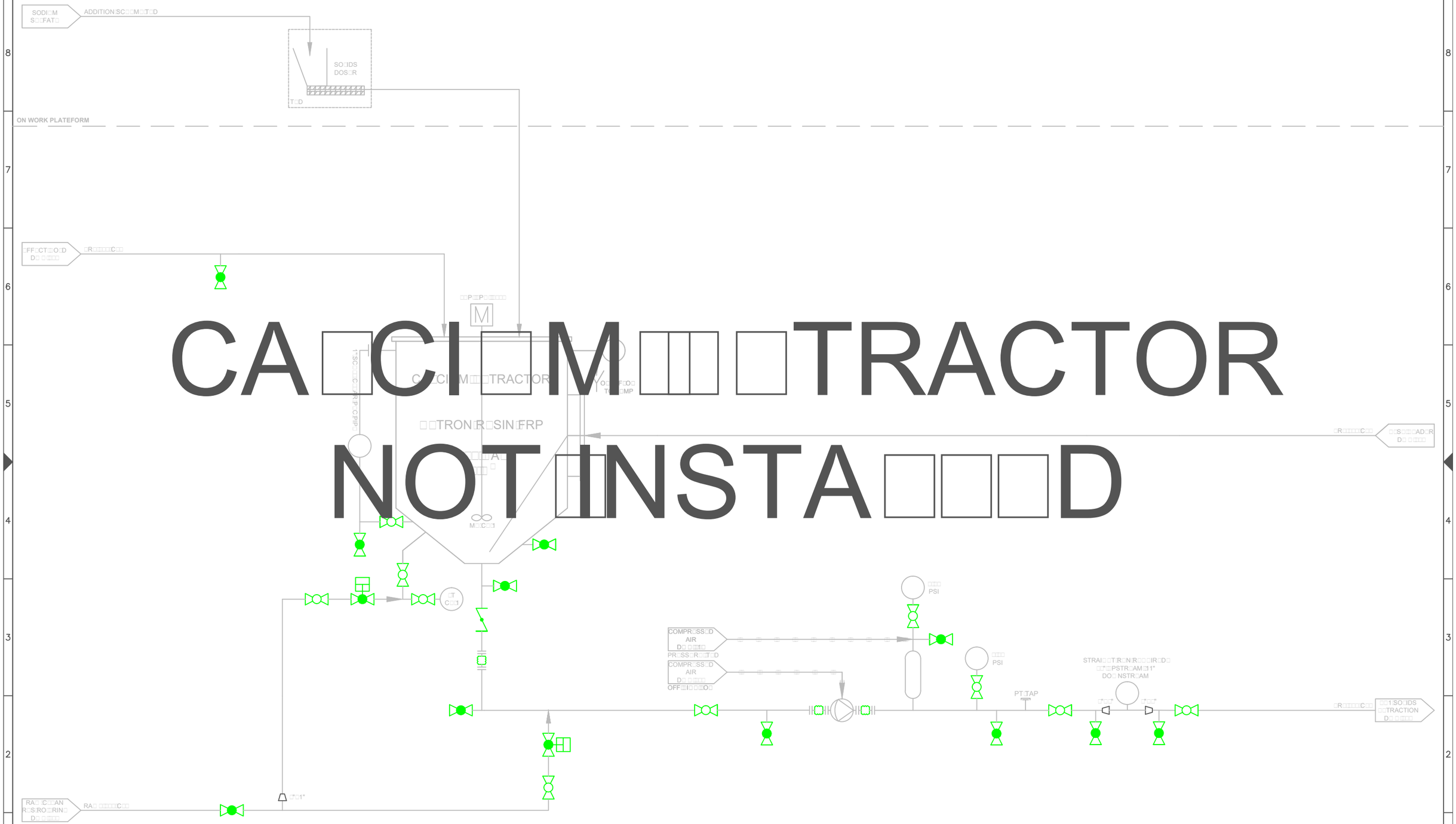
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	Q	12–FEB–2019	AS BUILT UPDATE	DKAO	
DO NOT SCALE DRAWING	N	06–JUL–2018	PINCH VALVES ADDED	JLAU	
	O	04–SEP–2018	NO CHANGES	–	

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TITLE: (SM2) 561: EFFECT HOLD 2

PROJECT: SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES		REVISION Q
PREPARED BY: JLAU	DATE: 01–SEP–2017		DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_562		
CHECKED BY: MLOW	DATE: 05–SEP–2017		JOB/CO NO: (JOB NO.)		
APPROVED BY: APPROVED BY	DATE: APPROVED DATE		SHEET: 90 OF117		


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P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 563: CALCIUM EXTRACTOR

PROJECT:	SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG163
CHECKED BY:	MLOW	DATE:	05–SEP–2017	JOB/CO NO:	(JOB NO.)
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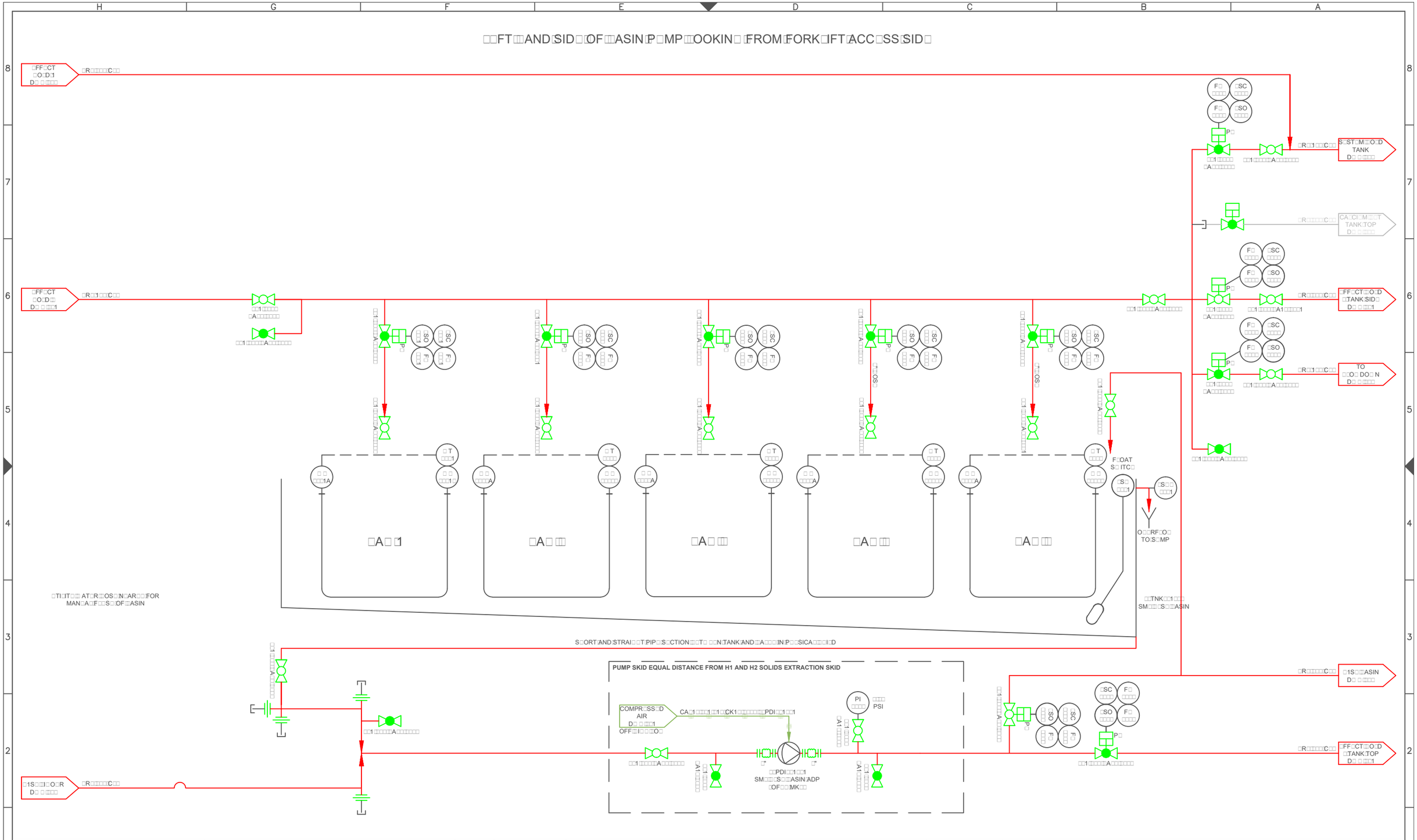
Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□□AND□□□T□□□□NTIT□□FOR □ □IC□□IT□ AS□ORI□INA□□□□S□PP□I□D□□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING					

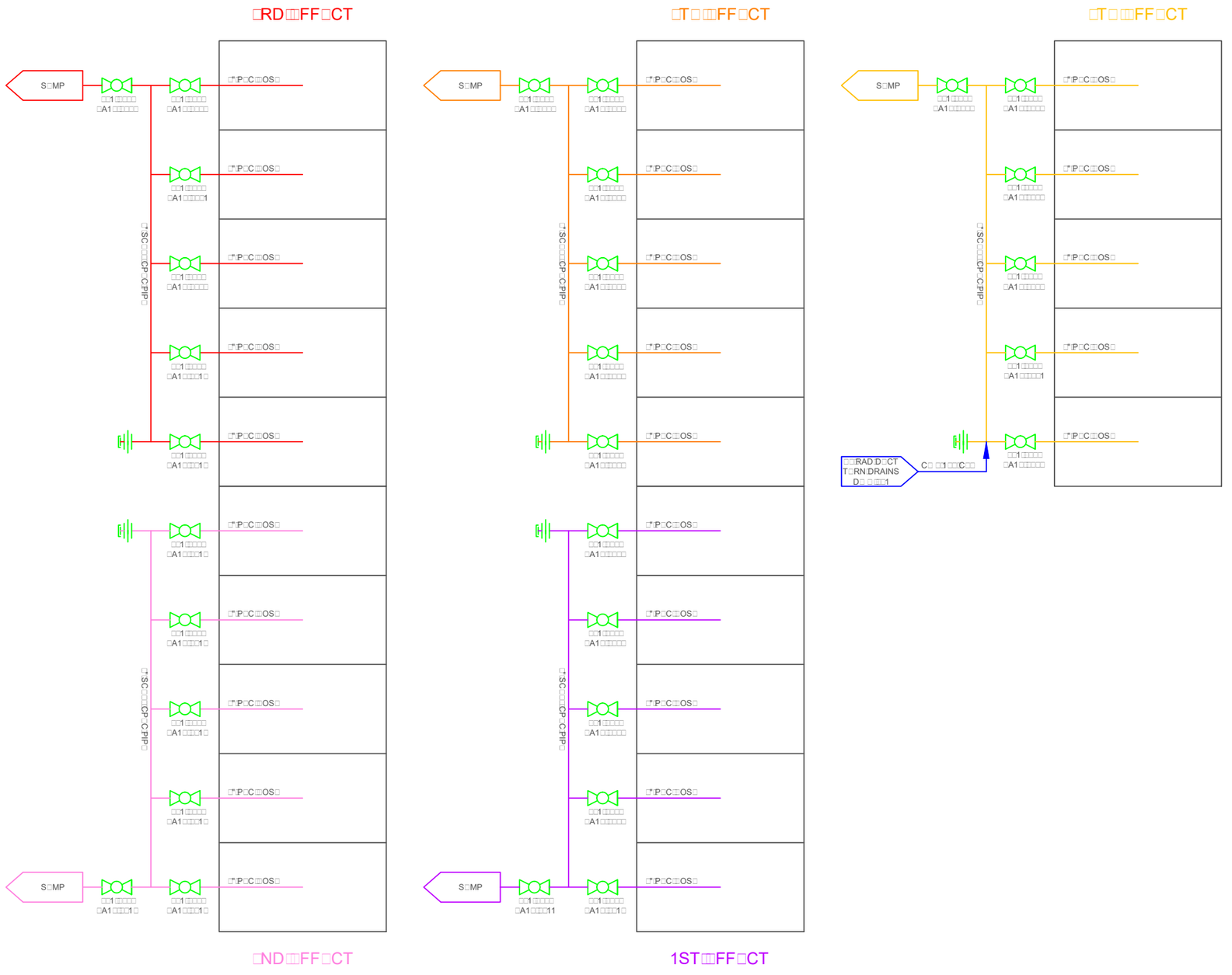
LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	PINCH VALVES ADDED, AS BUILT UPDATES	JLAU
O	04–SEP–2018	UPDATED HEADER FLOW DIRECTION TO MATCH AS BUILT	–

TITLE: (SM2) 564: EH1 SOLIDS EXTRACTION

PROJECT:	SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_564
CHECKED BY:	MLOW	DATE:	05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	93 OF117

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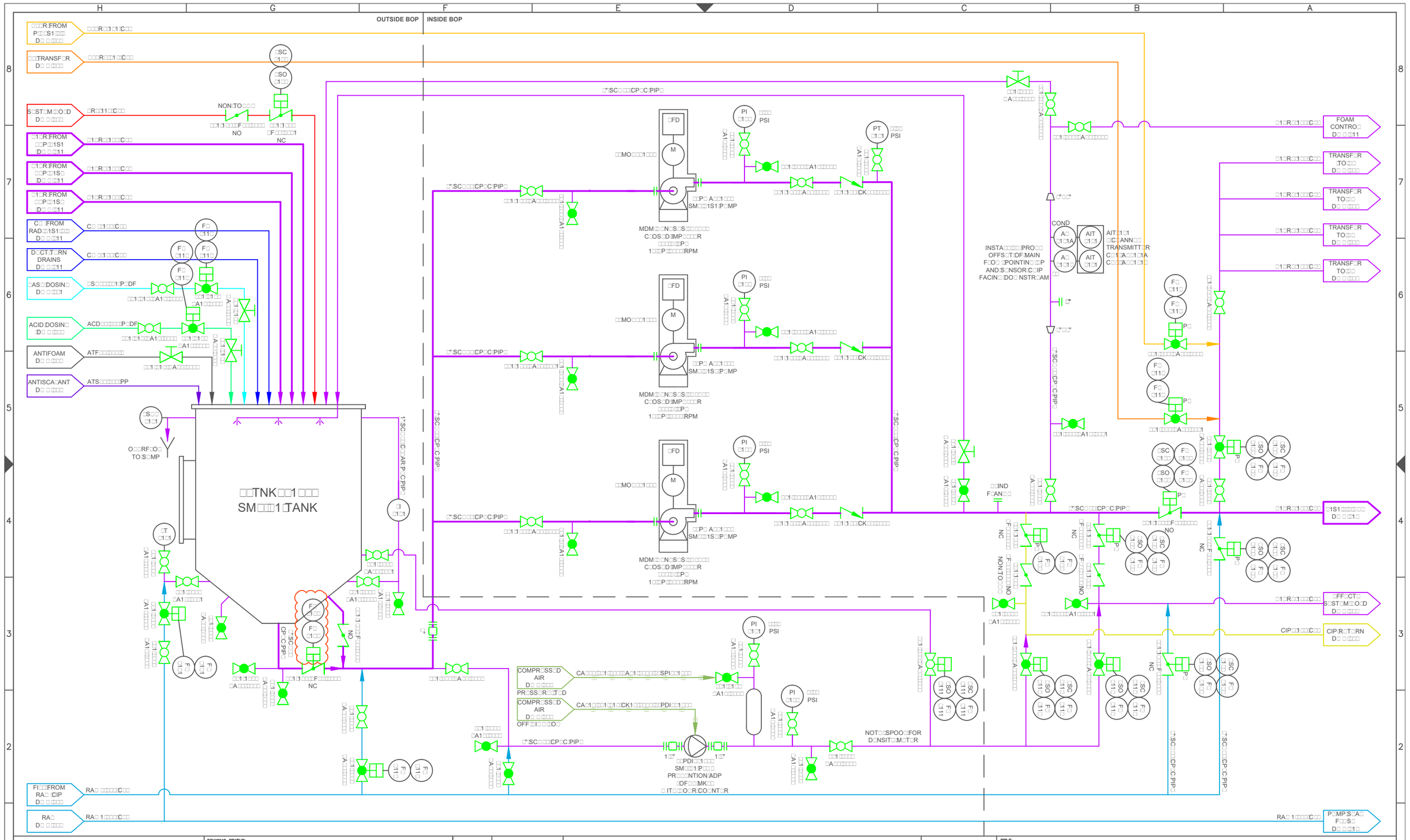
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LTR	DATE	DESCRIPTION	REV. BY:
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO
N	06-JUL-2018	NO CHANGES	–
O	04-SEP-2018	NO CHANGES	–

TITLE: (SM2) 580: DRIP TRAY

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE: 01-SEP-2017	DWG. NO:	SW_EN_SM_AEM-01_PID_SM2_DWG_580	
CHECKED BY:	MLOW	DATE: 05-SEP-2017	JOB/CO NO:	(JOB NO.)	
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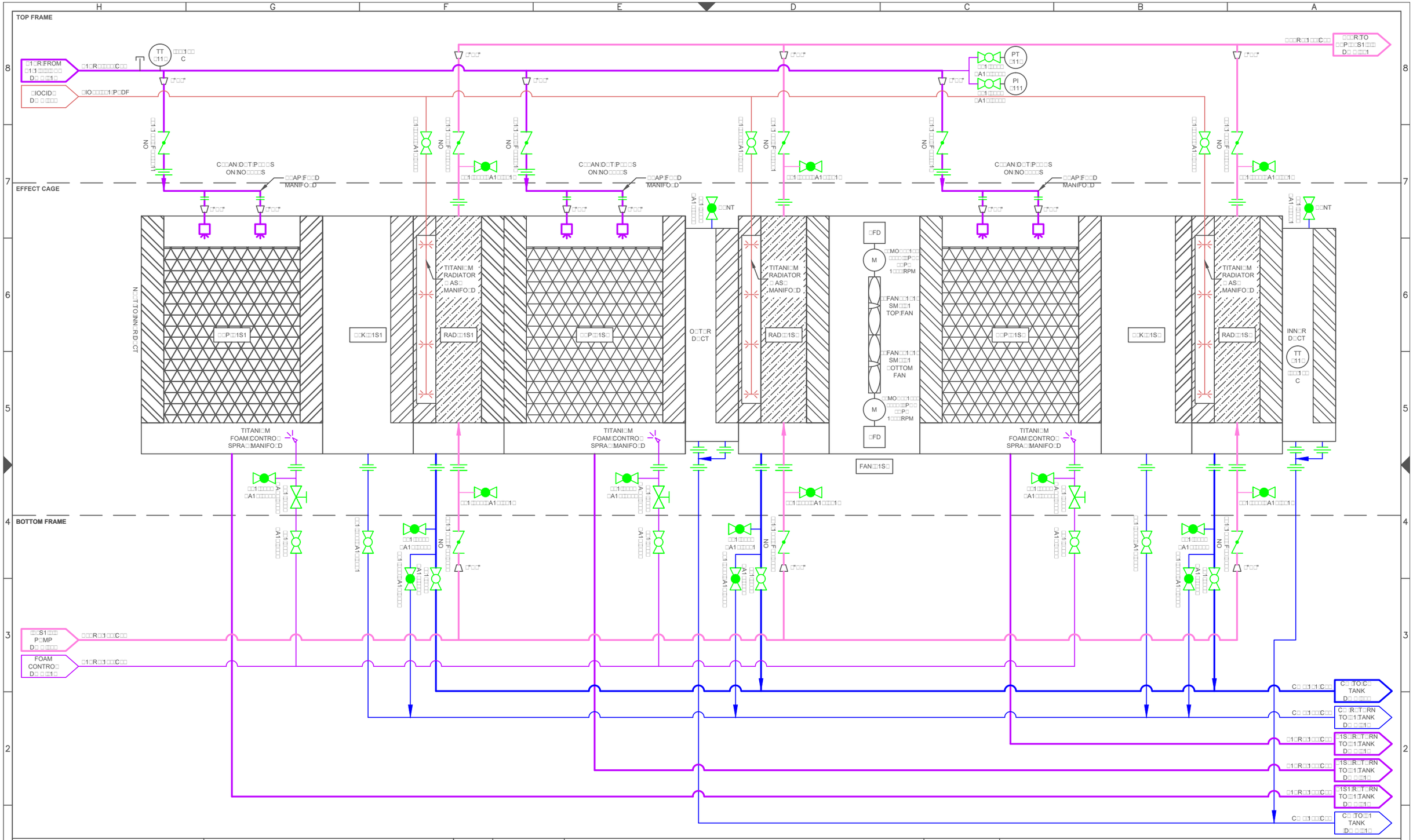
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	PINCH VALVES ADDED	JLAU
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 610: EFFECT 1 TANK AND PUMPS

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_610	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 96 OF117	



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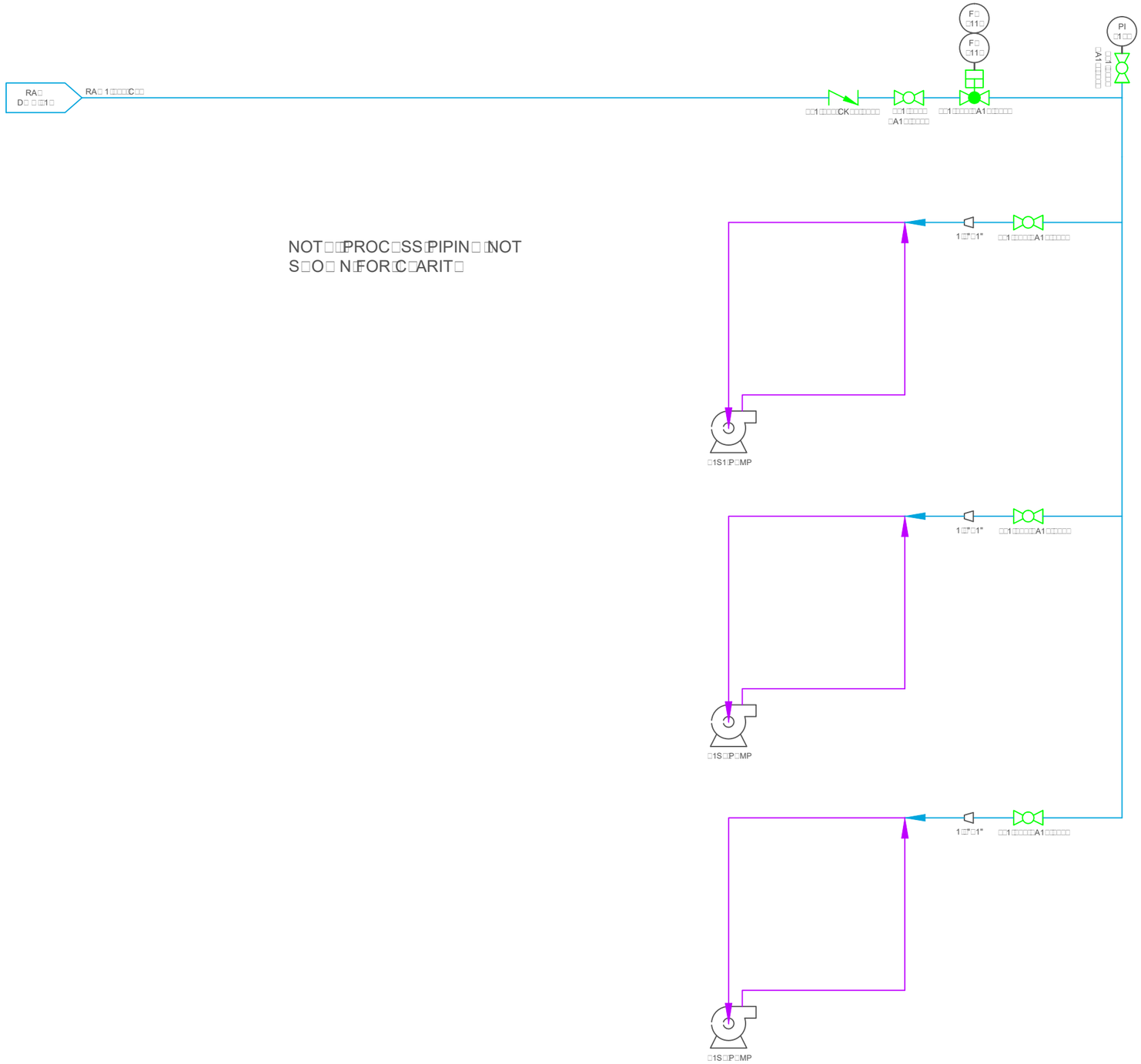
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

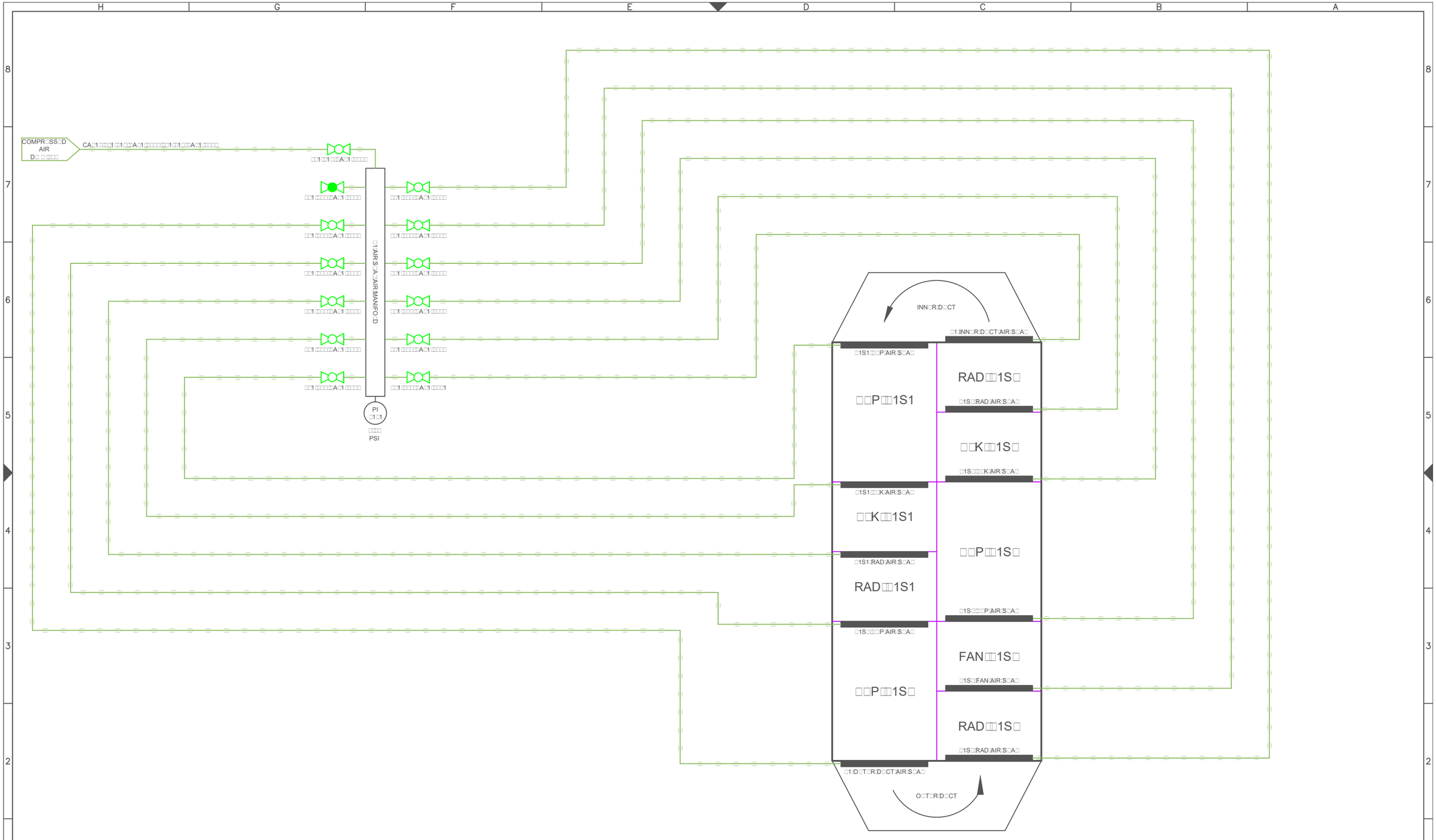
TITLE: (SM2) 611: EFFECT 1 MODULES

PROJECT:	SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_611
CHECKED BY:	MLOW	DATE:	05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	97 OF117



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	P	16-NOV-2018	NO CHANGES	–	PROJECT: SALTMAKER GEN III	CUSTOMER: AGNICO EAGLE MINES	REVISION Q
	Q	12-FEB-2019	AS BUILT UPDATE	DKAO	PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_SM2_DWG_613
	N	06-JUL-2018	NO CHANGES	–	CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)
	O	04-SEP-2018	NO CHANGES	–	APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 98 OF117



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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	UPDATED MANIFOLD	JLAU
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 614: EFFECT 1 AIR SEALS

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_614
CHECKED BY:	MLOW	DATE:	05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	99 OF117

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(SM2) 620: EFFECT 2 TANK AND PUMPS

PROJECT:	SALTMAKER GEN III
CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q
PREPARED BY:	JLAU
DATE:	01–SEP–2017
CHECKED BY:	MLOW
DATE:	05–SEP–2017
APPROVED BY:	APPROVED BY
DATE:	APPROVED DATE
DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_620
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	PINCH VALVES ADDED, P3 BOOSTER TAGS UPDATED	JLAU
O	04–SEP–2018	NO CHANGES	–

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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

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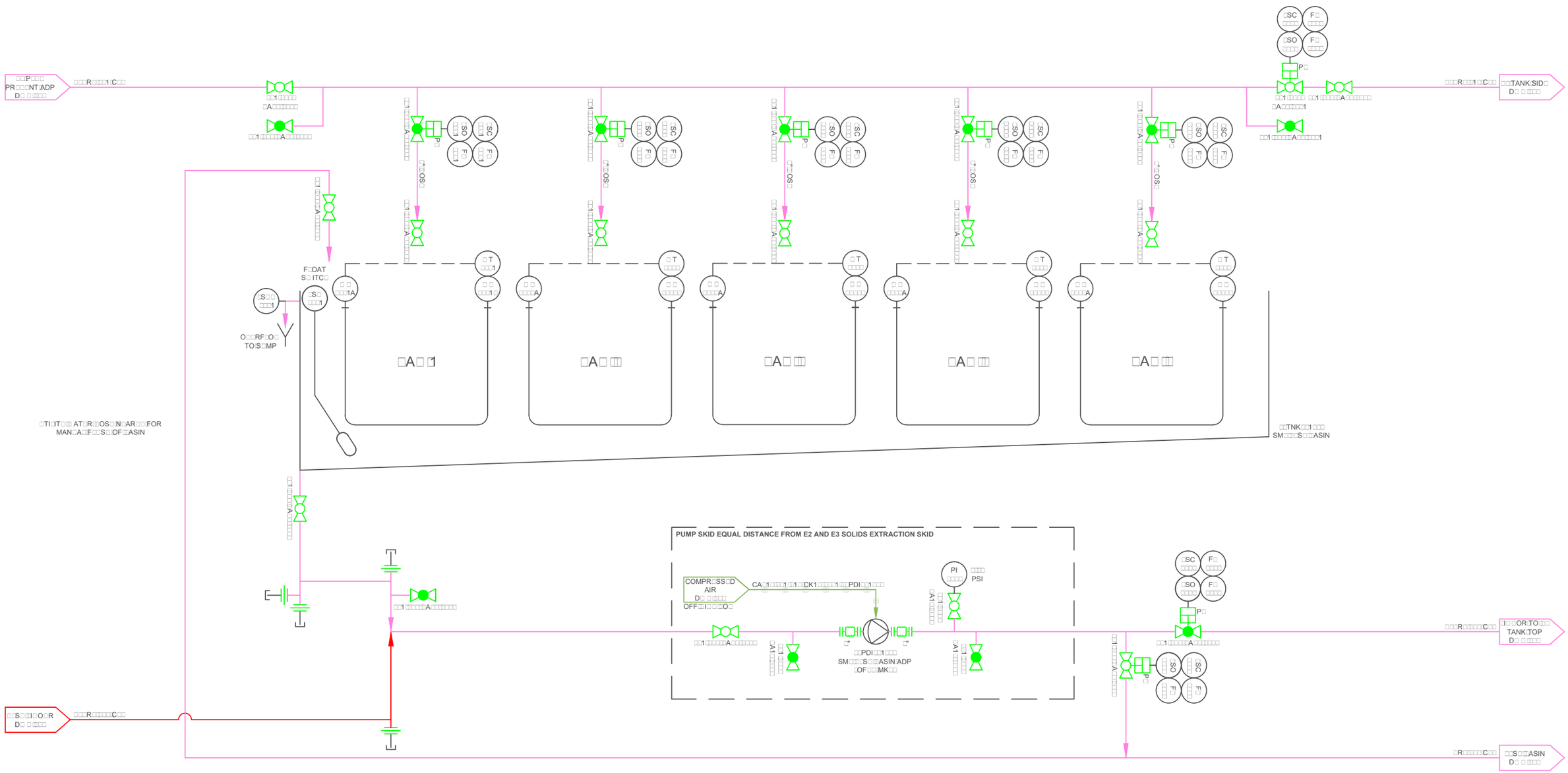
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TITLE: (SM2) 621: EFFECT 2 MODULES

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_621	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 101OF117	

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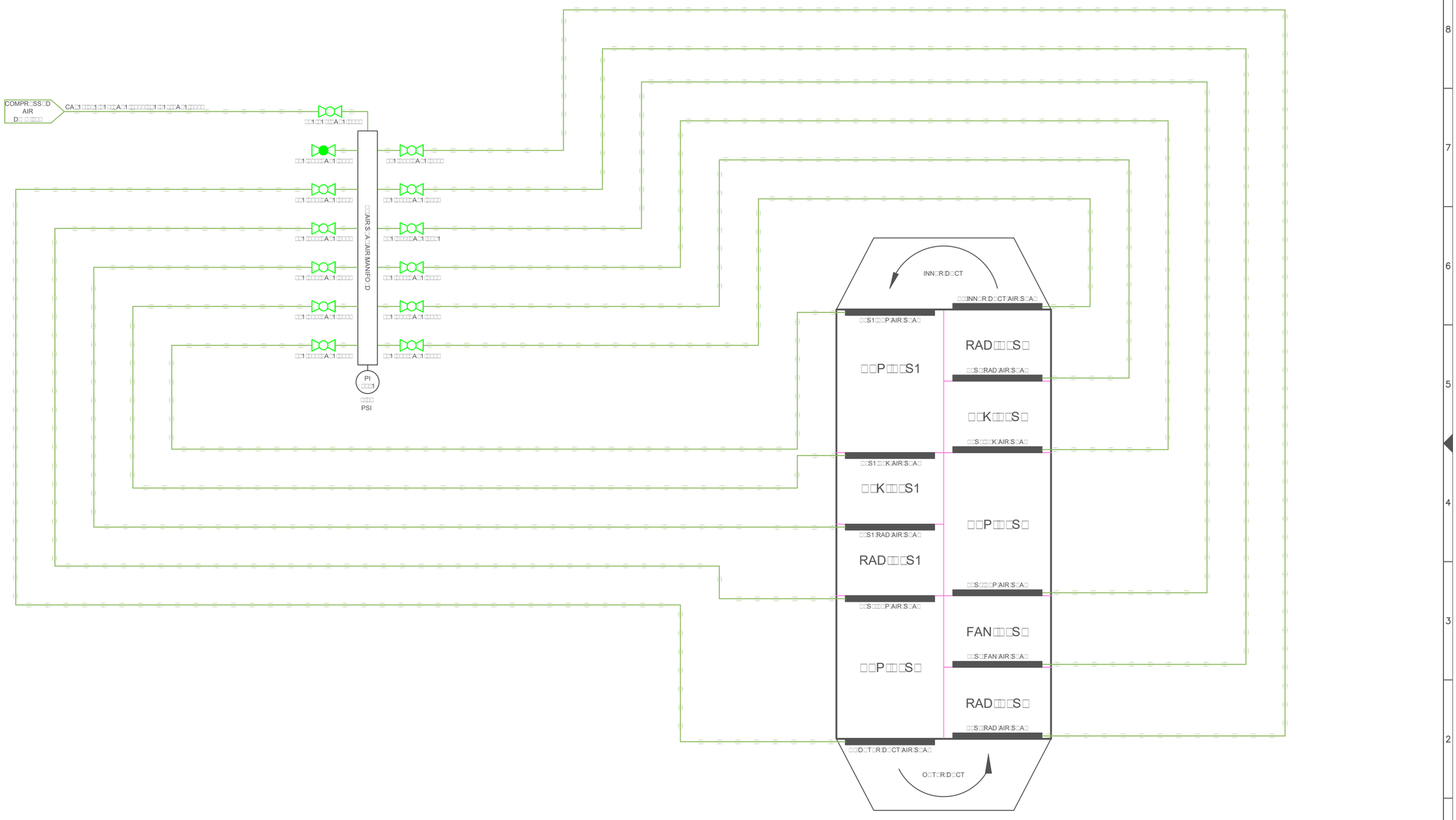
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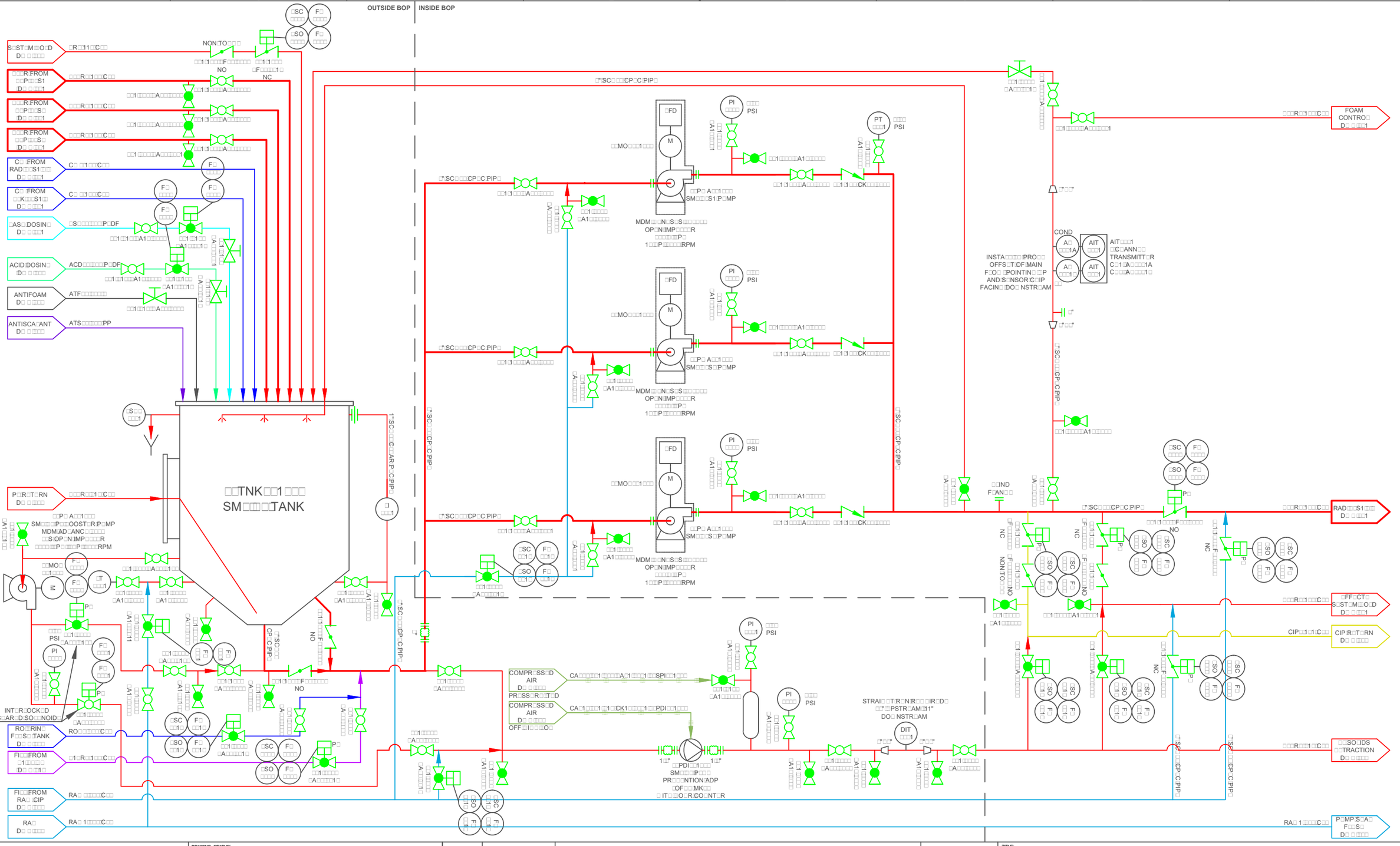
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	UPDATED MANIFOLD	JLAU
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 624: EFFECT 2 AIR SEALS

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_624	
CHECKED BY:	MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	104 OF 117	



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		Q	12–FEB–2019	AS BUILT UPDATE	DKAO
		N	06–JUL–2018	PINCH VALVES ADDED, P3 BOOSTER TAGS UPDATED	JLAU
		O	04–SEP–2018	NO CHANGES	–
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TITLE:	(SM2) 630: EFFECT 3 TANK AND PUMPS		
PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
		REVISION	Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017
CHECKED BY:	MLOW	DATE:	05–SEP–2017
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_630		
JOB/CO NO:	(JOB NO.)		
SHEET:	105OF117		

TOP FRAME

EFFECT CAGE

BOTTOM FRAME

TITANIUM RADIATOR MANIFOLD

TITANIUM FOAM CONTROL SPRAY MANIFOLD

INNER DUCT

OUTER DUCT

FAN

LTR	DATE	DESCRIPTION	REV. BY:
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO
N	06-JUL-2018	NO CHANGES	–
O	04-SEP-2018	NO CHANGES	–

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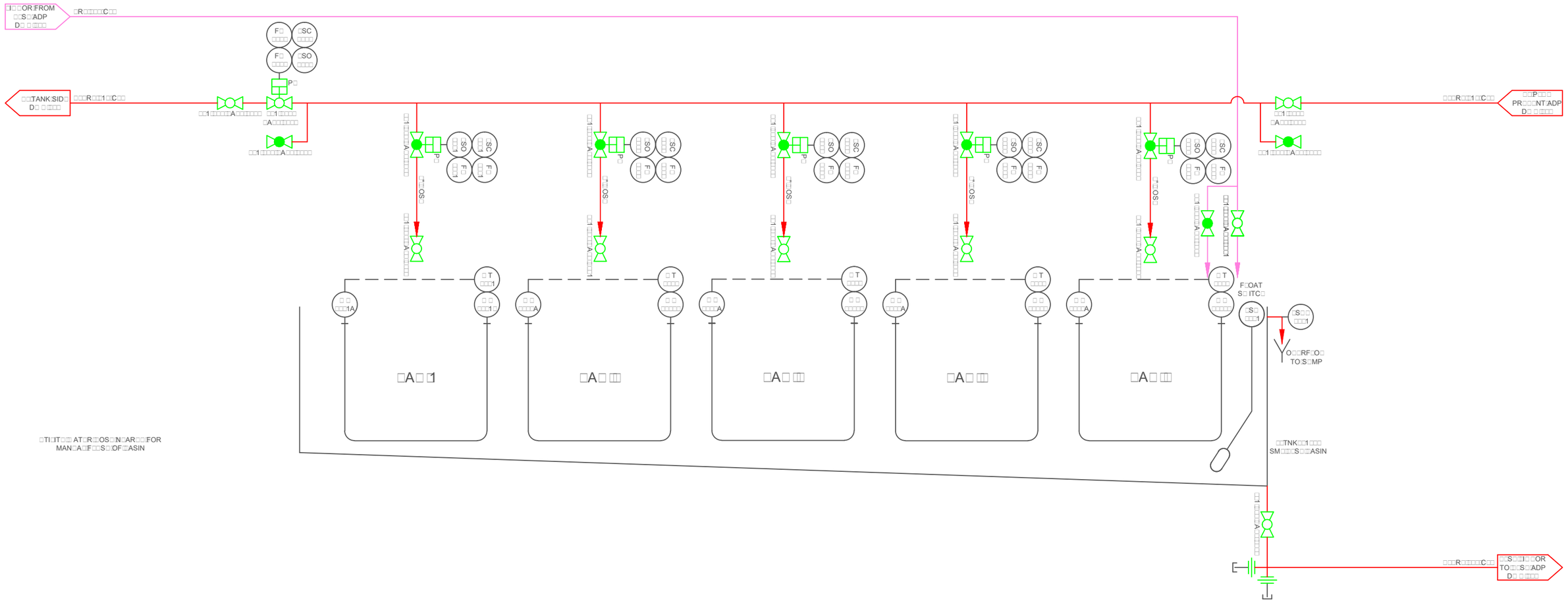
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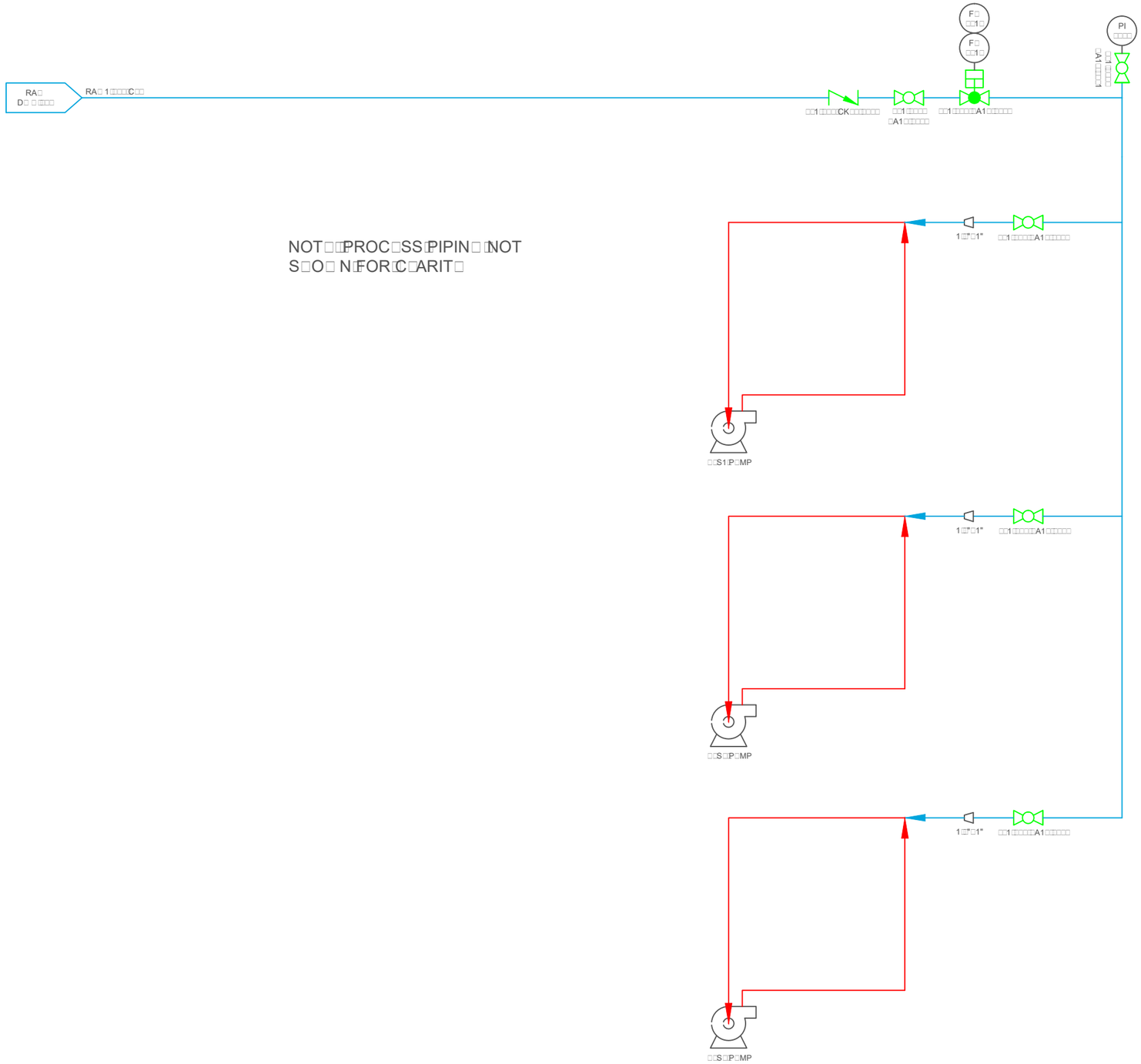
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TITLE: (SM2) 631: EFFECT 3 MODULES

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01-SEP-2017	DWG. NO: SW_EN_SM_AEM-01_PID_SM2_DWG_631	
CHECKED BY: MLOW	DATE: 05-SEP-2017	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 106OF117	

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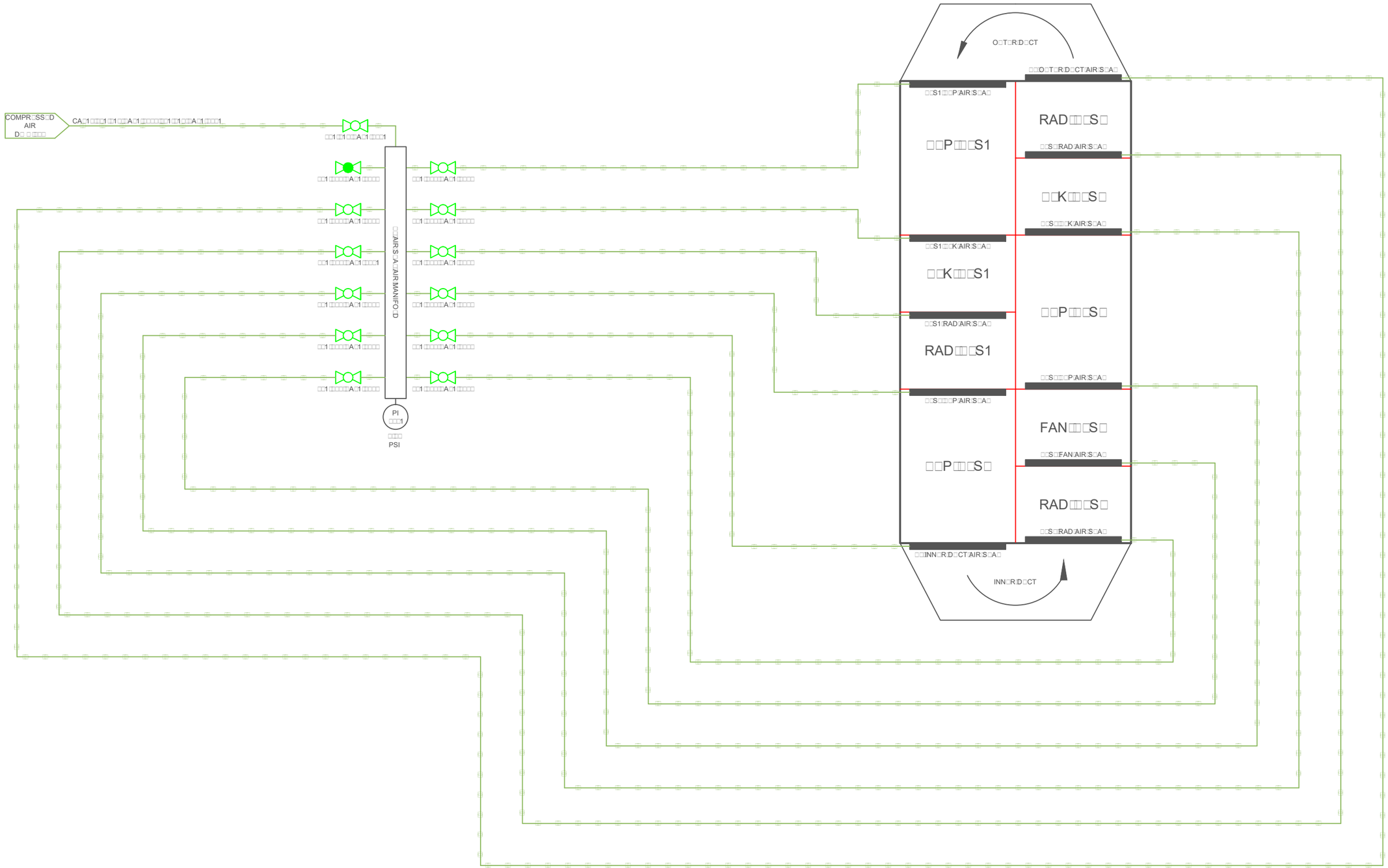
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P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 633: EFFECT 3 PUMP SEAL FLUSH

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_633
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	108OF117


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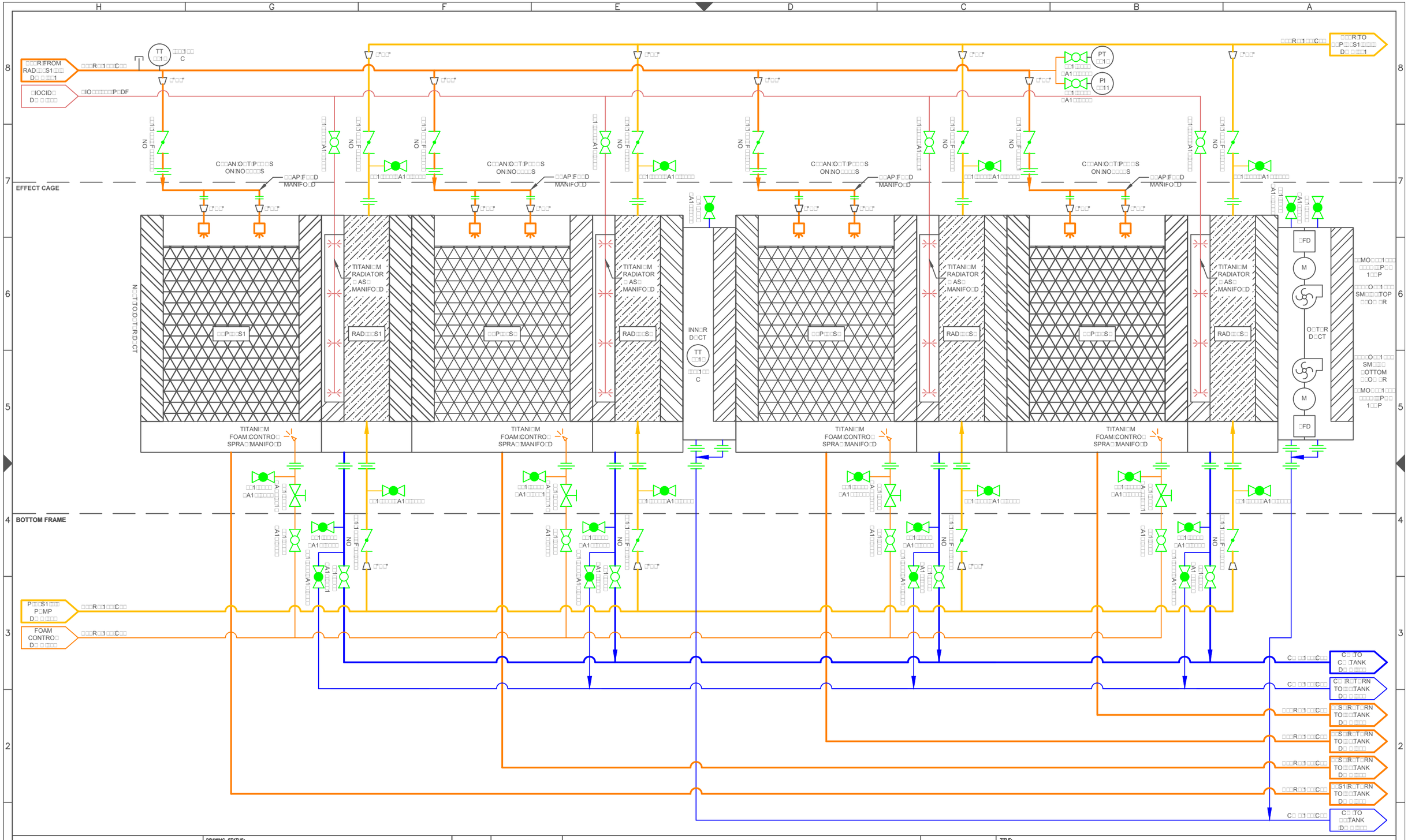
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	PINCH VALVES ADDED	JLAU
O	04–SEP–2018	NO CHANGES	–

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TITLE: (SM2) 640: EFFECT 4 TANK AND PUMPS

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_640	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO
		N	06–JUL–2018	NO CHANGES	–
		O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 641: EFFECT 4 MODULES			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_641	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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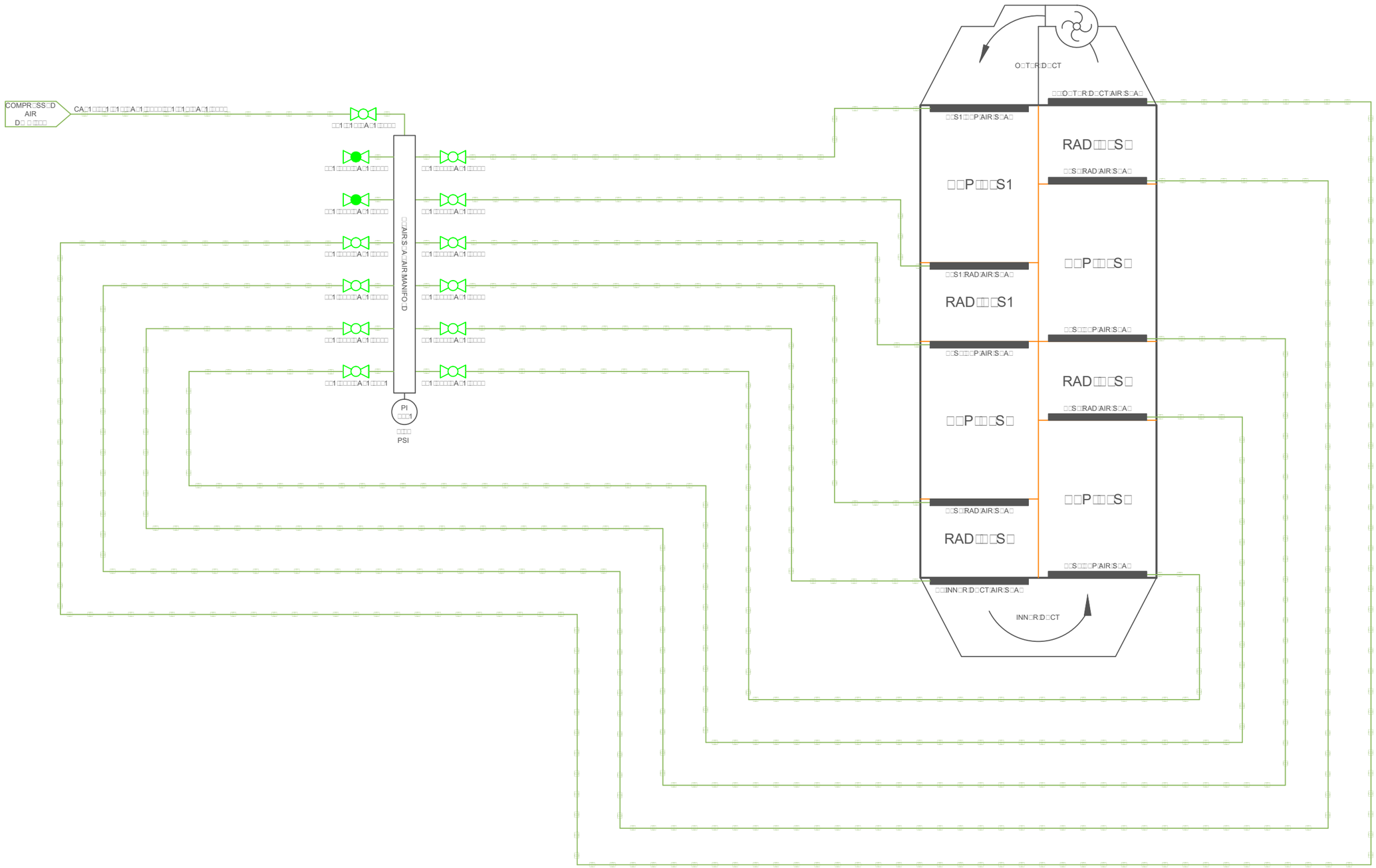
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N	06-JUL-2018	NO CHANGES	–
O	04-SEP-2018	NO CHANGES	–

TITLE: (SM2) 643: EFFECT 4 PUMP SEAL FLUSH

PROJECT:	SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	JLAU	DATE:	01-SEP-2017	DWG. NO:	SW_EN_SM_AEM-01_PID_SM2_DWG_643
CHECKED BY:	MLOW	DATE:	05-SEP-2017	JOB/CO NO:	(JOB NO.)
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO
N	06-JUL-2018	UPDATED MANIFOLD	JLAU
O	04-SEP-2018	NO CHANGES	–

TITLE: (SM2) 644: EFFECT 4 AIR SEALS

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE: 01-SEP-2017	DWG. NO:	SW_EN_SM_AEM-01_PID_SM2_DWG_644	
CHECKED BY:	MLOW	DATE: 05-SEP-2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	113OF117	

OUTSIDE BOP

INSIDE BOP

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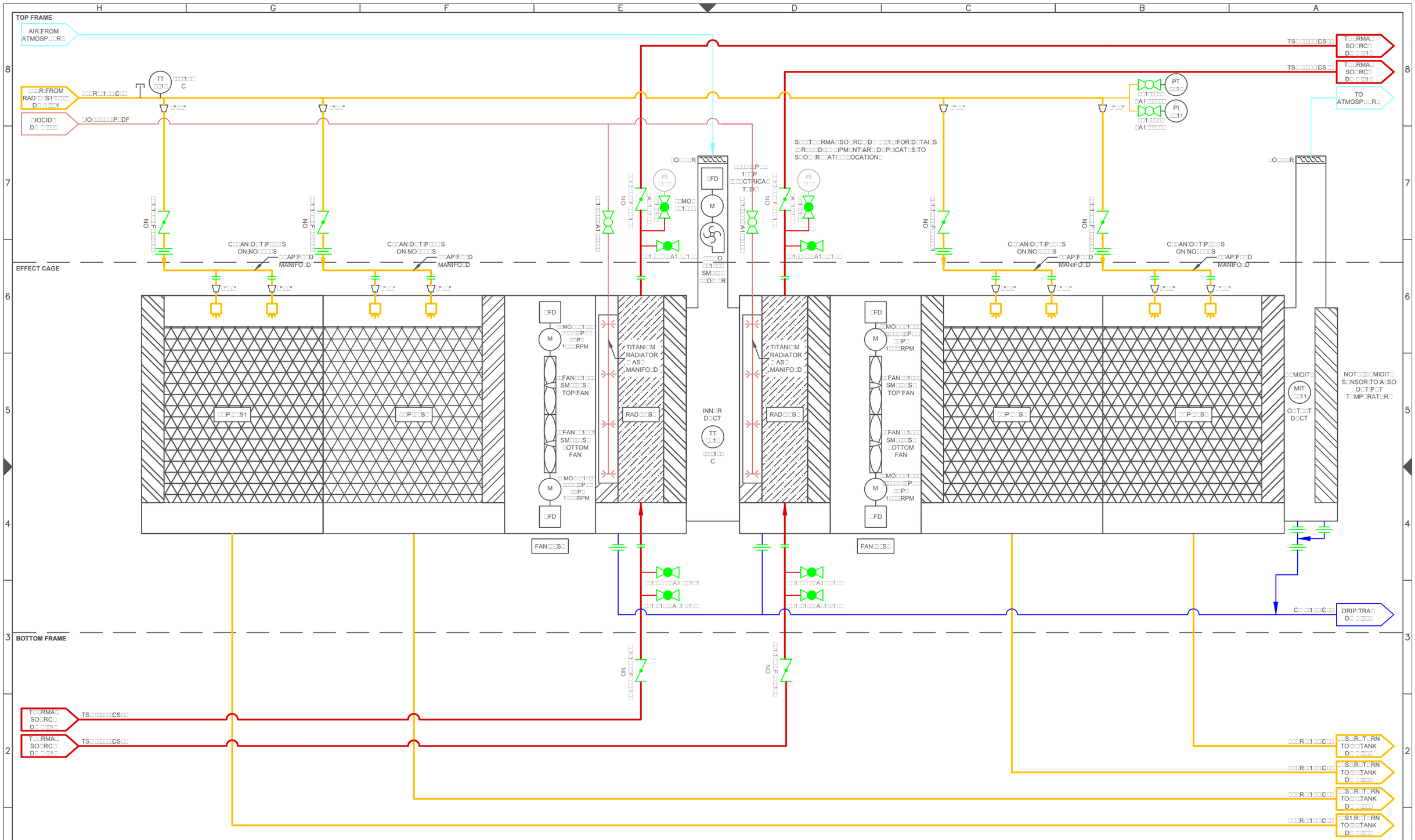
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	Q	12–FEB–2019	AS BUILT UPDATE	DKAO
	N	06–JUL–2018	PINCH VALVES ADDED	JLAU
DO NOT SCALE DRAWING	O	04–SEP–2018	NO CHANGES	–

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TITLE: (SM2) 650: EFFECT 5 TANK AND PUMPS

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
REVISION	Q		
PREPARED BY:	JLAU	DATE:	01–SEP–2017
DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_650		
CHECKED BY:	MLOW	DATE:	05–SEP–2017
JOB/CO NO:	(JOB NO.)		
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
SHEET:	114 OF 117		



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P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 651: EFFECT 5 MODULES

PROJECT:	SALTMAKER GEN III			CUSTOMER:	AGNICO EAGLE MINES
					REVISION: Q
PREPARED BY:	JLAU	DATE:	01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_651
CHECKED BY:	MLOW	DATE:	05–SEP–2017	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	115OF117

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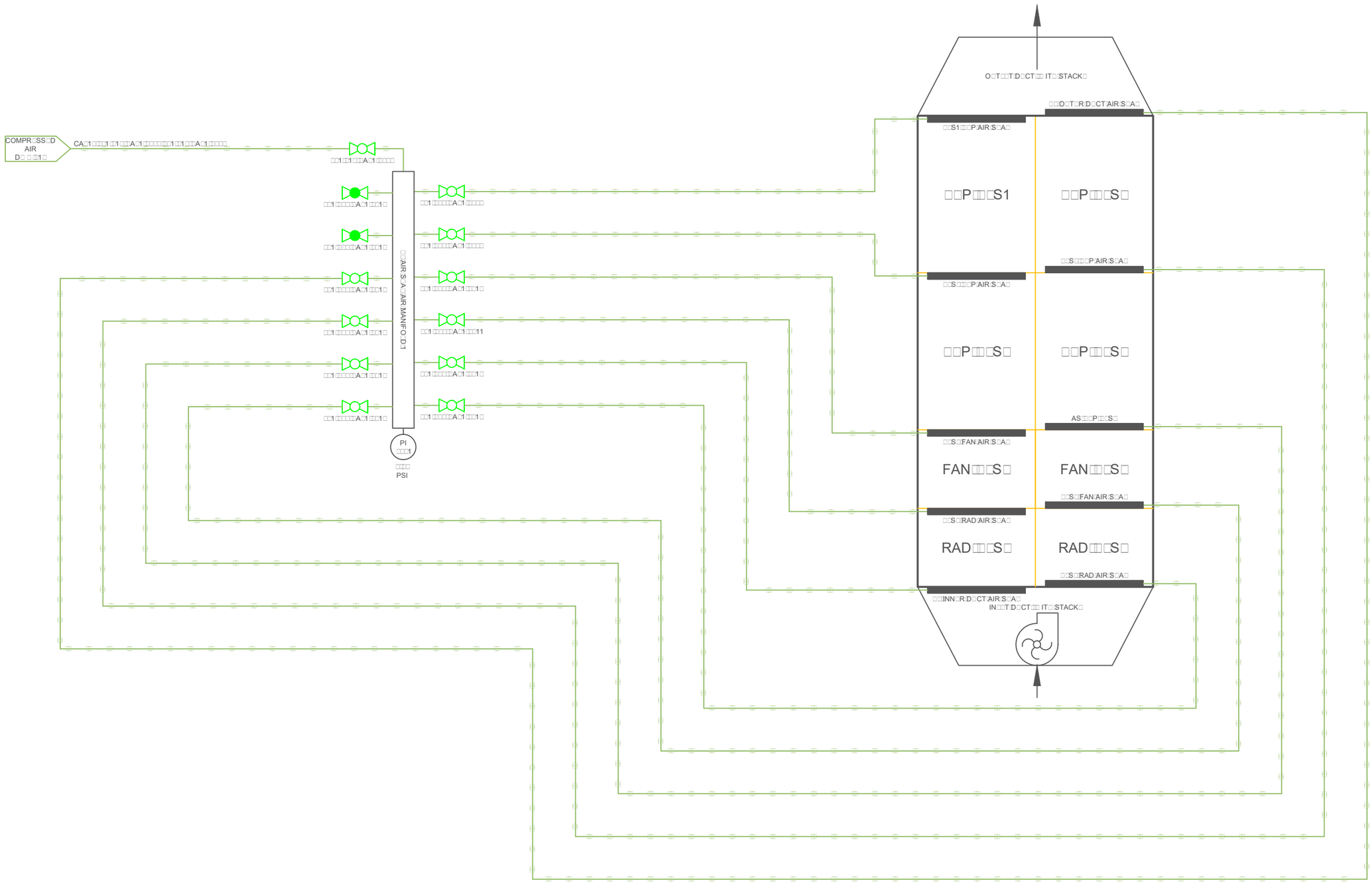
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LTR	DATE	DESCRIPTION	REV. BY:
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO
N	06–JUL–2018	NO CHANGES	–
O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 653: EFFECT 5 PUMP SEAL FLUSH

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	JLAU	DATE: 01–SEP–2017	DWG. NO:	SW_EN_SM_AEM–01_PID_SM2_DWG_653	
CHECKED BY:	MLOW	DATE: 05–SEP–2017	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	116OF117	



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		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO
		N	06–JUL–2018	UPDATED MANIFOLD	JLAU
		O	04–SEP–2018	NO CHANGES	–

TITLE: (SM2) 654: EFFECT 5 AIR SEALS			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 01–SEP–2017	DWG. NO: SW_EN_SM_AEM–01_PID_SM2_DWG_654	
CHECKED BY: MLOW	DATE: 05–SEP–2017	JOB/CO NO: (JOB NO.)	
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N	06–JUL–2018	NO CHANGES	–		
O	18–OCT–2018	NO CHANGES	–		
P	16–NOV–2018	NO CHANGES	–		
Q	12–FEB–2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO		

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TITLE: COVER SHEET

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 14–AUG–2017	DWG. NO: COVER SHEET	
CHECKED BY:	DATE:	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

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SHEET NO.	DRAWING NO.	DESCRIPTION
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□□T□□□□NTIT□□FOR □ □IC□□IT□□ AS□ORI□INA□□□□S□PP□□D□□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 14–AUG–2017	DWG. NO: DRAWING LIST 1	
CHECKED BY:	DATE:	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
□1	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□□1□□ □□□TRACT□AND□CIP□AIR
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□FOR □□IC□IT□ AS□ORI□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III

CUSTOMER: AGNICO EAGLE MINES

REVISION: Q

PREPARED BY: JLAU DATE: 14-AUG-2017

CHECKED BY: DATE:

APPROVED BY: APPROVED BY DATE: APPROVED DATE

DWG. NO: DRAWING LIST 2

JOB/CO NO: (JOB NO.)

SHEET: # OF #

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
F□□ID
SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
AR□A□COD□
□A□□□SI□□
S□□□□NTIA□N□M□□R
□A□□□T□P□

VALVE SIZE CONVERSION

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□□□	□	1
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VALVE TYPE CONVERSION

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Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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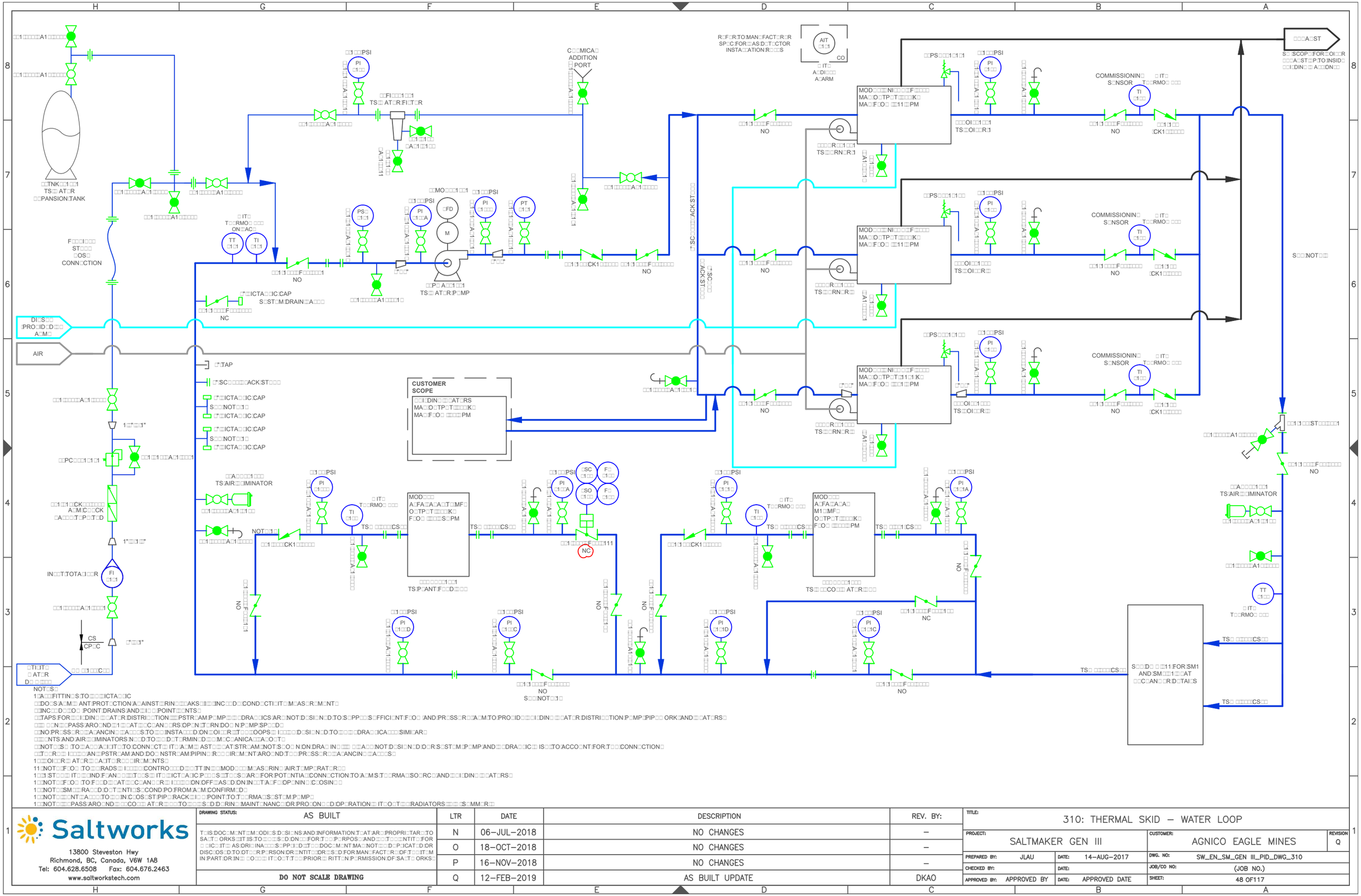
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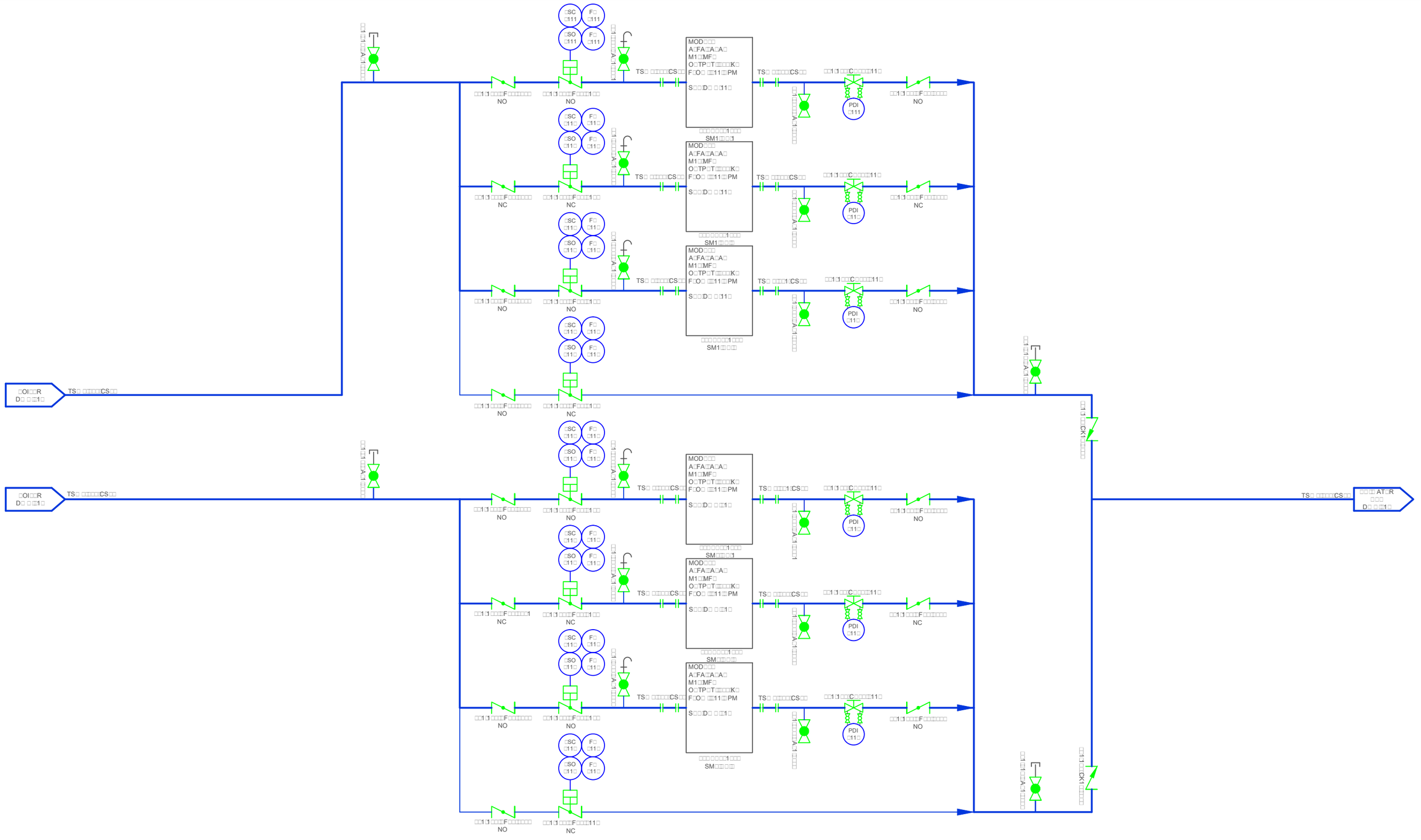
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O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: LEGEND

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 14–AUG–2017	DWG. NO: LEGEND	
CHECKED BY:	DATE:	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	


CUSTOMER SCOPE
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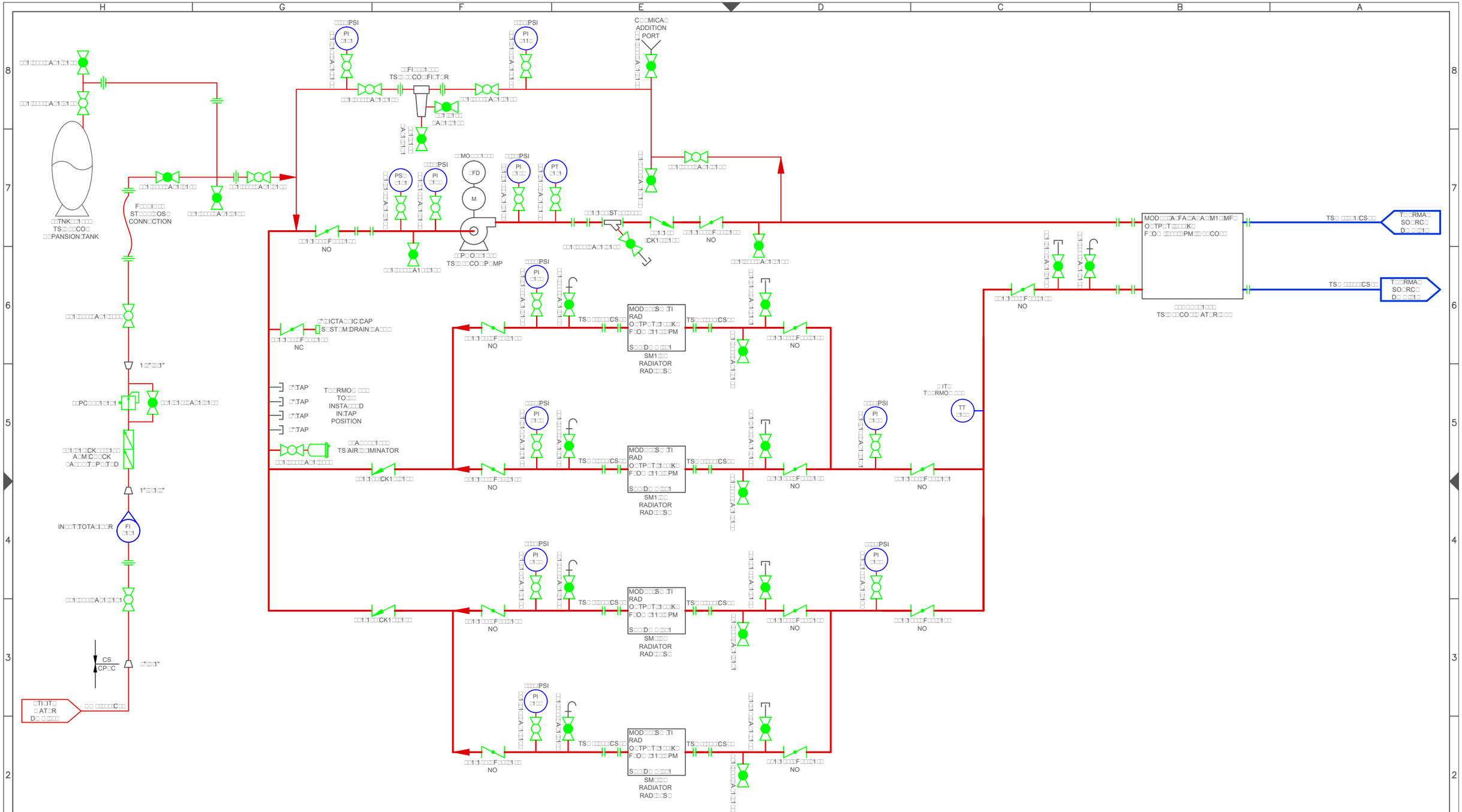


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Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

TITLE: 311: THERMAL SKID – WATER LOOP

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: JLAU	DATE: 14–AUG–2017	DWG. NO: SW_EN_SM_GEN III_PID_DWG_311	
CHECKED BY:	DATE:	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 49 OF117	



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N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: 312: THERMAL SKID – GLYCOL LOOP

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: JLAU	DATE: 14-AUG-2017	DWG. NO: SW_EN_SM_GEN III_PID_DWG_312	
CHECKED BY:	DATE:	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 50 OF117	

Saltworks

AGNICO EAGLE MINES
PUMP DRAWING PACKAGE

COMPRESSED AIR SYSTEM COMMON
REVISION

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		O	17-SEP-2018	AS MARKED BY REVISION CLOUDS	JLAU
		P	16-NOV-2018	AS MARKED BY REVISION CLOUDS	JLAU
		Q	12-FEB-2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO

TITLE: COVER SHEET			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22-FEB-2018	DWG. NO: COVER SHEET	
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

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□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□1□	PROC□SS□F□O□ □DIA□RAM
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	CONTAIN□R□□A□O□T
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	MOD□ □□S□□A□O□T
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	P□ANT□F□□D□TANKS
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□1	P□ANT□F□□D□P□MP□SKIDS
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	C□□AN□R□S□R□□□AND□□□O□ DO□ N□S□ST□MS
□	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	ACID□DOSIN□ □S□ST□M
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11	S□ □□N□SM□A□M□□1□PID□COMMON□D□ □ □□□□	ANTIFOAM□DOSIN□ □S□ST□M
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		SA□TMAK□R□1 □□SM1□
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□□	S□ □□N□SM□A□M□□1□PID□SM1□D□ □ □1□□	□□□SO□IDS□□□TRACTION
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SHEET NO.	DRAWING NO.	DESCRIPTION
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		COMPR□SS□D□AIR□SM1
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□□ AS□ORI□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22–FEB–2018	DWG. NO: DRAWING LIST 1	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□□1□□ □□□TRACT□AND□CIP□AIR
□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	P□□□□PR□□□NTION□P□MP□AIR
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□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□TI□IT□□AIR
□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□OP1□AIR□SO□□NOID□□ANK
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Richmond, BC, Canada, V6W 1A8
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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22–FEB–2018	DWG. NO: DRAWING LIST 2	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
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SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
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VALVE SIZE CONVERSION

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VALVE TYPE CONVERSION

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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

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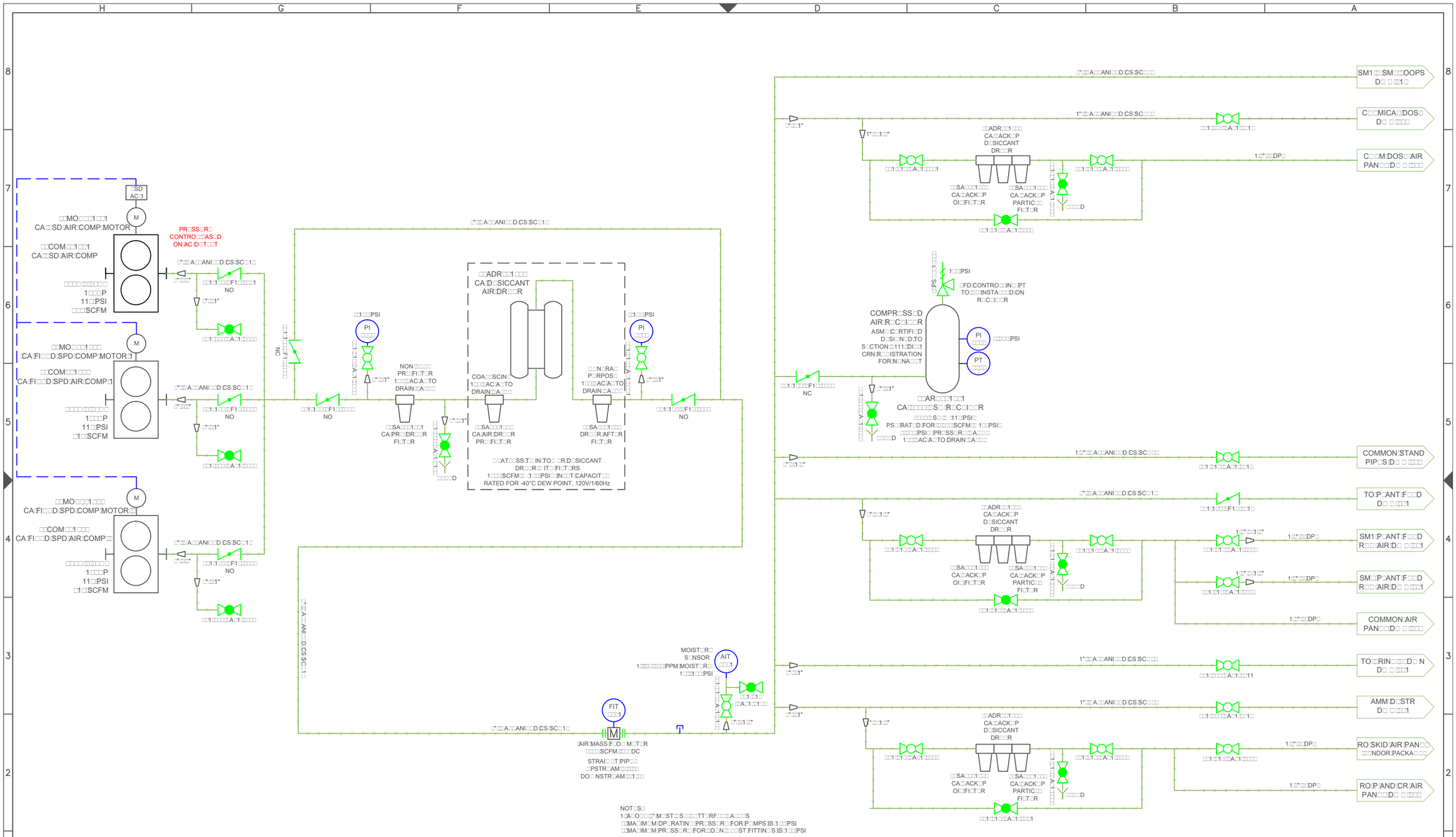
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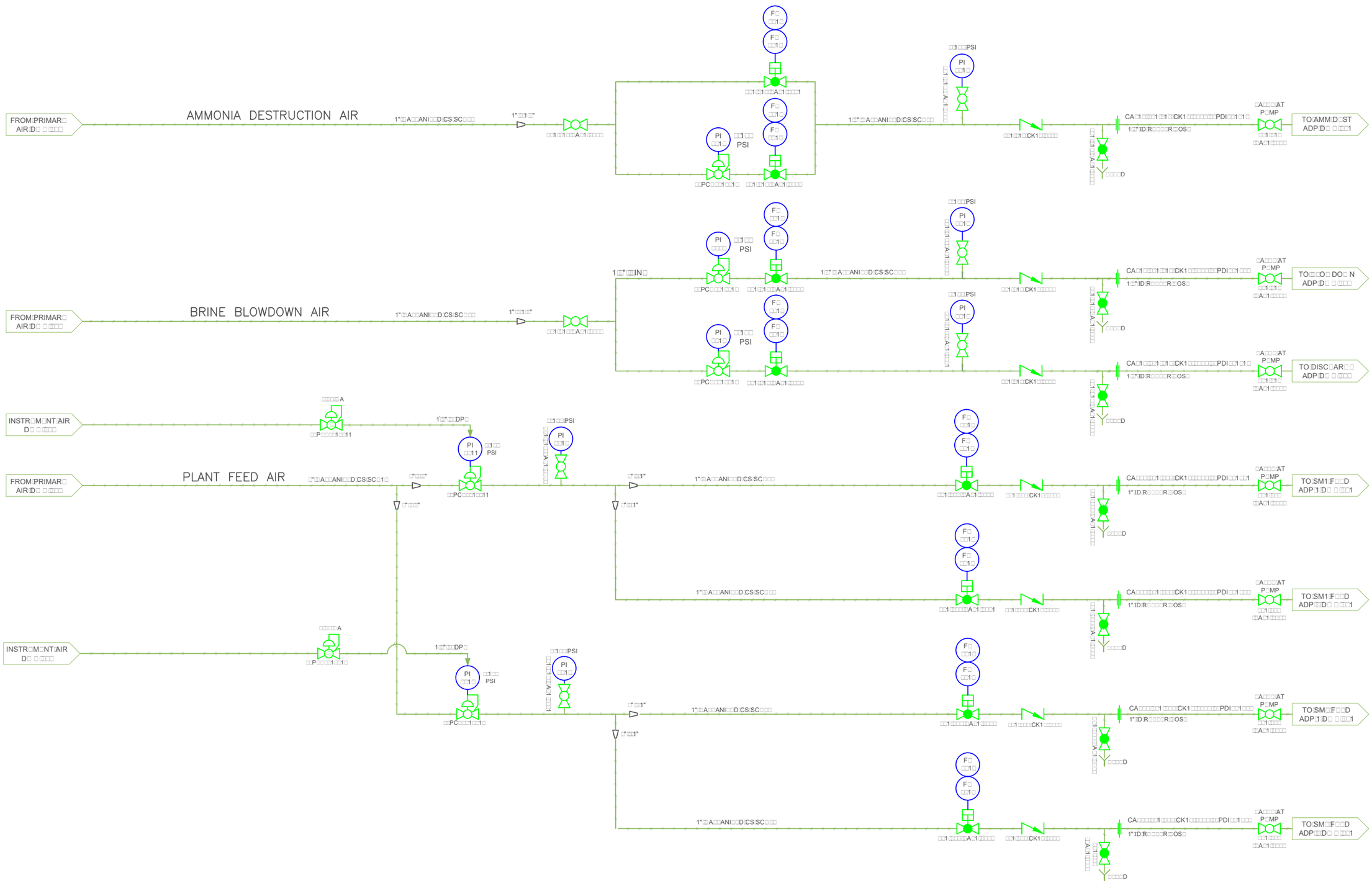
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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	17–SEP–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

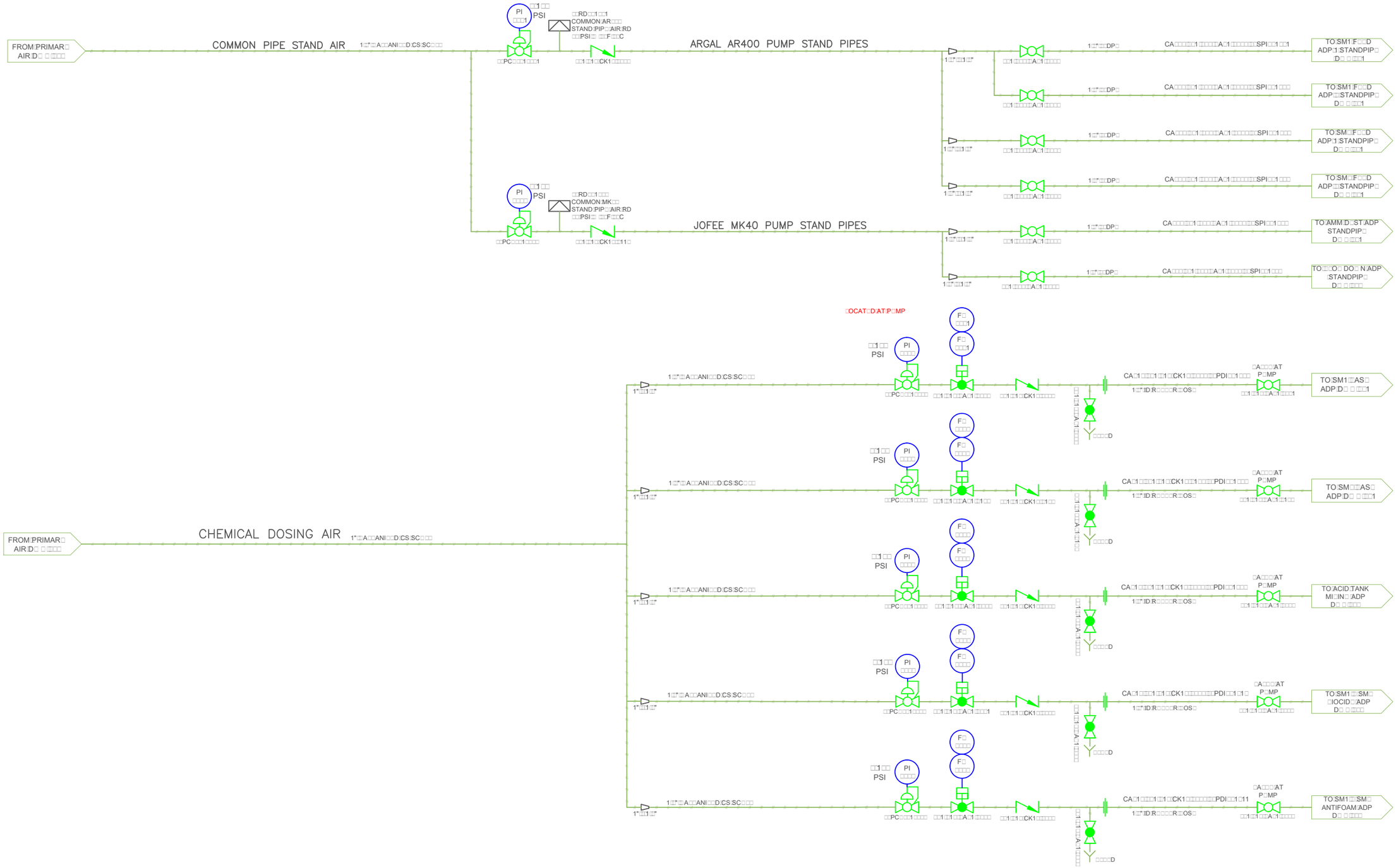
TITLE: LEGEND

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SNOW	DATE: 22–FEB–2018	DWG. NO:	LEGEND	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	# OF #	


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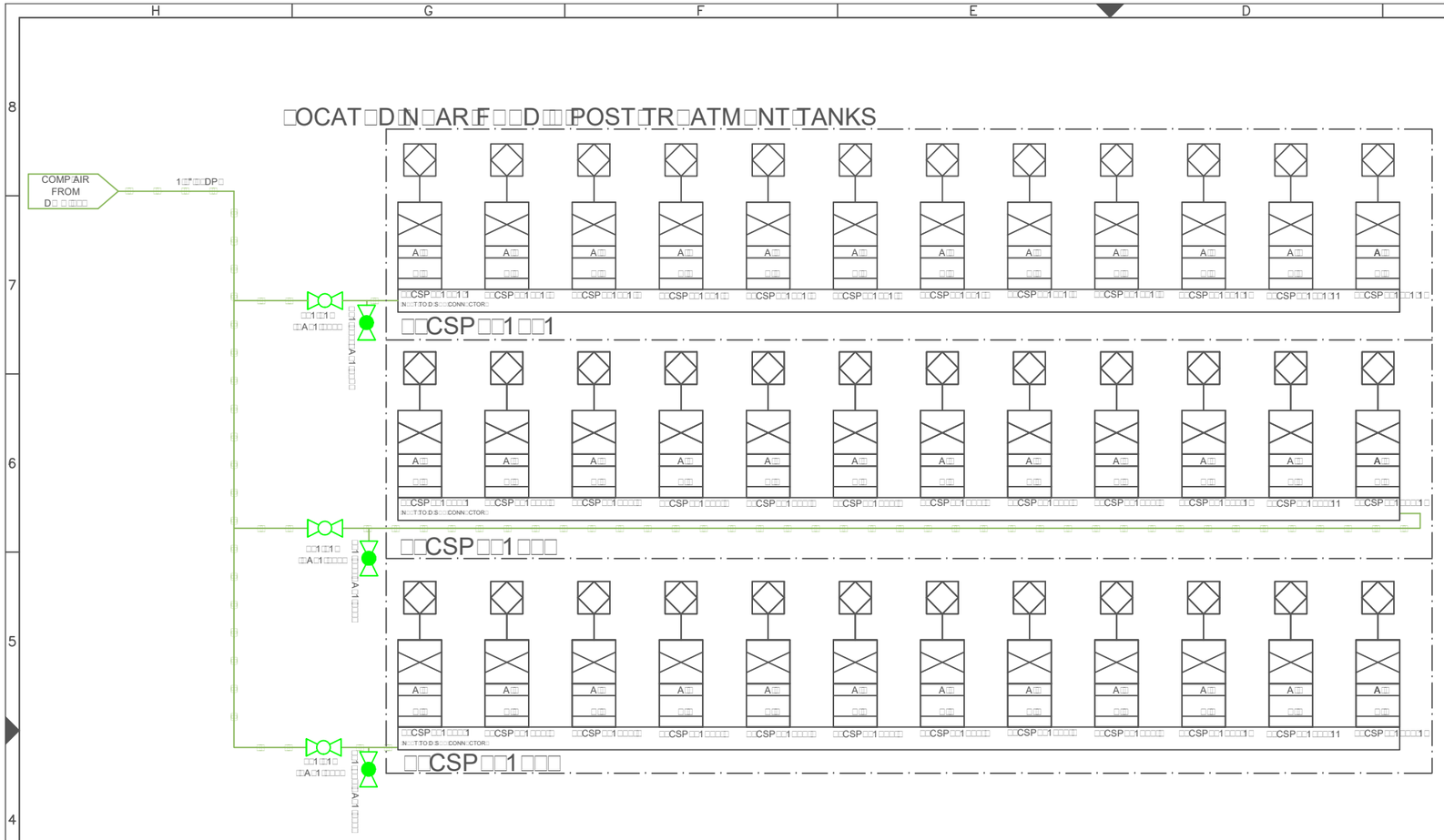
Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS:DOC□M□NT□M□ODI□S:D□SI□NS:AND:INFORMATION:T□AT:AR□PROPRI□TAR□TO SA□T□ ORKS□IT:IS:TO□□□S□D:ON□□FOR:T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □□IC□IT□□ AS:ORI□INA□□□S□PP□I□D□T□□DOC□M□NT:MA□NOT□□□D□P□ICAT□D:OR DISC□OS□D:TO:OT□□R:P□RSON:OR□NTIT□□OR□S□D:FOR:MAN□FACT□R□OF:T□□□IT□M IN:PART□OR:IN□□ □O□□□ IT□O□T:T□□PRIOR□ RITT□N:P□RMISSION:OF:SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:	TITLE: (COMMON) 401: AMM DESTR, BRINE BLOWDOWN, AND PLANT FEED AIR
		N	06–JUL–2018	NO CHANGES	–	PROJECT: SALTMAKER GEN III / CUSTOMER: AGNICO EAGLE MINES / REVISION: Q
		O	17–SEP–2018	NO CHANGES	–	PREPARED BY: SNOW / DATE: 22–FEB–2018 / DWG. NO: SW_EN_SM_GEN III_PID_DWG_401
		P	16–NOV–2018	UPDATED FOR BRINE MODE	MLOW	CHECKED BY: XXIAO / DATE: 23–FEB–2018 / JOB/CO NO: (JOB NO.)
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO	APPROVED BY: APPROVED BY / DATE: APPROVED DATE / SHEET: 56 OF117



Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□AND□□□T□□□NTIT□FOR □ □IC□□IT□ AS□OR□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:
		N	06-JUL-2018	RUPTURE DISK CONFIRMED	JLAU
		O	17-SEP-2018	NO CHANGES	–
		P	16-NOV-2018	NO CHANGES	–
		Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 402: CHEMICAL DOSING AND AMMOSNIA DESTRUCTION AIR

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_402
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	57 OF117



65CSP681401

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681401-1	65FV6810401	65CSP681401-1/65FV6810401/A	65CSP681401-1/65FV6810401/B	PF/040	NC
65CSP681401-2	SPARE				
65CSP681401-3	65FV6810409	65CSP681401-3/65FV6810409/A	65CSP681401-3/65FV6810409/B	PF-ACD/040	NC
65CSP681401-4	65FV6810406	65CSP681401-4/65FV6810406/A	65CSP681401-4/65FV6810406/B	PF/040	NC
65CSP681401-5	65FV6810403	65CSP681401-5/65FV6810403/A	65CSP681401-5/65FV6810403/B	PF/040	NO
65CSP681401-6	65FV6810413	65CSP681401-6/65FV6810413/A	65CSP681401-6/65FV6810413/B	PF/041	NO
65CSP681401-7	65FV6810414	65CSP681401-7/65FV6810414/A	65CSP681401-7/65FV6810414/B	PF/041	NC
65CSP681401-8	65FV6810415	65CSP681401-8/65FV6810415/A	65CSP681401-8/65FV6810415/B	PF/041	NC
65CSP681401-9	65FV6810417	65CSP681401-9/65FV6810417/A	65CSP681401-9/65FV6810417/B	PF/041	NC
65CSP681401-10	65FV6810418	65CSP681401-10/65FV6810418/A	65CSP681401-10/65FV6810418/B	PF/041	NC
65CSP681401-11	65FV6814012	65CSP681401-11/65FV6814012/A	65CSP681401-11/65FV6814012/B	CA-PF/401	NC
65CSP681401-12	65FV6814013	65CSP681401-12/65FV6814013/A	65CSP681401-12/65FV6814013/B	CA-PF/401	NC

65CSP681402

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681402-1	65FV6810420	65CSP681402-1/65FV6810420/A	65CSP681402-1/65FV6810420/B	PF/041	NO
65CSP681402-2	65FV6810419	65CSP681402-2/65FV6810419/A	65CSP681402-2/65FV6810419/B	PF/041	NC
65CSP681402-3	65FV6810410	65CSP681402-3/65FV6810410/A	65CSP681402-3/65FV6810410/B	PF/041	NC
65CSP681402-4	65FV6810412	65CSP681402-4/65FV6810412/A	65CSP681402-4/65FV6810412/B	PF/041	NC
65CSP681402-5	65FV6814014	65CSP681402-5/65FV6814014/A	65CSP681402-5/65FV6814014/B	CA-PF/401	NC
65CSP681402-6	65FV6814015	65CSP681402-6/65FV6814015/A	65CSP681402-6/65FV6814015/B	CA-PF/401	NC
65CSP681402-7	65FV6810702	65CSP681402-7/65FV6810702/A	65CSP681402-7/65FV6810702/B	UW/070 (PENDING MECH LAYOUT)	NC
65CSP681402-8	65FV6810505	65CSP681402-8/65FV6810505/A	65CSP681402-8/65FV6810505/B	SUMP/050	NC
65CSP681402-9	65FV6810023	65CSP681402-9/65FV6810023/A	65CSP681402-9/65FV6810023/B	TW/AEM	NC
65CSP681402-10	65FV681021	65CSP681402-10/65FV681021/A	65CSP681402-10/65FV681021/B	THERMAL - BOILER FUEL VALVES	NC
65CSP681402-11	65FV681022	65CSP681402-11/65FV681022/A	65CSP681402-11/65FV681022/B	THERMAL - BOILER FUEL VALVES	NC
65CSP681402-12	65FV681023	65CSP681402-12/65FV681023/A	65CSP681402-12/65FV681023/B	THERMAL - BOILER FUEL VALVES	NC

65CSP681403

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681403-1	65FV6813201	65CSP681403-1/65FV6813201/A	65CSP681403-1/65FV6813201/B	ND/320	NO
65CSP681403-2	65FV6813202	65CSP681403-2/65FV6813202/A	65CSP681403-2/65FV6813202/B	ND/320	NC
65CSP681403-3	65FV6813203	65CSP681403-3/65FV6813203/A	65CSP681403-3/65FV6813203/B	ND/320	NC
65CSP681403-4	65FV6813204	65CSP681403-4/65FV6813204/A	65CSP681403-4/65FV6813204/B	ND/320	NC
65CSP681403-5	65FV6813209	65CSP681403-5/65FV6813209/A	65CSP681403-5/65FV6813209/B	ND-ACD/320	NC
65CSP681403-6	65FV6813221	65CSP681403-6/65FV6813221/A	65CSP681403-6/65FV6813221/B	PC/320	NC
65CSP681403-7	65FV6813222	65CSP681403-7/65FV6813222/A	65CSP681403-7/65FV6813222/B	PC/320	NC
65CSP681403-8	65FV6813223	65CSP681403-8/65FV6813223/A	65CSP681403-8/65FV6813223/B	PC/320	NC
65CSP681403-9	65FV6813224	65CSP681403-9/65FV6813224/A	65CSP681403-9/65FV6813224/B	PC/320	NC
65CSP681403-10	65FV6813229	65CSP681403-10/65FV6813229/A	65CSP681403-10/65FV6813229/B	PC-BSE/320	NC
65CSP681403-11	65FV6813109	65CSP681403-11/65FV6813109/A	65CSP681403-11/65FV6813109/B	TSW/310	NC
65CSP681403-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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DRAWING STATUS: AS BUILT

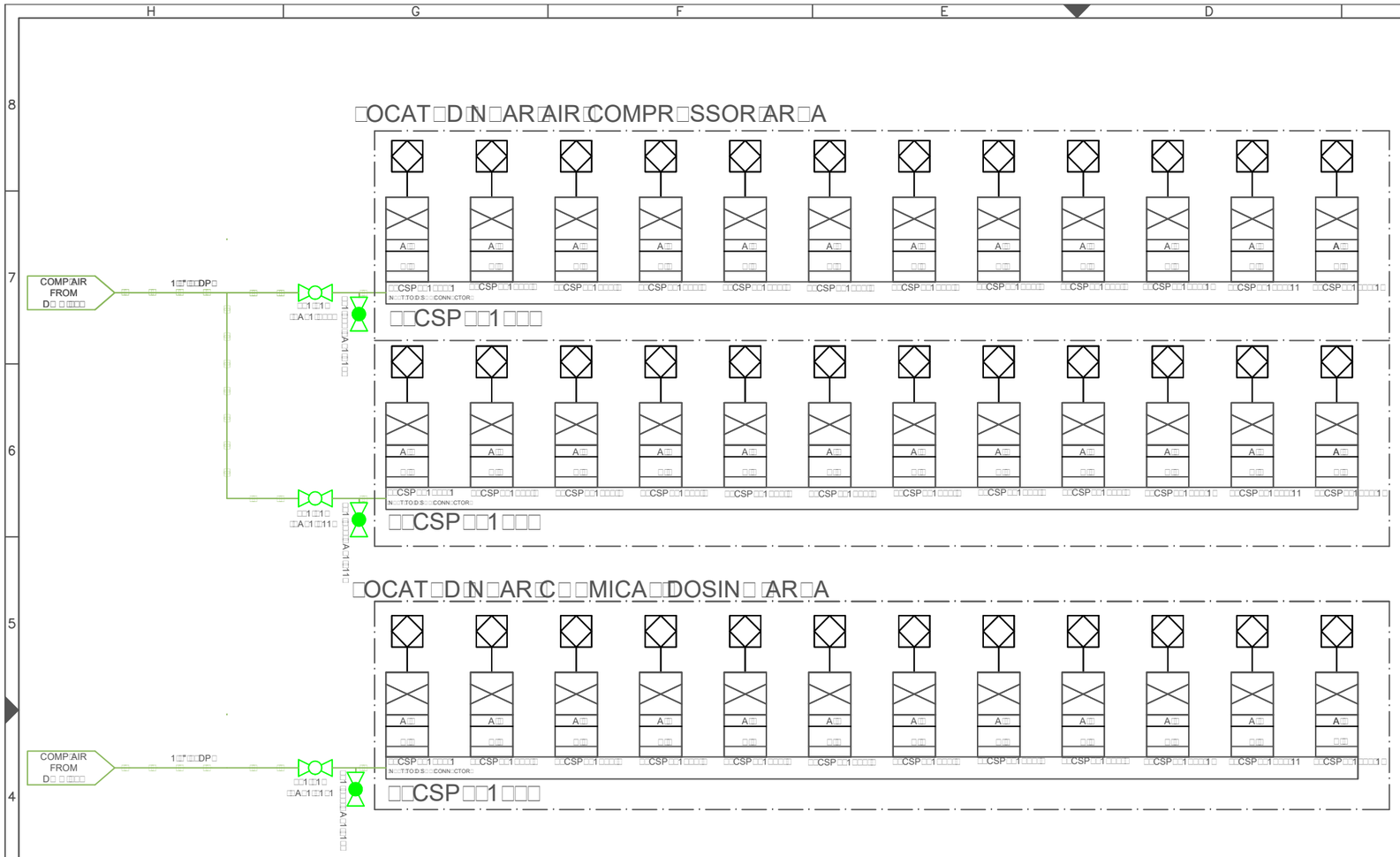
T□IS□DOC□M□NT□M□ODI□S□D□S□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □□IC□□IT□□ AS□ORI□INA□□□□S□PP□□D□T□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	UPDATED SOLENOID VALVE FOR BOILER FUEL VALVES	MLOW
Q	12-FEB-2019	ADDED ABVs ON SUMP LINE AND TREATED WATER DISCHARGE; AS BUILT UPDATE	DKAO

TITLE: (COMMON) 403: COMMON & POST TREATMENT AIR BANKS 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22-FEB-2018	DWG. NO:	
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 58 OF117	



65CSP681404

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681404-1	65FV6813211	65CSP681404-1/65FV6813211/A	65CSP681404-1/65FV6813211/B	AD/321	NC
65CSP681404-2	65FV6813212	65CSP681404-2/65FV6813212/A	65CSP681404-2/65FV6813212/B	AD/321	NC
65CSP681404-3	65FV6813213	65CSP681404-3/65FV6813213/A	65CSP681404-3/65FV6813213/B	AD/321	NC
65CSP681404-4	65FV6813214	65CSP681404-4/65FV6813214/A	65CSP681404-4/65FV6813214/B	AD/321	NO
65CSP681404-5	65FV6813215	65CSP681404-5/65FV6813215/A	65CSP681404-5/65FV6813215/B	AD/321	NC
65CSP681404-6	65FV6813216	65CSP681404-6/65FV6813216/A	65CSP681404-6/65FV6813216/B	AD/321	NO
65CSP681404-7	65FV6813219	65CSP681404-7/65FV6813219/A	65CSP681404-7/65FV6813219/B	AD-BSE/321	NC
65CSP681404-8	65FV6814018	65CSP681404-8/65FV6814018/A	65CSP681404-8/65FV6814018/B	CA-AD/401	NC
65CSP681404-9	65FV6814019	65CSP681404-9/65FV6814019/A	65CSP681404-9/65FV6814019/B	CA-AD/401	NC
65CSP681404-10	65FV6814016	65CSP681404-10/65FV6814016/A	65CSP681404-10/65FV6814016/B	CA-BD/401	NC
65CSP681404-11	65FV6814017	65CSP681404-11/65FV6814017/A	65CSP681404-11/65FV6814017/B	CA-BD/401	NC
65CSP681404-12	65FV6810509	65CSP681404-12/65FV6810509/A	65CSP681404-12/65FV6810509/B	BD/050	NC

65CSP681407

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681407-1	65FV6810503	65CSP681407-1/65FV6810503/A	65CSP681407-1/65FV6810503/B	CR/050	NC
65CSP681407-2	65FV6810511	65CSP681407-2/65FV6810511/A	65CSP681407-2/65FV6810511/B	CR/050	NC
65CSP681407-3	65FV6810512	65CSP681407-3/65FV6810512/A	65CSP681407-3/65FV6810512/B	CR/050	NC
65CSP681407-4	65FV6810504	65CSP681407-4/65FV6810504/A	65CSP681407-4/65FV6810504/B	CR/050	NC
65CSP681407-5	65FV6810411	65CSP681407-5/65FV6810411/A	65CSP681407-5/65FV6810411/B	PF/041	NC
65CSP681407-6	65FV6813239	65CSP681407-6/65FV6813239/A	65CSP681407-6/65FV6813239/B	PE-BSE/323	NC
65CSP681407-7	65FV6813232	65CSP681407-7/65FV6813232/A	65CSP681407-7/65FV6813232/B	PE/323	NO
65CSP681407-8	65FV6813231	65CSP681407-8/65FV6813231/A	65CSP681407-8/65FV6813231/B	PE/323	NO
65CSP681407-9	65FV6810416	65CSP681407-9/65FV6810416/A	65CSP681407-9/65FV6810416/B	PF/041	NC
65CSP681407-10	65FV6810506	65CSP681407-10/65FV6810506/A	65CSP681407-10/65FV6810506/B	BD/050	NO
65CSP681407-11	65FV6810507	65CSP681407-11/65FV6810507/A	65CSP681407-11/65FV6810507/B	BD/050	NO
65CSP681407-12	65FV6810508	65CSP681407-12/65FV6810508/A	65CSP681407-12/65FV6810508/B	BD/050	NC

65CSP681405

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681405-1	65FV6814021	65CSP681405-1/65FV6814021/A	65CSP681405-1/65FV6814021/B	CA-BSE/402	NC
65CSP681405-2	65FV6814025	65CSP681405-2/65FV6814025/A	65CSP681405-2/65FV6814025/B	CA-BSE/402	NC
65CSP681405-3	65FV6814022	65CSP681405-3/65FV6814022/A	65CSP681405-3/65FV6814022/B	CA-ACD/402	NC
65CSP681405-4	65FV6814023	65CSP681405-4/65FV6814023/A	65CSP681405-4/65FV6814023/B	CA-BIO/402	NC
65CSP681405-5	65FV6814024	65CSP681405-5/65FV6814024/A	65CSP681405-5/65FV6814024/B	CA-ATF/402	NC
65CSP681405-6	65FV6810621/65FV6810622	65CSP681405-6/65FV6810621/65FV6810622/A	65CSP681405-6/65FV6810621/65FV6810622/B	BIO/062	NO/NC
65CSP681405-7	65FV6810601	65CSP681405-7/65FV6810601/A	65CSP681405-7/65FV6810601/B	ACD/060	NC
65CSP681405-8	65FV6810641	65CSP681405-8/65FV6810641/A	65CSP681405-8/65FV6810641/B	ATS/064	NC
65CSP681405-9	SPARE				
65CSP681405-10	SPARE				
65CSP681405-11	SPARE				
65CSP681405-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
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DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	17-SEP-2018	NO CHANGES	–
P	16-NOV-2018	UPDATED SOLNEOID TABLE	MLOW
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (COMMON) 404: COMMON & POST TREATMENT AIR BANKS 2

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SNOW	DATE: 22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_404
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	59 OF117

Saltworks

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Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□DN□□□FOR□T□□□P□RPOS□□AND□□□T□□□□NTIT□□FOR □□IC□□IT□□ AS□ORI□INA□□□□S□□PP□□D□□T□□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□□ IT□O□T□T□□□PRIOR□□ RITT□N□P□RMISSION□OF□SA□T□□ ORKS□ DO NOT SCALE DRAWING	LTR	DATE	DESCRIPTION	REV. BY:	TITLE: COVER SHEET
		N	06–JUL–2018	AS MARKED BY REVISION CLOUDS	JLAU	PROJECT: SALTMAKER GEN III — CUSTOMER: AGNICO EAGLE MINES — REVISION: Q
		O	18–OCT–2018	AS MARKED BY REVISION CLOUDS	–	
		P	16–NOV–2018	NO CHANGES	–	PREPARED BY: SN — DATE: 22–FEB–2018 — DWG. NO: COVER SHEET
		Q	12–FEB–2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO	CHECKED BY: XXIAO — DATE: 23–FEB–2018 — JOB/CO NO: (JOB NO.)
						APPROVED BY: APPROVED BY — DATE: APPROVED DATE — SHEET: # OF #

DRA□ IN□ □□IST□1

SHEET NO.	DRAWING NO.	DESCRIPTION
		CO□□R□S□□□T
		DRA□ IN□ □□IST□1
		DRA□ IN□ □□IST□□
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		COMMON
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SHEET NO.	DRAWING NO.	DESCRIPTION
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□ON□□□FOR□T□□□P□RPOS□□AND□□□T□□□NTIT□□FOR □ □IC□□IT□□ AS□ORI□INA□□□□S□PP□I□D□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: DRAWING LIST 1	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

DRA□ IN□ □□IST□□

SHEET NO.	DRAWING NO.	DESCRIPTION
□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□□1□□ □□□TRACT□AND□CIP□AIR
□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	P□□□□PR□□□NTION□P□MP□AIR
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□□	S□ □□N□SM□A□M□□1□PID□COMPR□SS□D AIR□SM1□D□ □ □□1□	□TI□IT□□AIR
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N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 2

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22-FEB-2018	DWG. NO: DRAWING LIST 2	
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
F□□ID
SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
AR□A□COD□□
□A□□□SI□□
S□□□□NTIA□N□M□□R
□A□□□T□P□

VALVE SIZE CONVERSION

MM		INCH
□□□	□	1□□
□1□	□	1□□
□□□	□	1
□□□	□	□
1□□	□	□
1□□	□	□

VALVE TYPE CONVERSION

□A1□ □□□ □A□□□A□□□
□A□□ □□□ TO□□□□A□□□A□□□
□F□□ □□□ TO□□□□□TT□RF□□□A□□□
□□C□PT□T□OS□NOT□D"NON□TO□□□"□
CK□□ □□□ C□□CK□A□□□
□A□□ □□□ □AT□□A□□□

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Richmond, BC, Canada, V6W 1A8
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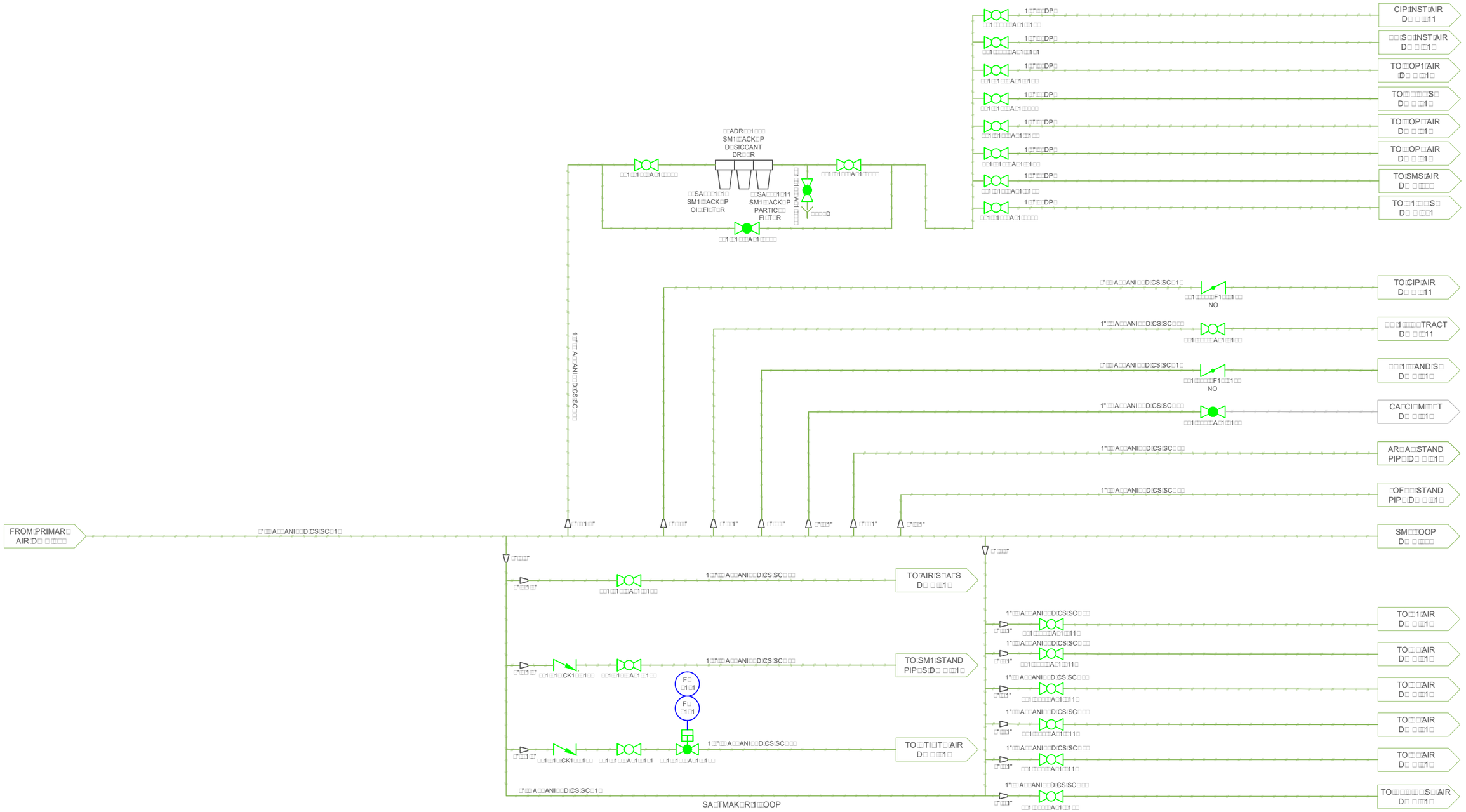
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N	06–JUL–2018	PINCH VALVE LEGEND ADDED	JLAU
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

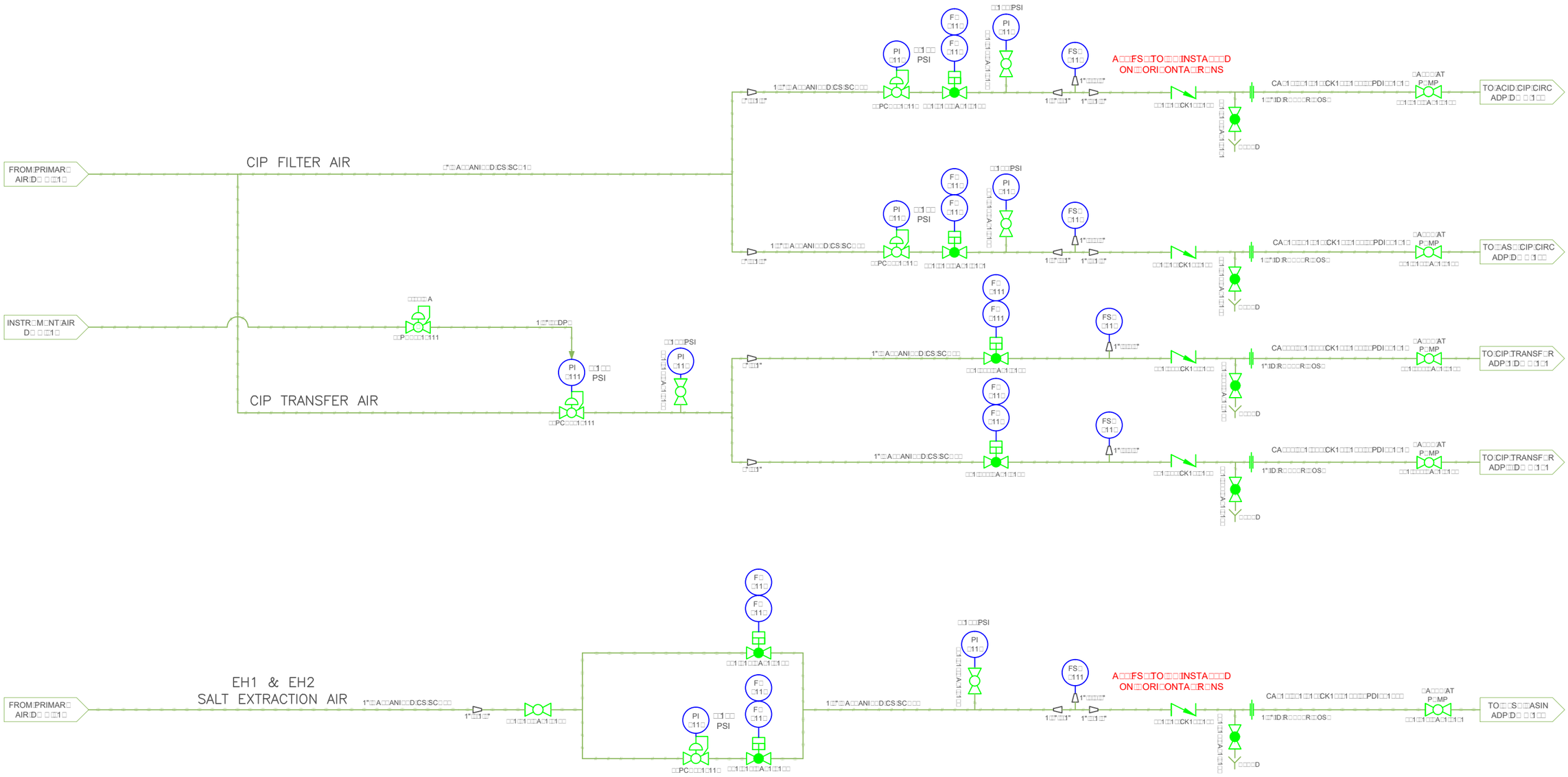
TITLE: LEGEND

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	LEGEND	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	# OF #	



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		O	18-OCT-2018	NO CHANGES	–
		P	16-NOV-2018	NO CHANGES	–
		Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 410: SM1 INSTRUMENT AND PROCESS AIR			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: SN	DATE: 22-FEB-2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_410	
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 60 OF117	



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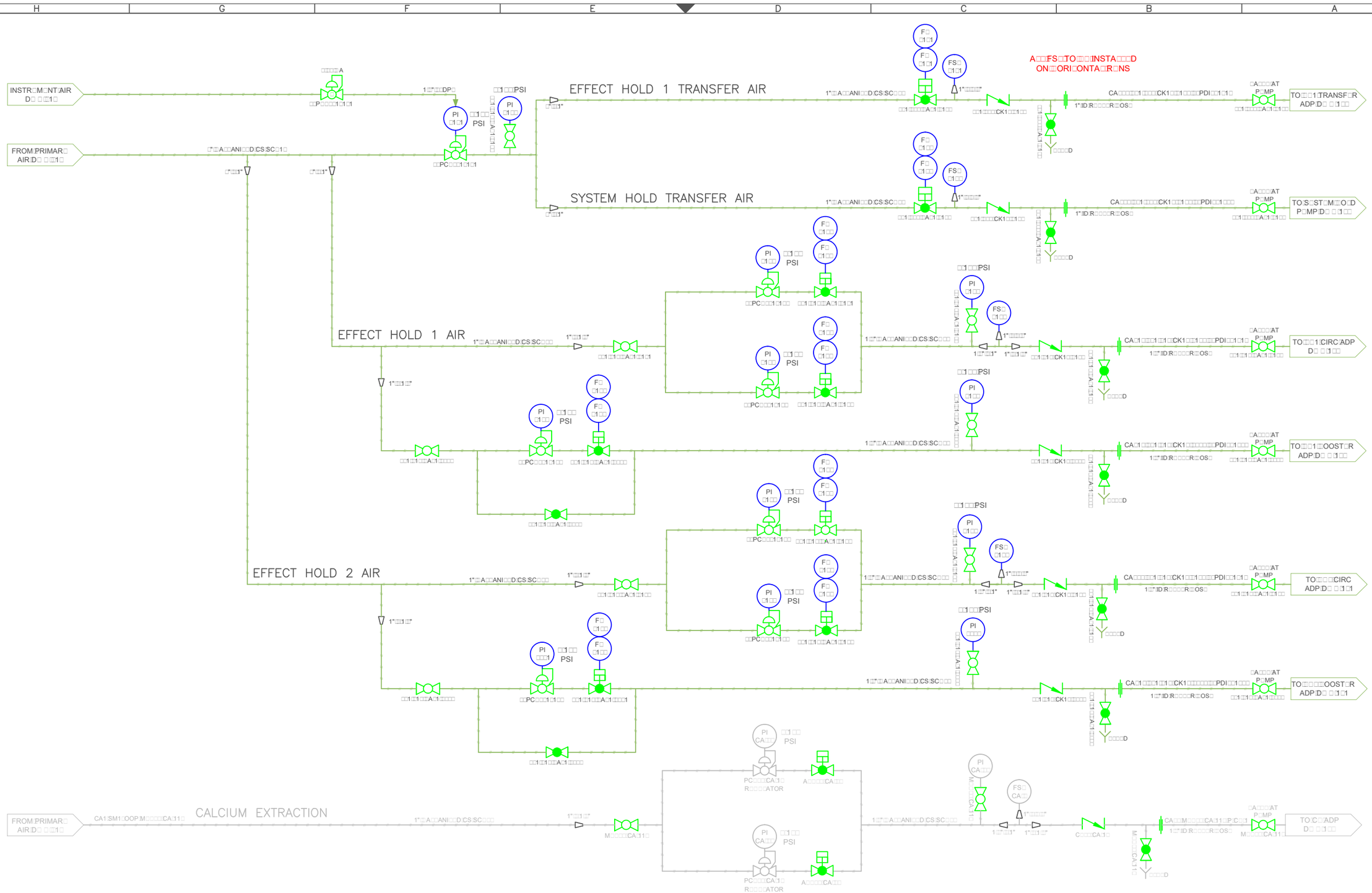
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P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

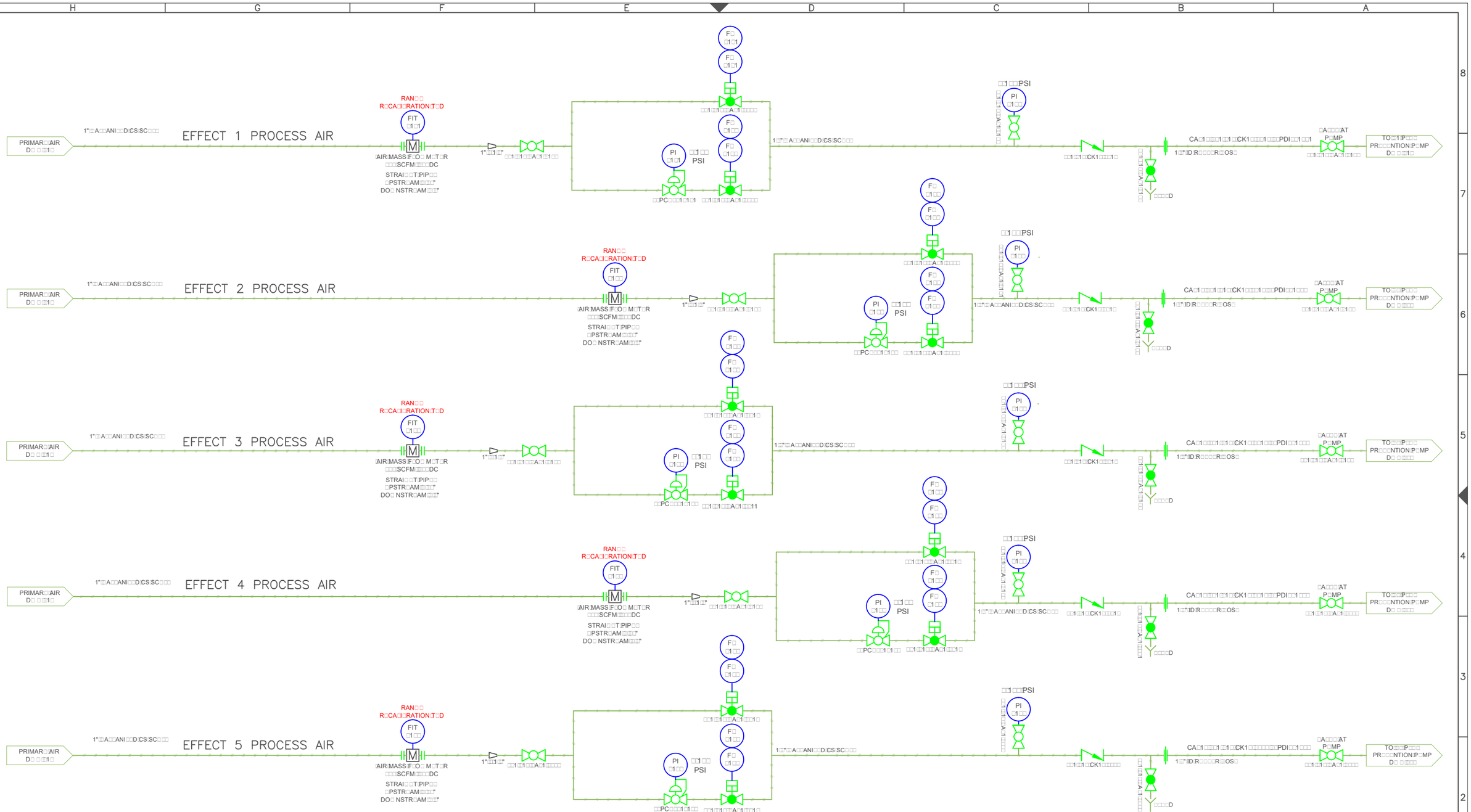
TITLE: (SM1) 411: EH1/EH2 EXTRACT AND CIP AIR

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_411
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO:	(JOB NO.)
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET:	61 OF117



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		O	18–OCT–2018	NO CHANGES	–	
		P	16–NOV–2018	NO CHANGES	–	
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO	

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_412	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 62 OF117	

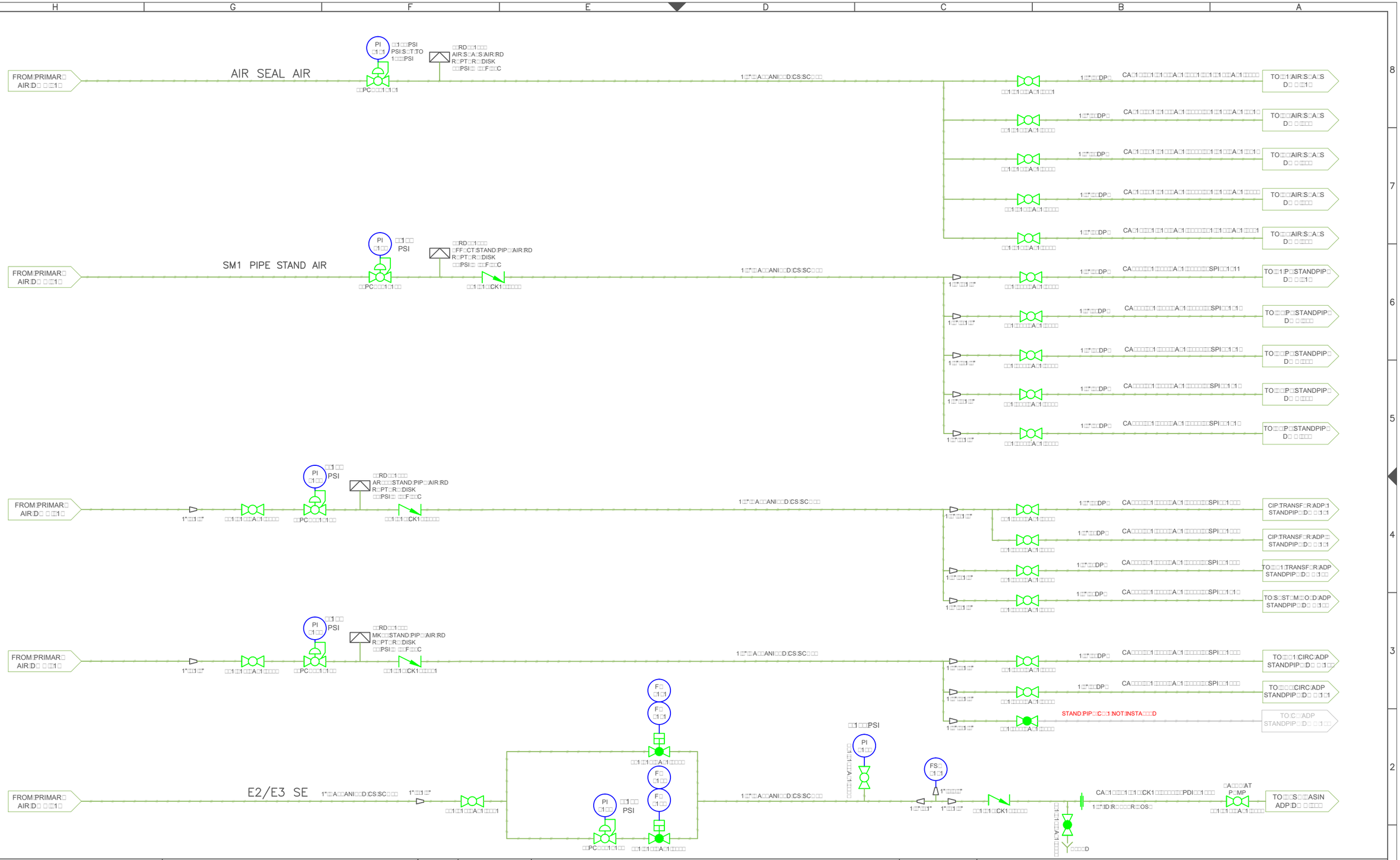


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		O	18–OCT–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
DO NOT SCALE DRAWING		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

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Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

TITLE: (SM1) 413: EFFECT PUMP COMPRESSED AIR

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
		REVISION	Q
PREPARED BY:	SN	DATE:	22–FEB–2018
CHECKED BY:	XXIAO	DATE:	23–FEB–2018
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
DWG. NO:	SW_EN_SM_GEN III_PID_DWG_413		
JOB/CO NO:	(JOB NO.)		
SHEET:	63 OF117		



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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	RUPTURE DISK CONFIRMED	JLAU
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 414: SM1 AIR SEAL, PIPE STAND, AND E2/E3 SE AIR

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_414	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 64 OF117	

SM1
UTILITY AIR LINE DROPS

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DRAWING STATUS: AS BUILT

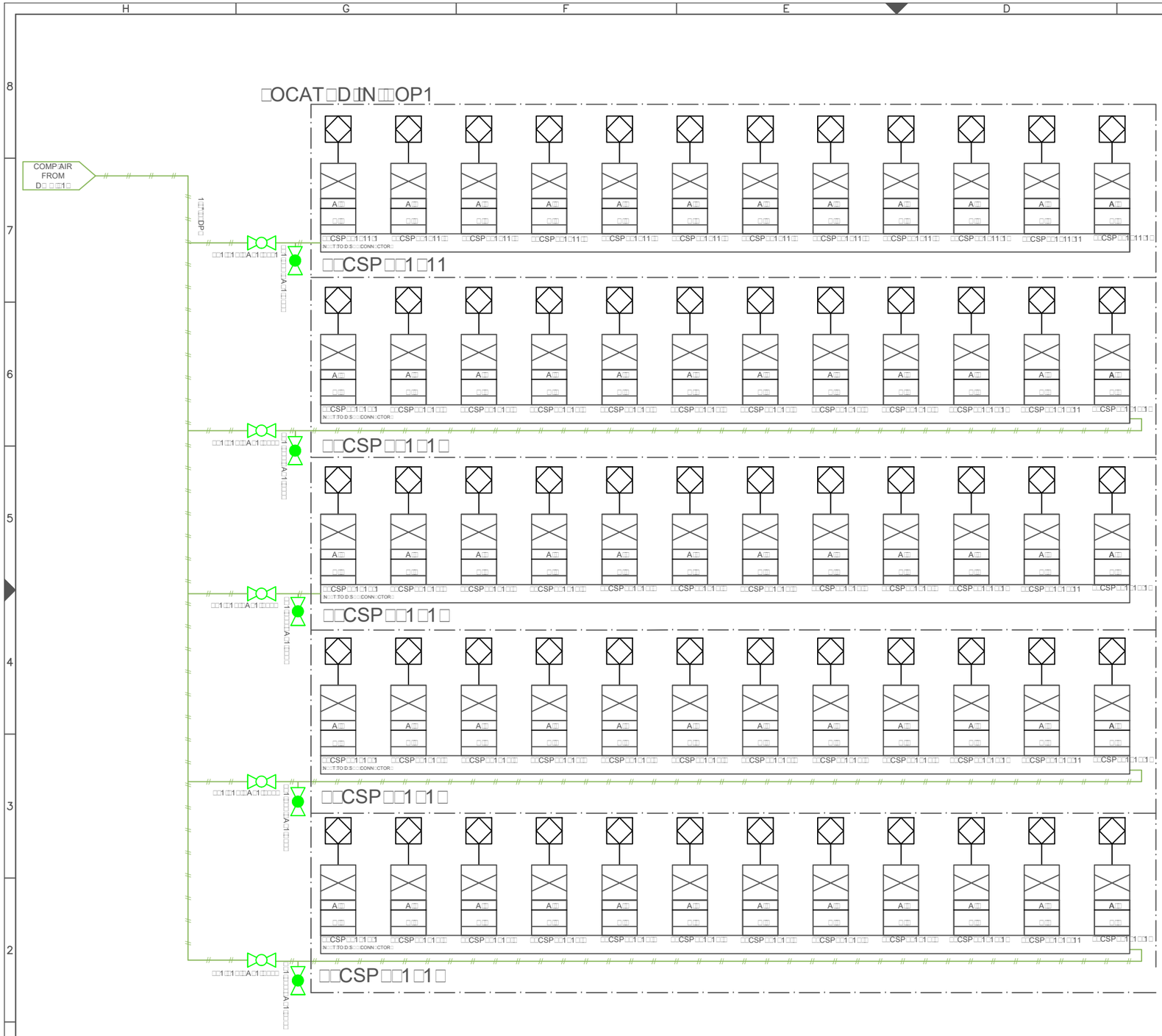
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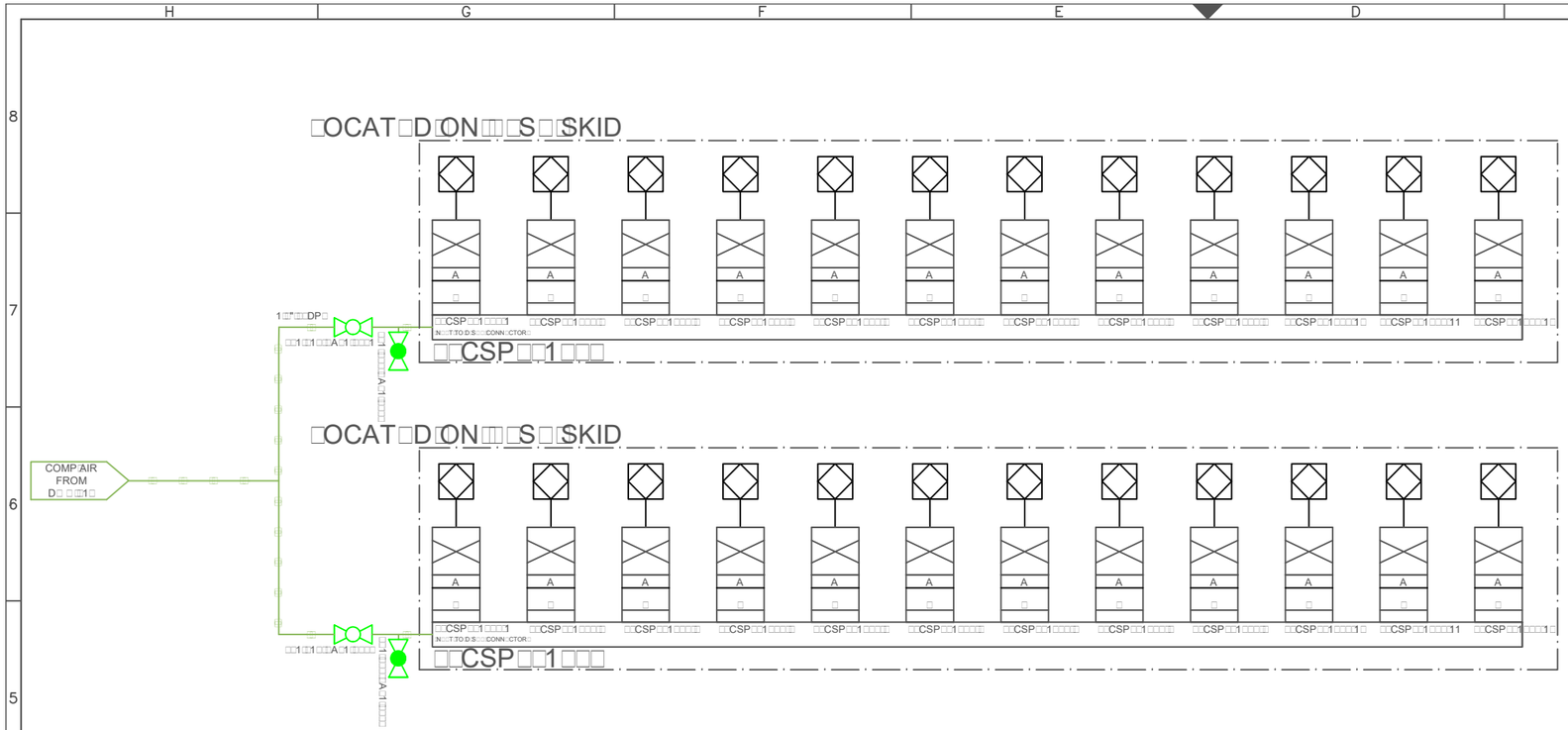
DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 415: SM1 UTILITY AIR

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_415	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	65 OF117	


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65CSP681423

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681423-1	65FV6812221	65CSP681423-1/65FV6812221/A	65CSP681423-1/65FV6812221/B	E2SE/222	NC
65CSP681423-2	65FV6812222	65CSP681423-2/65FV6812222/A	65CSP681423-2/65FV6812222/B	E2SE/222	NC
65CSP681423-3	65FV6812223	65CSP681423-3/65FV6812223/A	65CSP681423-3/65FV6812223/B	E2SE/222	NC
65CSP681423-4	65FV6812224	65CSP681423-4/65FV6812224/A	65CSP681423-4/65FV6812224/B	E2SE/222	NC
65CSP681423-5	65FV6812225	65CSP681423-5/65FV6812225/A	65CSP681423-5/65FV6812225/B	E2SE/222	NC
65CSP681423-6	65FV6812226	65CSP681423-6/65FV6812226/A	65CSP681423-6/65FV6812226/B	E2SE/222	NO
65CSP681423-7	SPARE				
65CSP681423-8	SPARE				
65CSP681423-9	SPARE				
65CSP681423-10	SPARE				
65CSP681423-11	SPARE				
65CSP681423-12	SPARE				

65CSP681424

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681424-1	65FV6812321	65CSP681424-1/65FV6812321/A	65CSP681424-1/65FV6812321/B	E3SE/232	NC
65CSP681424-2	65FV6812322	65CSP681424-2/65FV6812322/A	65CSP681424-2/65FV6812322/B	E3SE/232	NC
65CSP681424-3	65FV6812323	65CSP681424-3/65FV6812323/A	65CSP681424-3/65FV6812323/B	E3SE/232	NC
65CSP681424-4	65FV6812324	65CSP681424-4/65FV6812324/A	65CSP681424-4/65FV6812324/B	E3SE/232	NC
65CSP681424-5	65FV6812325	65CSP681424-5/65FV6812325/A	65CSP681424-5/65FV6812325/B	E3SE/232	NC
65CSP681424-6	65FV6812326	65CSP681424-6/65FV6812326/A	65CSP681424-6/65FV6812326/B	E3SE/232	NO
65CSP681424-7	65FV6812227	65CSP681424-7/65FV6812227/A	65CSP681424-7/65FV6812227/B	E2SE/222	NO
65CSP681424-8	65FV6812228	65CSP681424-8/65FV6812228/A	65CSP681424-8/65FV6812228/B	E2SE/222	NC
65CSP681424-9	65FV6814141	65CSP681423-7/65FV6814141/A	65CSP681423-7/65FV6814141/B	CA-E2SE/414	NC
65CSP681424-10	65FV6814142	65CSP681423-8/65FV6814142/A	65CSP681423-8/65FV6814142/B	CA-E2SE/414	NC
65CSP681424-11	SPARE				
65CSP681424-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

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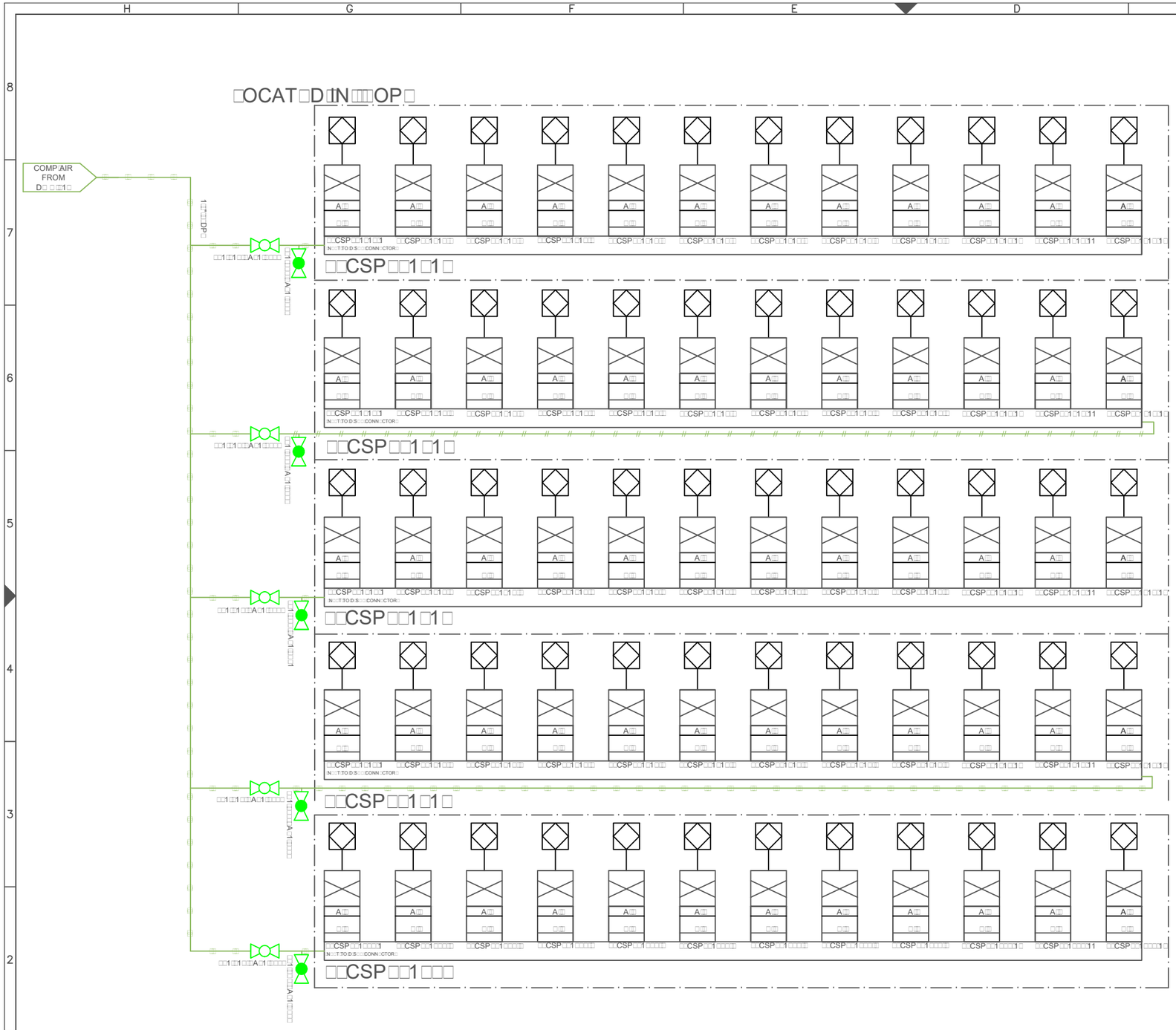
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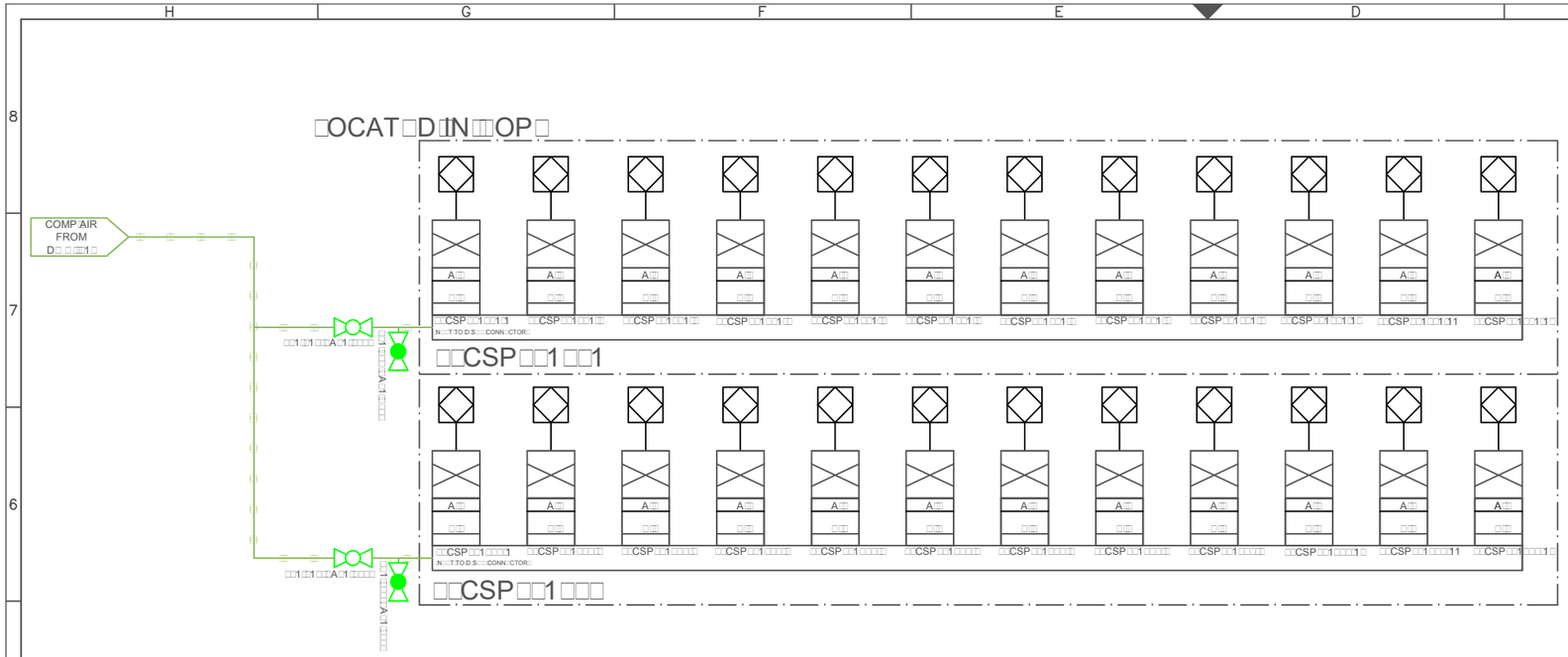
DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 417: E2/E3 SE AIR SOLENOID BANK

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_417	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 67 OF117	


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65CSP681421

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681421-1	65FV6812502	65CSP681421-1/65FV6812502/A	65CSP681421-1/65FV6812502/B	E5/250	NC
65CSP681421-2	65FV6812503	65CSP681421-2/65FV6812503/A	65CSP681421-2/65FV6812503/B	E5/250	NC
65CSP681421-3	65FV6812504	65CSP681421-3/65FV6812504/A	65CSP681421-3/65FV6812504/B	E5/250	NC
65CSP681421-4	65FV6812505	65CSP681421-4/65FV6812505/A	65CSP681421-4/65FV6812505/B	E5/250	NC
65CSP681421-5	65FV6812506	65CSP681421-5/65FV6812506/A	65CSP681421-5/65FV6812506/B	E5/250	NO
65CSP681421-6	65FV6812507	65CSP681421-6/65FV6812507/A	65CSP681421-6/65FV6812507/B	E5/250	NC
65CSP681421-7	65FV6812508	65CSP681421-7/65FV6812508/A	65CSP681421-7/65FV6812508/B	E5/250	NC
65CSP681421-8	65FV6812501	65CSP681421-8/65FV6812501/A	65CSP681421-8/65FV6812501/B	E5/250	NC
65CSP681421-9	65FV6811101	65CSP681421-9/65FV6811101/A	65CSP681421-9/65FV6811101/B	HX/110	NO
65CSP681421-10	65FV6811102	65CSP681421-10/65FV6811102/A	65CSP681421-10/65FV6811102/B	HX/110	NC
65CSP681421-11	65FV6812511	65CSP681421-11/65FV6812511/A	65CSP681421-11/65FV6812511/B	E5/250	NO
65CSP681421-12	65FV6812512	65CSP681421-12/65FV6812512/A	65CSP681421-12/65FV6812512/B	E5/250	NC

65CSP681422

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681422-1	65FV6812513	65CSP681422-1/65FV6812513/A	65CSP681422-1/65FV6812513/B	E5/250	NC
65CSP681422-2	65FV6812514	65CSP681422-2/65FV6812514/A	65CSP681422-2/65FV6812514/B	E5/250	NC
65CSP681422-3	65FV6814139	65CSP681422-3/65FV6814139/A	65CSP681422-3/65FV6814139/B	CA-E5/413	NC
65CSP681422-4	65FV6814130	65CSP681422-4/65FV6814130/A	65CSP681422-4/65FV6814130/B	CA-E5/413	NC
65CSP681422-5	65FV6812516	65CSP681422-5/65FV6812516/A	65CSP681422-5/65FV6812516/B	E5/253	NC
65CSP681422-6	TBD - VALVE MAY NOT EXIST				
65CSP681422-7	65FV6811103	65CSP681422-7/65FV6811103/A	65CSP681422-7/65FV6811103/B	HX/110	NO
65CSP681422-8	65FV6811104	65CSP681422-8/65FV6811104/A	65CSP681422-8/65FV6811104/B	HX/110	NO
65CSP681422-9	65FV6811105	65CSP681422-9/65FV6811105/A	65CSP681422-9/65FV6811105/B	HX/110	NO
65CSP681422-10	65FV6811106	65CSP681422-10/65FV6811106/A	65CSP681422-10/65FV6811106/B	HX/110	NC
65CSP681422-11	65FV6811107	65CSP681422-11/65FV6811107/A	65CSP681422-11/65FV6811107/B	HX/110	NC
65CSP681422-12	65FV6811108	65CSP681422-12/65FV6811108/A	65CSP681422-12/65FV6811108/B	HX/110	NC

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

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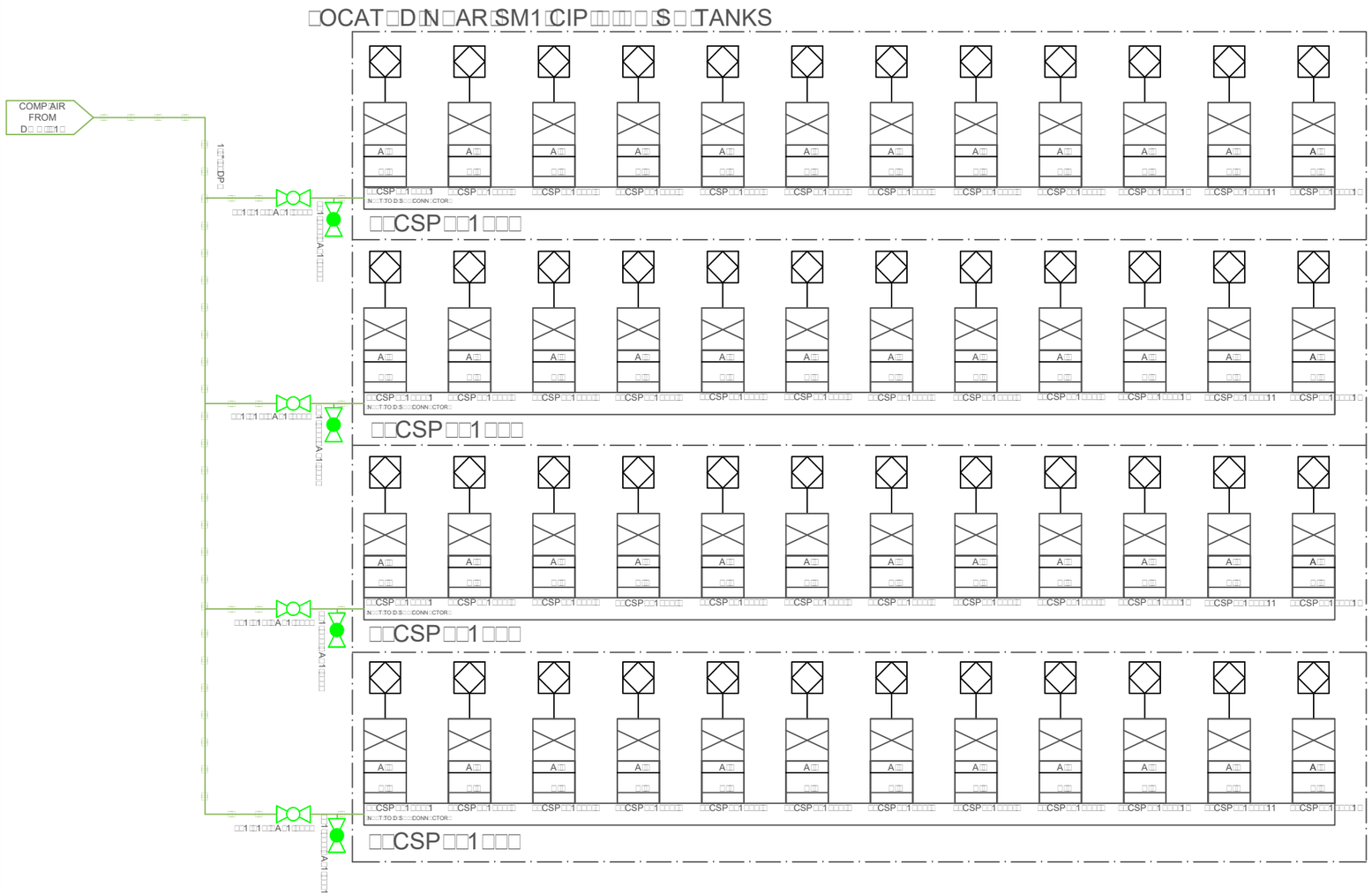
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	ADDED HEX BACKFLUSH SYSTEM; AS BUILT UPDATE	DKAO

TITLE: (SM1) 419: BOP3 AIR BANK

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_419	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 69 OF117	



RESERVE PHYSICAL AND ELECTRICAL SPACE FOR 1 ADDITIONAL BANK

65CSP681425

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM	NO/NC
65CSP681425-1	65FV6811505	65CSP681425-1/65FV6811505/A	65CSP681425-1/65FV6811505/B	CIP/150	NC
65CSP681425-2	65FV6811511	65CSP681425-2/65FV6811511/A	65CSP681425-2/65FV6811511/B	CIP/150	NC
65CSP681425-3	65FV6811501	65CSP681425-3/65FV6811501/A	65CSP681425-3/65FV6811501/B	CIP/150	NC
65CSP681425-4	65FV6811502	65CSP681425-4/65FV6811502/A	65CSP681425-4/65FV6811502/B	CIP/150	NC
65CSP681425-5	SPARE				
65CSP681425-6	65FV6811504	65CSP681425-6/65FV6811504/A	65CSP681425-6/65FV6811504/B	CIP/150	NO
65CSP681425-7	65FV6811506	65CSP681425-7/65FV6811506/A	65CSP681425-7/65FV6811506/B	CIP/150	NC
65CSP681425-8	65FV6811507	65CSP681425-8/65FV6811507/A	65CSP681425-8/65FV6811507/B	CIP/150	NC
65CSP681425-9	SPARE				
65CSP681425-10	65FV6811508	65CSP681425-10/65FV6811508/A	65CSP681425-10/65FV6811508/B	CIP/150	NC
65CSP681425-11	65FV6811510	65CSP681425-11/65FV6811510/A	65CSP681425-11/65FV6811510/B	CIP/150	NO
65CSP681425-12	65FV6811512	65CSP681425-12/65FV6811512/A	65CSP681425-12/65FV6811512/B	CIP/150	NC

65CSP681426

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM	NO/NC
65CSP681426-1	SPARE				
65CSP681426-2	SPARE				
65CSP681426-3	65FV6811518	65CSP681426-3/65FV6811518/A	65CSP681426-3/65FV6811518/B	CIP-UW/150	NC
65CSP681426-4	65FV6811519	65CSP681426-4/65FV6811519/A	65CSP681426-4/65FV6811519/B	CIP-UW/150	NC
65CSP681426-5	65FV6811523	65CSP681426-5/65FV6811523/A	65CSP681426-5/65FV6811523/B	CIP/151	NC
65CSP681426-6	65FV6811525	65CSP681426-6/65FV6811525/A	65CSP681426-6/65FV6811525/B	CIP/151	NC
65CSP681426-7	65FV6811524	65CSP681426-7/65FV6811524/A	65CSP681426-7/65FV6811524/B	CIP/151	NC
65CSP681426-8	65FV6811526	65CSP681426-8/65FV6811526/A	65CSP681426-8/65FV6811526/B	CIP/151	NC
65CSP681426-9	65FV6814111	65CSP681426-9/65FV6814111/A	65CSP681426-9/65FV6814111/B	CA-CIP/411	NC
65CSP681426-10	65FV6814112	65CSP681426-10/65FV6814112/A	65CSP681426-10/65FV6814112/B	CA-CIP/411	NC
65CSP681426-11	65FV6814113	65CSP681426-11/65FV6814113/A	65CSP681426-11/65FV6814113/B	CA-CIP/411	NC
65CSP681426-12	65FV6814114	65CSP681426-12/65FV6814114/A	65CSP681426-12/65FV6814114/B	CA-CIP/411	NC

65CSP681427

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM	NO/NC
65CSP681427-1	65FV6811601	65CSP681427-1/65FV6811601/A	65CSP681427-1/65FV6811601/B	H1/160	NC
65CSP681427-2	65FV6811604	65CSP681427-2/65FV6811604/A	65CSP681427-2/65FV6811604/B	H1/160	NC
65CSP681427-3	65FV6811600	65CSP681427-3/65FV6811600/A	65CSP681427-3/65FV6811600/B	H1/160	NC
65CSP681427-4	65FV6814127	65CSP681427-4/65FV6814127/A	65CSP681427-4/65FV6814127/B	CA-H1/412	NC
65CSP681427-5	65FV6811605	65CSP681427-5/65FV6811605/A	65CSP681427-5/65FV6811605/B	H1/160	NC
65CSP681427-6	65FV6814121	65CSP681427-6/65FV6814121/A	65CSP681427-6/65FV6814121/B	CA-H1/412	NC
65CSP681427-7	65FV6814123	65CSP681427-7/65FV6814123/A	65CSP681427-7/65FV6814123/B	CA-H1/412	NC
65CSP681427-8	65FV6814124	65CSP681427-8/65FV6814124/A	65CSP681427-8/65FV6814124/B	CA-H1/412	NC
65CSP681427-9	65FV6811610	65CSP681427-9/65FV6811610/A	65CSP681427-9/65FV6811610/B	H2/161	NC
65CSP681427-10	65FV6811611	65CSP681427-10/65FV6811611/A	65CSP681427-10/65FV6811611/B	H2/161	NC
65CSP681427-11	65FV6811614	65CSP681427-11/65FV6811614/A	65CSP681427-11/65FV6811614/B	H2/161	NC
65CSP681427-12	65FV6814125	65CSP681427-12/65FV6814125/A	65CSP681427-12/65FV6814125/B	CA-H2/412	NC

65CSP681428

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM	NO/NC
65CSP681428-1	65FV6814126	65CSP681428-1/65FV6814126/A	65CSP681428-1/65FV6814126/B	CA-H2/412	NC
65CSP681428-2	65FV6811621	65CSP681428-2/65FV6811621/A	65CSP681428-2/65FV6811621/B	SY/162	NC
65CSP681428-3	65FV6811625	65CSP681428-3/65FV6811625/A	65CSP681428-3/65FV6811625/B	SY/162	NC
65CSP681428-4	65FV6811627	65CSP681428-4/65FV6811627/A	65CSP681428-4/65FV6811627/B	SY/162	NC
65CSP681428-5	65FV6811628	65CSP681428-5/65FV6811628/A	65CSP681428-5/65FV6811628/B	SY/162	NC
65CSP681428-6	65FV6811629	65CSP681428-6/65FV6811629/A	65CSP681428-6/65FV6811629/B	SY/162	NC
65CSP681428-7	65FV6814122	65CSP681428-7/65FV6814122/A	65CSP681428-7/65FV6814122/B	CA-SY/412	NC
65CSP681428-8	65FV6814128	65CSP681428-8/65FV6814128/A	65CSP681428-8/65FV6814128/B	CA-H2/412	NC
65CSP681428-9	SPARE				
65CSP681428-10	SPARE				
65CSP681428-11	SPARE				
65CSP681428-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

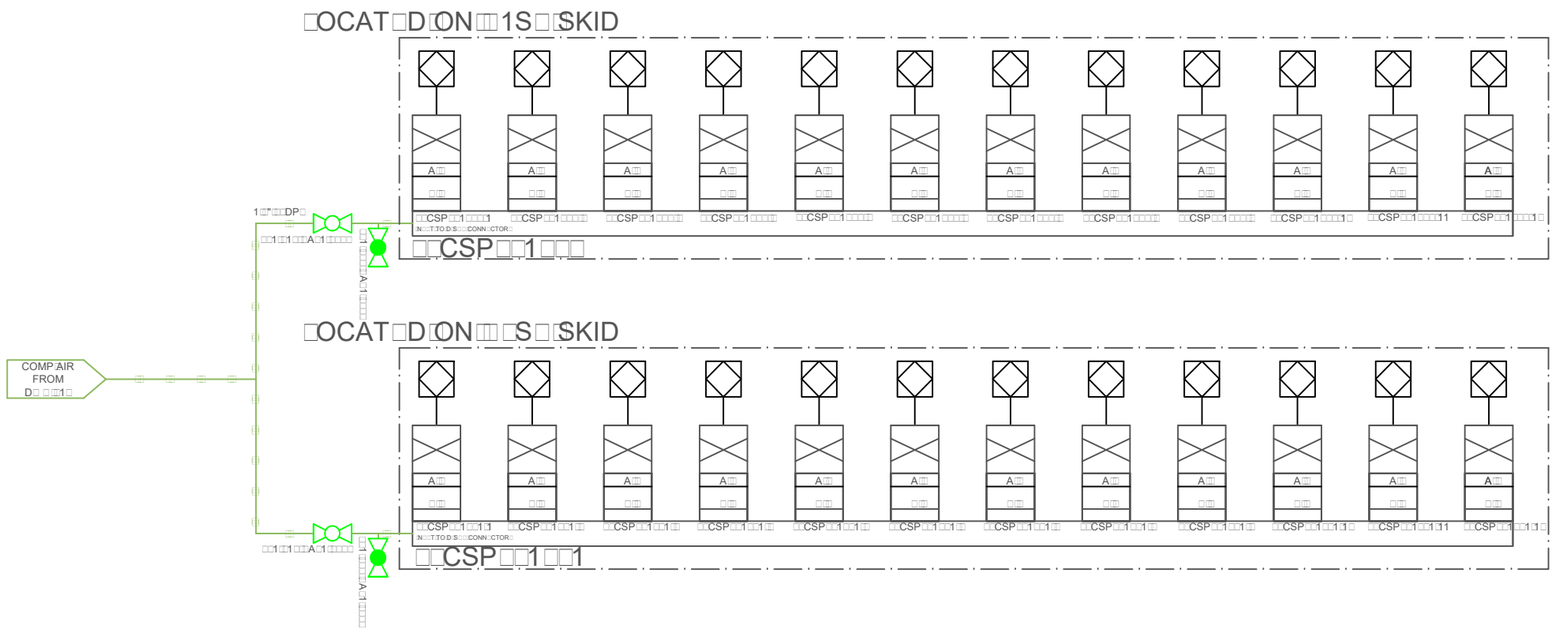
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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	UPDATED SOLENOID TABLE	JLAU
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM1) 420: CIP & EH/SH AIR BANK

PROJECT:	SALTMAKER GEN III			CUSTOMER:	AGNICO EAGLE MINES
				REVISION	Q
PREPARED BY:	SN	DATE:	22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_420
CHECKED BY:	XXIAO	DATE:	23-FEB-2018	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	70 OF117


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Saltworks

AGNICO EAGLE MINES
PID DRAIN PACKAGE

COMPRESSED AIR SYSTEM
REVISION

Saltworks 13800 Steveston Hwy Richmond, BC, Canada, V6W 1A8 Tel: 604.628.6508 Fax: 604.676.2463 www.saltworkstech.com	DRAWING STATUS: AS BUILT THIS DOCUMENT AND ODIS DESIGNS AND INFORMATION THAT ARE PROPRIETARY TO SALTWORKS IT IS TO BE USED FOR THE PURPOSE AND PROJECT NTIT FOR DISCLOSURE IT AS ORIGINALLY SUPPLIED DOCUMENT AND NOT DUPLICATED OR DISCLOSED TO OTHER PERSON OR ENTITY FOR MANUFACTURE OF THIS ITEM IN PART OR IN WHOLE WITHOUT PRIOR WRITTEN PERMISSION OF SALTWORKS DO NOT SCALE DRAWING				

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	AS MARKED BY REVISION CLOUDS	JLAU
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS MARKED BY REVISION CLOUDS; AS BUILT UPDATE	DKAO

TITLE:	COVER SHEET		
PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
		REVISION	Q
PREPARED BY:	SN	DATE:	22-FEB-2018
CHECKED BY:	XXIAO	DATE:	23-FEB-2018
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
DWG. NO:	COVER SHEET		
JOB/CO NO:	(JOB NO.)		
SHEET:	# OF #		

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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
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DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: DRAWING LIST 1

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: DRAWING LIST 1	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

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SHEET NO.	DRAWING NO.	DESCRIPTION
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Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

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DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE:

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22-FEB-2018	DWG. NO: DRAWING LIST 2	
CHECKED BY: XXIAO	DATE: 23-FEB-2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: # OF #	

VALVES

- MANUAL BALL (MBV) – NORMALLY CLOSED
- MANUAL BALL (MBV) – NORMALLY OPEN
- CHECK (CV)
- GATE (GV)
- BUTTERFLY (BFV)
- PRESSURE RELIEF VALVE (PRV)
- FLOAT VALVE (FV)
- DIAPHRAGM (DV)
- NEEDLE (NV)
- 3–WAY
- 3–WAY SOLENOID
- 4–WAY SOLENOID
- 4–FUNCTION VALVE
- FOOT VALVE

N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

CONTROL VALVES/ACTUATORS

- PRESSURE CONTROL VALVE (PCV) WITH PRESSURE GAUGE
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY CLOSED
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN
- DOUBLE ACTING ACTUATED BALL VALVE (ABV) – NORMALLY OPEN WITH PINCH VALVES
- SOLENOID VALVE (SV)
- SOLENOID VALVE (SV)
- MOTORIZED ACTUATOR
- MOTORIZED ACTUATOR WITH MANUAL OVERRIDE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH LIMIT STOP
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO CLOSE
- DOUBLE ACTING DIAPHRAGM ACTUATOR WITH SPRING TO OPEN
- AIR OPERATOR W/POSITIONER

EQUIPMENT SYMBOL

- MIXER OR AGITATOR (MX)
- INLINE STATIC MIXER
- HEATER (HE)
- ELECTRIC HEATER (EH)
- INJECTION QUILL
- EDUCTOR/EJECTOR (ED)
- POSITIVE DISPLACEMENT PUMP W/MANUAL STROKE ADJUSTMENT (MP)
- POSITIVE DISPLACEMENT PUMP W/ELECTRIC STROKE ADJUSTMENT (MP)
- ROTARY COMPRESSER OR BLOWER
- AIR FILTER
- BLOWER OR FAN (BW OR FN)
- VACUUM PUMP (VP)
- DIAPHRAGM PUMP (P)
- CENTRIFUGAL PUMP (P)
- HIGH PRESSURE PUMP (P)
- DESICCANT BREATHER
- VENT PIPE
- Y–STRAINER
- RUPTURE DISC
- DIAPHRAGM SEAL
- STANDPIPE (SP)
- CALIBRATION COLUMN (CC)
- AIR COMPRESSOR (AC)
- PNEUMATIC VIBRATOR (VIB)

- RO/UF MODULE
- FILTER – BASKET (BAF)
- FILTER (F) HOUSING
- CLOSED TOP TANK (TK)
- CONE BOTTOM TANK (TK)
- OPEN TOP TANK (TK) WITH COVER
- PLATE HEAT EXCHANGER (HX)
- SHELL AND TUBE HEAT EXCHANGER (HX)
- CONE CONSTRAINER (CSTR)
- PERISTALTIC HOSE PUMP (P)
- FLEXIBLE CONNECTION

MISCELLANEOUS SYMBOLS

- LINE, EQUIPMENT OR PRODUCT REFERENCES INTO OR LEAVING DWG.
- TIE IN TO PIPING BY OTHERS
- 304 | CPVC — PIPING MATERIAL SPEC. BREAK

SOLENOID VALVE OPERATION

3–WAY: FAIL OPEN TO PATH A–C

4–WAY: FAIL OPEN TO PATHS A–C AND D–B

- AIR SUPPLY
- NITROGEN SUPPLY
- CONCENTRIC REDUCING
- ECCENTRIC REDUCING
- ENCLOSURE (CAP)
- FLANGE
- END CLOSURE (BLIND FLANGE)
- END CLOSURE (VIC PLUG)
- QUICK DISCONNECT
- UNION
- SANITARY CONNECTION
- FLOOR DRAIN OR SUMP
- BULKHEAD
- EXPANSION JOINT

FILL SYMBOLS

- SPLASH FILL
- FILM FILL
- NET FILL

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL (ANALOG)
- PNEUMATIC SIGNAL (DIGITAL)
- ELECTRICAL SIGNAL (ANALOG – 4–20mA OR 1–10 VDC)
- ELECTRICAL SIGNAL (FREQUENCY OR PULSE)
- CAPILLARY TUBING (FILLED TUBING)
- CONNECTION TO PROCESS, OR INSTRUMENT SUPPLY

FLUID LINE SYMBOLS

- EFFECT 1 BRINE (90°C)
- EFFECT 2 BRINE (75°C)
- EFFECT 3 BRINE (60°C)
- EFFECT 4 BRINE (45°C)
- EFFECT 5 BRINE (30°C)
- CIP
- RAW FEED
- CONDENSED WATER (70°C – 40°C)
- THERMAL LOOP (GYLCOL)
- EVAPORATE
- COMPRESSED AIR LINE
- ACID DOSING
- BASE DOSING
- ANTIFOAM
- BIOFILM TREATMENT SOLUTION

MISCELLANEOUS LINE SYMBOLS

- SYSTEM BOUNDARY

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED
- PANEL MOUNTED (MAIN OR REMOTE)
- SHARED DISPLAY (CRT) AND/OR SHARED CONTROL

CONTROL SYMBOLS

- DI — DISCRETE INPUT TO PLC
- DO — DISCRETE OUTPUT FROM PLC
- AI — ANALOG INPUT TO PLC
- AO — ANALOG OUTPUT FROM PLC

EQUIPMENT IDENTIFICATION

M – MOTOR
AS – AIR SEAL
VFD – VARIABLE FREQUENCY DRIVE
DRY – DRYER

MODULE IDENTIFICATION

EVP – EVAPORATOR MODULE
RAD – RADIATOR MODULE
FAN – FAN MODULE

MATERIAL ABBREVIATIONS

PP – POLYPROPYLENE
PVC – POLYVINYL CHLORIDE
UPVC – POLYVINYL CHLORIDE
P – POLYVINYL CHLORIDE (IN LINE NUMBER)
CPVC – CHLORINATED POLYVINYL CHLORIDE
C – CHLORINATED POLYVINYL CHLORIDE (IN LINE NUMBER)
HDPE – HIGH DENSITY POLYETHYLENE
PVDF – POLYVINYLIDENE FLUORIDE
PVFB – PVDF BEADLESS & CREVICE FREE
PVFL – PVDF LINED
PTFE – TEFLON
304 – 304 STAINLESS STEEL
304L – 304L STAINLESS STEEL
316 – 316 STAINLESS STEEL
316L – 316L STAINLESS STEEL

INSTRUMENT IDENTIFICATION

PARAMETER (1ST LETTER)
P – PRESSURE
F – FLOW
T – TEMPERATURE
C – CONDUCTIVITY
D – DENSITY
Z – POSITION
A – ANALYTICAL (SEE NOTES)

TYPE (2ND AND 3RD LETTER)
I – INDICATING/INDICATOR
T – TRANSMITTER
E – ELEMENT/PROBE
A – ALARM
S – SWITCH

NOTES:
1. THE DESCRIPTION OF AN ANALYTICAL VARIABLE FUNCTION (pH, SiO_2, O, ETC.) SHALL BE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
   EXAMPLE: AIT pH
2. ADD THE SUFFIX L (LOW), LL (LOW–LOW), H (HIGH), HH (HIGH–HIGH), HL (HIGH–LOW), AS REQUIRED.
   EXAMPLE: PSL FAL

LINE NUMBERING

E1BR4–001–P80
F□□ID
SI□□
SC□□D□□□
MAT□RIA□
S□□□□NTIA□N□M□□R

VALVE NUMBERING

681–015–BA17–0001
AR□A□COD□□
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VALVE SIZE CONVERSION

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□1□	1□□
□□□	1
□□□	□ □
1□□	□ □
1□□	□ □

VALVE TYPE CONVERSION

□A1□ □□□ □A□□□A□□□
□A□□ □□□ TO□□□□A□□□A□□□
□F□□ □□□ TO□□□□□TT□RF□□□A□□□
□□C□PT□T□OS□NOT□D"NON□TO□□□"□
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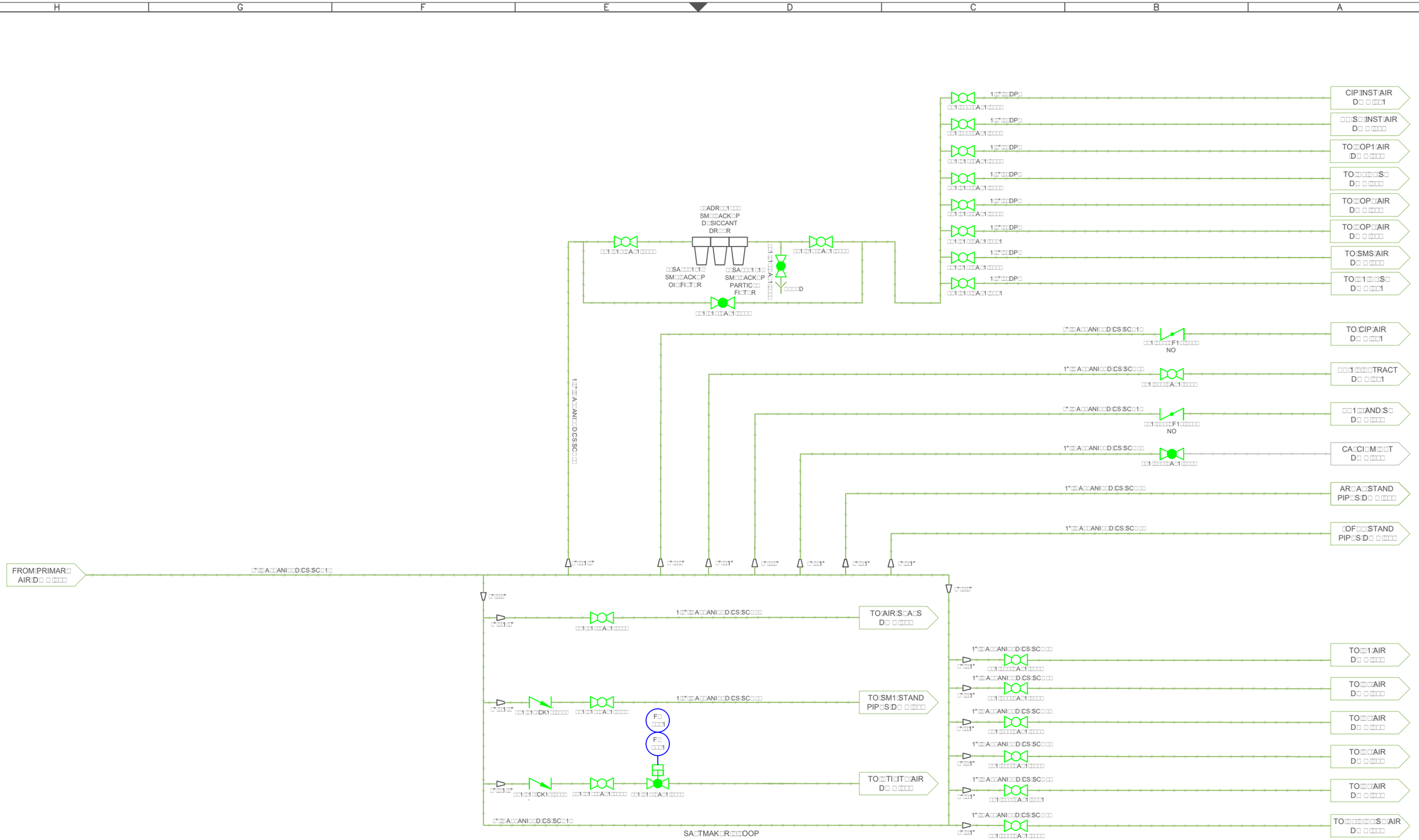
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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: LEGEND

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	LEGEND	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	# OF #	



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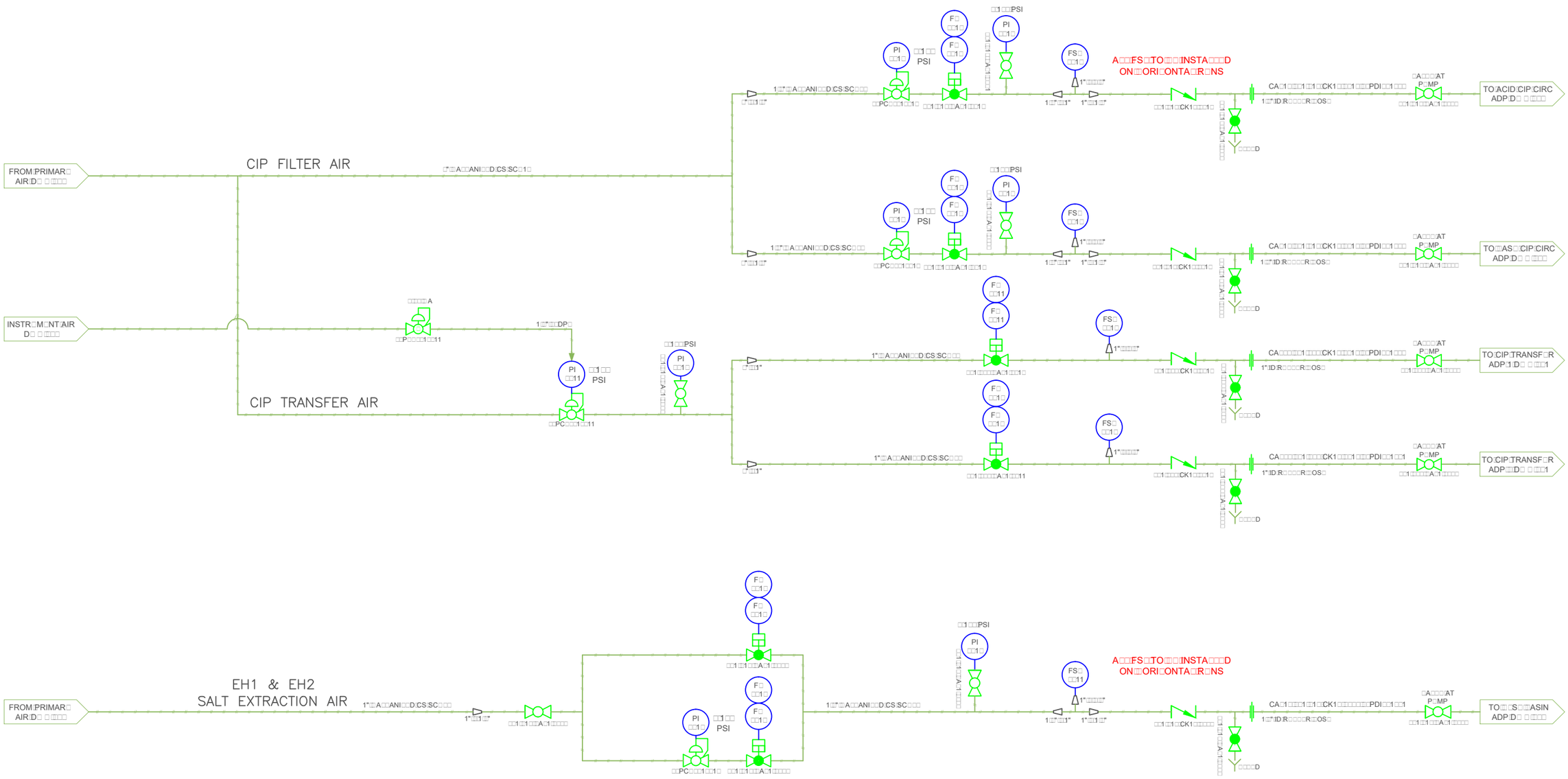
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O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

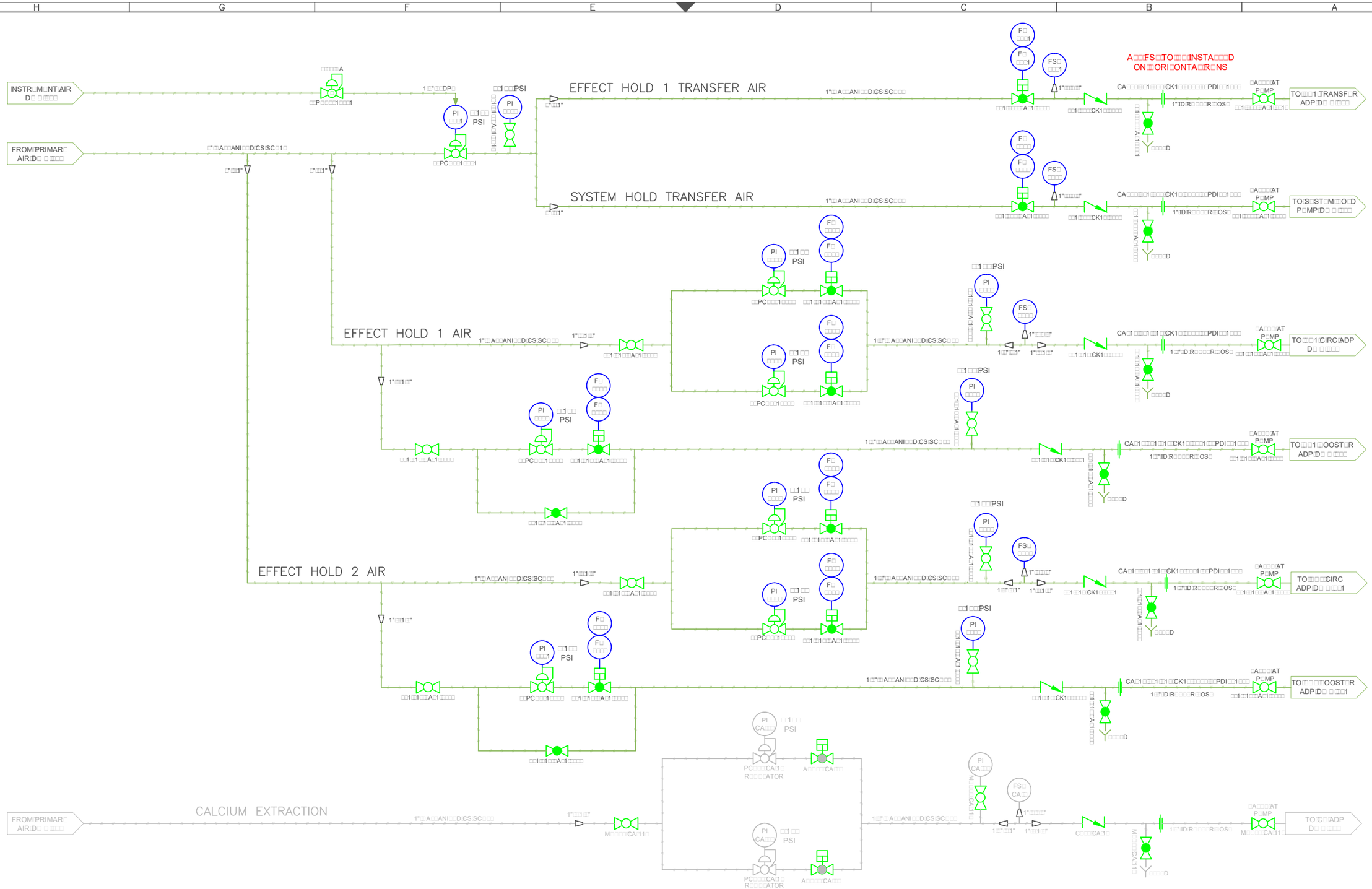
TITLE: (SM2) 450: SM2 INSTRUMENT AND PROCESS AIR

PROJECT:	SALTMAKER GEN III			CUSTOMER: AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	SN	DATE:	22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_450
CHECKED BY:	XXIAO	DATE:	23-FEB-2018	JOB/CO NO:	(JOB NO.)
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE	SHEET:	72 OF117



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	T□IS:DOC□M□NT□M□ODI□S:D□SI□NS:AND:INFORMATION:T□AT:AR□PROPRI□TAR□TO SA□T□ ORKS□IT:IS:TO□□□S□D:ON□□FOR:T□□P□RPOS□AND□□T□□□NTIT□FOR □□IC□IT□ AS:ORI□INA□□S□PP□D□T□□DOC□M□NT:MA□NOT□□□D□P□ICAT□D:OR DISC□OS□D:TO:OT□□R:P□RSON:OR□NTIT□□OR□S□D:FOR:MAN□FACT□R□OF:T□□IT□M IN:PART:OR:IN□ □O□□□ IT□O□T:T□□PRIOR□ RITT□N:P□RMISSION:OF:SA□T□ ORKS□	N	06–JUL–2018	NO CHANGES	–
		O	18–OCT–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
	DO NOT SCALE DRAWING	Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 451: EH1/EH2 EXTRACT AND CIP AIR			
PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_451	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 73 OF117	

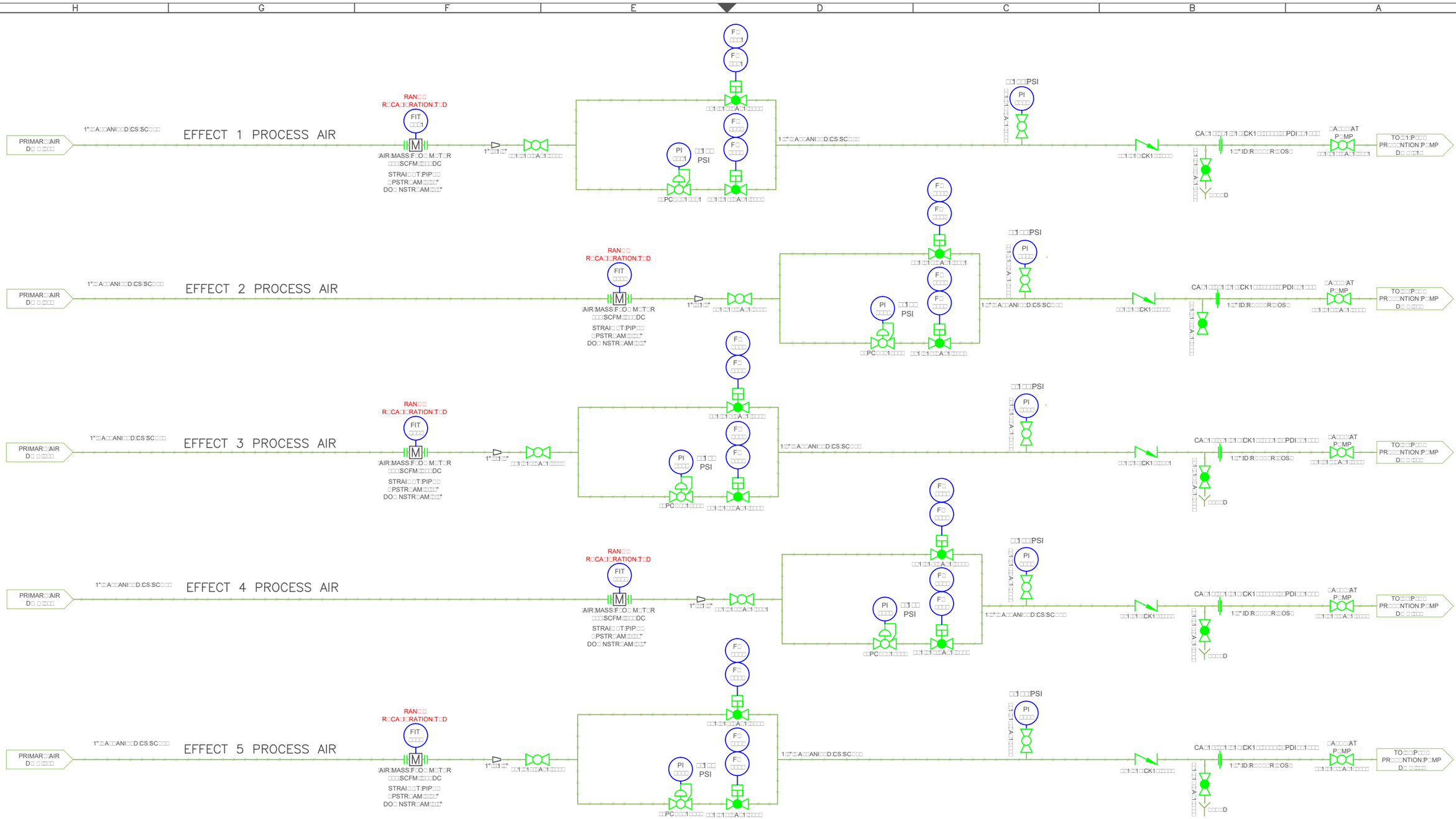


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		N	06–JUL–2018	NO CHANGES	–
		O	18–OCT–2018	NO CHANGES	–
		P	16–NOV–2018	NO CHANGES	–
		Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 452: EFFECT HOLD, SYSTEM HOLD, AND CALCIUM EXTRACTION AIR

PROJECT:	SALTMAKER GEN III			CUSTOMER:	AGNICO EAGLE MINES
PREPARED BY:	SN	DATE:	22–FEB–2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_452
CHECKED BY:	XXIAO	DATE:	23–FEB–2018	JOB/CO NO:	(JOB NO.)
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REVISION: Q



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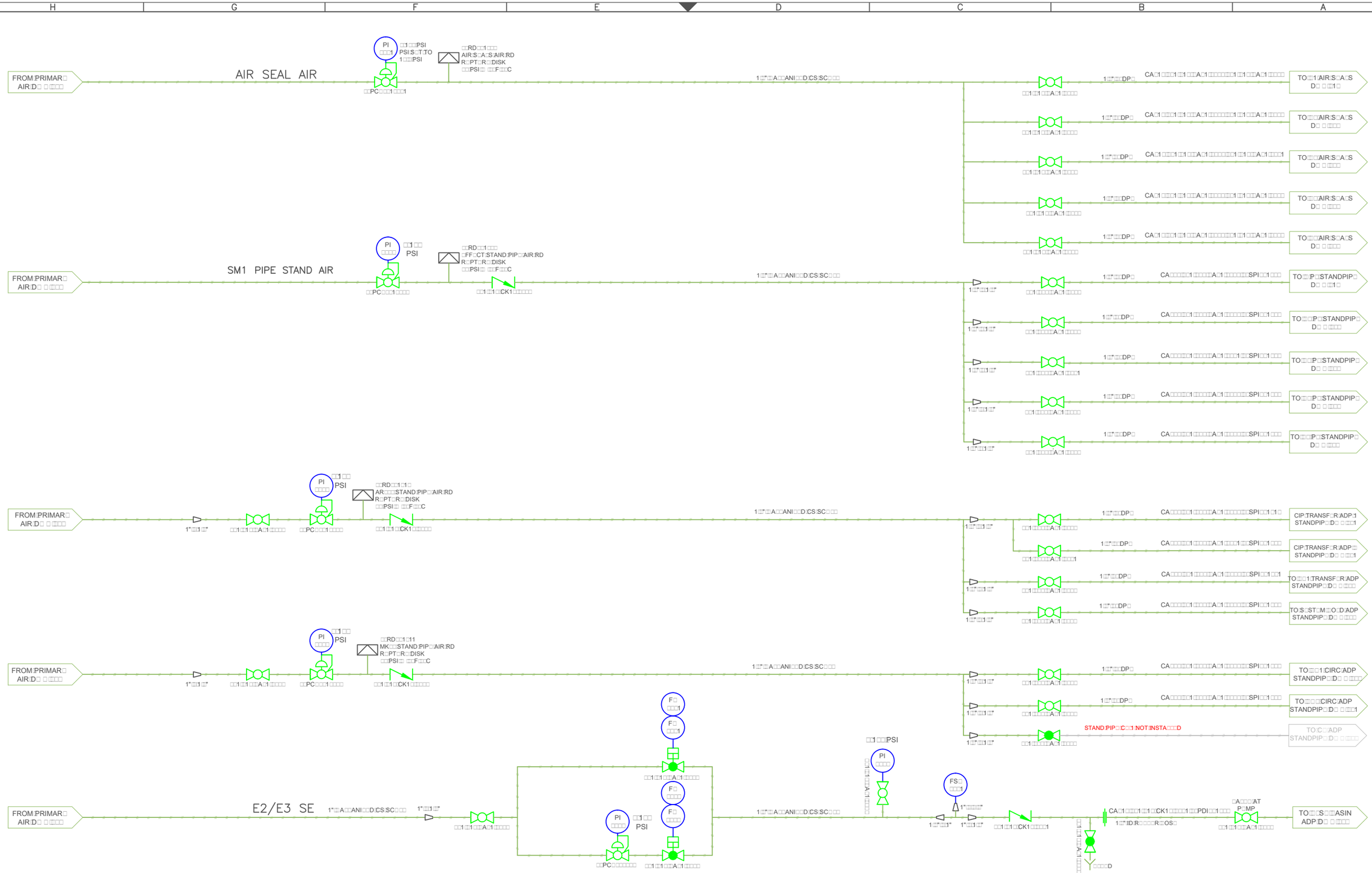
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N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 453: EFFECT PUMP COMPRESSED AIR

PROJECT:	SALTMAKER GEN III	CUSTOMER:	AGNICO EAGLE MINES
		REVISION	Q
PREPARED BY:	SN	DATE:	22–FEB–2018
CHECKED BY:	XXIAO	DATE:	23–FEB–2018
APPROVED BY:	APPROVED BY	DATE:	APPROVED DATE
DWG. NO:	SW_EN_SM_GEN III_PID_DWG_453		
JOB/CO NO:	(JOB NO.)		
SHEET:	75 OF117		



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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	RUPTURE DISK CONFIRMED	JLAU
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 454: SM2 AIR SEAL, PIPE STAND, AND E2/E3 SE AIR

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_454	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 76 OF117	

SM2
UTILITY AIR LINE DROPS

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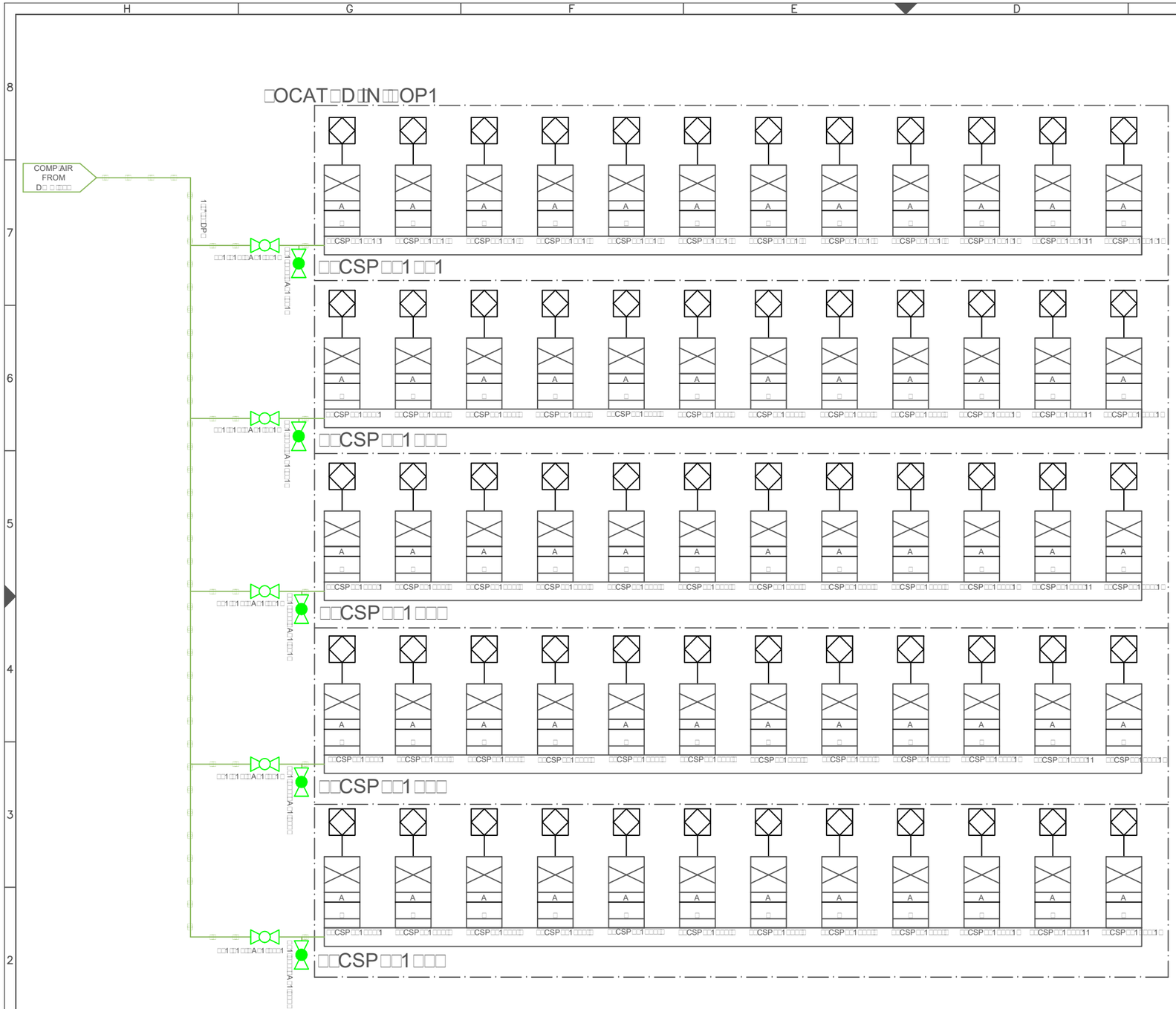
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LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 455: SM2 UTILITY AIR

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_455	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	77 OF117	



65CSP681451

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681451-1	65FV6816202	65CSP681451-1/65FV6816202/A	65CSP681451-1/65FV6816202/B	E2/620	NC
65CSP681451-2	65FV6816203	65CSP681451-2/65FV6816203/A	65CSP681451-2/65FV6816203/B	E2/620	NC
65CSP681451-3	65FV6816204	65CSP681451-3/65FV6816204/A	65CSP681451-3/65FV6816204/B	E2/620	NC
65CSP681451-4	65FV6816205	65CSP681451-4/65FV6816205/A	65CSP681451-4/65FV6816205/B	E2/620	NC
65CSP681451-5	65FV6816206	65CSP681451-5/65FV6816206/A	65CSP681451-5/65FV6816206/B	E2/620	NO
65CSP681451-6	65FV6816207	65CSP681451-6/65FV6816207/A	65CSP681451-6/65FV6816207/B	E2/620	NC
65CSP681451-7	65FV6816208	65CSP681451-7/65FV6816208/A	65CSP681451-7/65FV6816208/B	E2/620	NC
65CSP681451-8	65FV6816201	65CSP681451-8/65FV6816201/A	65CSP681451-8/65FV6816201/B	E2/620	NC
65CSP681451-9	65FV6816217	65CSP681451-9/65FV6816217/A	65CSP681451-9/65FV6816217/B	E2/620	NC
65CSP681451-10	65FV6816218	65CSP681451-10/65FV6816218/A	65CSP681451-10/65FV6816218/B	E2/620	NC
65CSP681451-11	65FV6816200	65CSP681451-11/65FV6816200/A	65CSP681451-11/65FV6816200/B	E2-ACD/620	NC
65CSP681451-12	65FV6816209	65CSP681451-12/65FV6816209/A	65CSP681451-12/65FV6816209/B	E2-BSE/620	NC

65CSP681452

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681452-1	65FV6816216	65CSP681452-1/65FV6816216/A	65CSP681452-1/65FV6816216/B	E2/623	NC
65CSP681452-2	65FV6816212	65CSP681452-2/65FV6816212/A	65CSP681452-2/65FV6816212/B	E2/620	NC
65CSP681452-3	65FV6816213	65CSP681452-3/65FV6816213/A	65CSP681452-3/65FV6816213/B	E2/620	NC
65CSP681452-4	65FV6816219	65CSP681452-4/65FV6816219/A	65CSP681452-4/65FV6816219/B	E2/620	NC
65CSP681452-5	65FV6814533	65CSP681452-5/65FV6814533/A	65CSP681452-5/65FV6814533/B	CA-E2/453	NC
65CSP681452-6	65FV6814534	65CSP681452-6/65FV6814534/A	65CSP681452-6/65FV6814534/B	CA-E2/453	NC
65CSP681452-7	65FV6816302	65CSP681452-7/65FV6816302/A	65CSP681452-7/65FV6816302/B	E3/630	NC
65CSP681452-8	65FV6816303	65CSP681452-8/65FV6816303/A	65CSP681452-8/65FV6816303/B	E3/630	NC
65CSP681452-9	65FV6816304	65CSP681452-9/65FV6816304/A	65CSP681452-9/65FV6816304/B	E3/630	NC
65CSP681452-10	65FV6816305	65CSP681452-10/65FV6816305/A	65CSP681452-10/65FV6816305/B	E3/630	NC
65CSP681452-11	65FV6816306	65CSP681452-11/65FV6816306/A	65CSP681452-11/65FV6816306/B	E3/630	NO
65CSP681452-12	65FV6816307	65CSP681452-12/65FV6816307/A	65CSP681452-12/65FV6816307/B	E3/630	NC

65CSP681453

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681453-1	65FV6816308	65CSP681453-1/65FV6816308/A	65CSP681453-1/65FV6816308/B	E3/630	NC
65CSP681453-2	65FV6816301	65CSP681453-2/65FV6816301/A	65CSP681453-2/65FV6816301/B	E3/630	NC
65CSP681453-3	65FV6816317	65CSP681453-3/65FV6816317/A	65CSP681453-3/65FV6816317/B	E3/630	NC
65CSP681453-4	65FV6816318	65CSP681453-4/65FV6816318/A	65CSP681453-4/65FV6816318/B	E3/630	NC
65CSP681453-5	65FV6816300	65CSP681453-5/65FV6816300/A	65CSP681453-5/65FV6816300/B	E3-ACD/630	NC
65CSP681453-6	65FV6816309	65CSP681453-6/65FV6816309/A	65CSP681453-6/65FV6816309/B	E3-BSE/630	NC
65CSP681453-7	65FV6816316	65CSP681453-7/65FV6816316/A	65CSP681453-7/65FV6816316/B	E3/633	NC
65CSP681453-8	65FV6816312	65CSP681453-8/65FV6816312/A	65CSP681453-8/65FV6816312/B	E3/630	NC
65CSP681453-9	65FV6816313	65CSP681453-9/65FV6816313/A	65CSP681453-9/65FV6816313/B	E3/630	NC
65CSP681453-10	65FV6816319	65CSP681453-10/65FV6816319/A	65CSP681453-10/65FV6816319/B	E3/630	NC
65CSP681453-11	65FV6814535	65CSP681453-11/65FV6814535/A	65CSP681453-11/65FV6814535/B	CA-E3/453	NC
65CSP681453-12	65FV6814536	65CSP681453-12/65FV6814536/A	65CSP681453-12/65FV6814536/B	CA-E3/453	NC

65CSP681454

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681454-1	65FV6815301	65CSP681454-1/65FV6815301/A	65CSP681454-1/65FV6815301/B	FD/530	NC
65CSP681454-2	65FV6815302	65CSP681454-2/65FV6815302/A	65CSP681454-2/65FV6815302/B	FD/530	NC
65CSP681454-3	65FV6815303	65CSP681454-3/65FV6815303/A	65CSP681454-3/65FV6815303/B	FD/530	NC
65CSP681454-4	65FV6815304	65CSP681454-4/65FV6815304/A	65CSP681454-4/65FV6815304/B	FD/530	NC
65CSP681454-5	65FV6815305	65CSP681454-5/65FV6815305/A	65CSP681454-5/65FV6815305/B	FD/530	NC
65CSP681454-6	65FV6815306	65CSP681454-6/65FV6815306/A	65CSP681454-6/65FV6815306/B	FD/530	NC
65CSP681454-7	65FV6815307	65CSP681454-7/65FV6815307/A	65CSP681454-7/65FV6815307/B	FD/530	NC
65CSP681454-8	65FV6815308	65CSP681454-8/65FV6815308/A	65CSP681454-8/65FV6815308/B	FD/530	NC
65CSP681454-9	65FV6815309	65CSP681454-9/65FV6815309/A	65CSP681454-9/65FV6815309/B	FD/530	NC
65CSP681454-10	65FV6815310	65CSP681454-10/65FV6815310/A	65CSP681454-10/65FV6815310/B	FD/530	NC
65CSP681454-11	65FV6815311	65CSP681454-11/65FV6815311/A	65CSP681454-11/65FV6815311/B	FD/530	NC
65CSP681454-12	SPARE				

65CSP681455

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681455-1	65FV6810627	65CSP681455-1/65FV6810627/A	65CSP681455-1/65FV6810627/B	BIO/062	NC
65CSP681455-2	65FV6810628	65CSP681455-2/65FV6810628/A	65CSP681455-2/65FV6810628/B	BIO/062	NC
65CSP681455-3	65FV6810629	65CSP681455-3/65FV6810629/A	65CSP681455-3/65FV6810629/B	BIO/062	NC
65CSP681455-4	65FV6810620	65CSP681455-4/65FV6810620/A	65CSP681455-4/65FV6810620/B	BIO/062	NC
65CSP681455-5	65FV6810691	65CSP681455-5/65FV6810691/A	65CSP681455-5/65FV6810691/B	BIO/062	NC
65CSP681455-6	TBD - VALVE MAY NOT EXIST				
65CSP681455-7	65FV6810636	65CSP681455-7/65FV6810636/A	65CSP681455-7/65FV6810636/B	ATF/063	NC
65CSP681455-8	65FV6810637	65CSP681455-8/65FV6810637/A	65CSP681455-8/65FV6810637/B	ATF/063	NC
65CSP681455-9	65FV6810638	65CSP681455-9/65FV6810638/A	65CSP681455-9/65FV6810638/B	ATF/063	NC
65CSP681455-10	65FV6810639	65CSP681455-10/65FV6810639/A	65CSP681455-10/65FV6810639/B	ATF/063	NC
65CSP681455-11	65FV6810630	65CSP681455-11/65FV6810630/A	65CSP681455-11/65FV6810630/B	ATF/063	NC
65CSP681455-12	TBD - VALVE MAY NOT EXIST				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

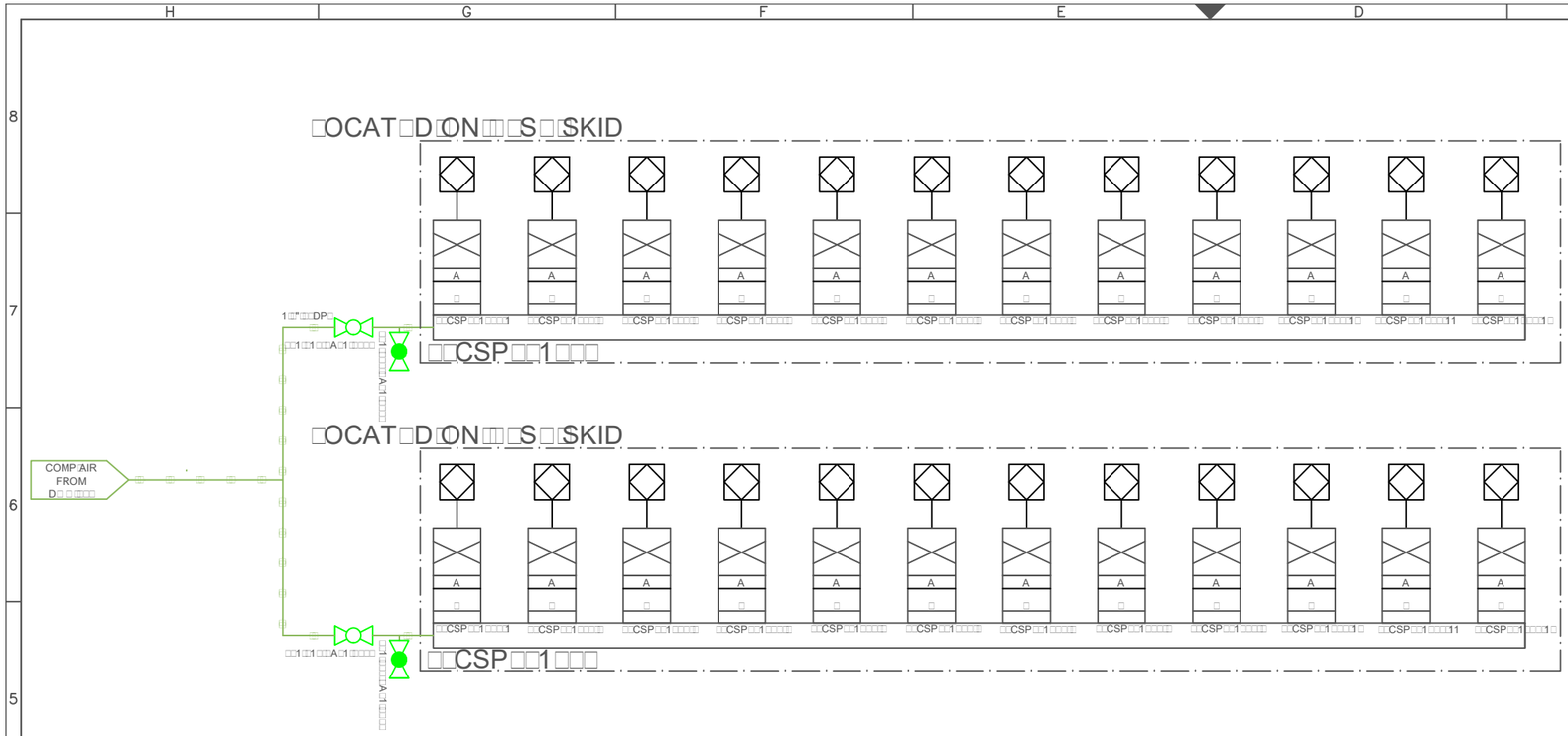
T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□□AND□□□T□□□□NTIT□□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□T□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□NTIT□□OR□S□D□FOR□MAN□FACT□R□□OF□T□□IT□M IN□PART□OR□IN□ □O□□□IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 456: BOP1 AIR SOLENOID BANK

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_456	
CHECKED BY:	XXIAO	DATE: 23-FEB-2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	78 OF117	



65CSP681463

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681463-1	65FV6816221	65CSP681463-1/65FV6816221/A	65CSP681463-1/65FV6816221/B	E2SE/622	NC
65CSP681463-2	65FV6816222	65CSP681463-2/65FV6816222/A	65CSP681463-2/65FV6816222/B	E2SE/622	NC
65CSP681463-3	65FV6816223	65CSP681463-3/65FV6816223/A	65CSP681463-3/65FV6816223/B	E2SE/622	NC
65CSP681463-4	65FV6816224	65CSP681463-4/65FV6816224/A	65CSP681463-4/65FV6816224/B	E2SE/622	NC
65CSP681463-5	65FV6816225	65CSP681463-5/65FV6816225/A	65CSP681463-5/65FV6816225/B	E2SE/622	NC
65CSP681463-6	65FV6816226	65CSP681463-6/65FV6816226/A	65CSP681463-6/65FV6816226/B	E2SE/622	NO
65CSP681463-7	SPARE				
65CSP681463-8	SPARE				
65CSP681463-9	SPARE				
65CSP681463-10	SPARE				
65CSP681463-11	SPARE				
65CSP681463-12	SPARE				

65CSP681464

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681464-1	65FV6816321	65CSP681464-1/65FV6816321/A	65CSP681464-1/65FV6816321/B	E3SE/632	NC
65CSP681464-2	65FV6816322	65CSP681464-2/65FV6816322/A	65CSP681464-2/65FV6816322/B	E3SE/632	NC
65CSP681464-3	65FV6816323	65CSP681464-3/65FV6816323/A	65CSP681464-3/65FV6816323/B	E3SE/632	NC
65CSP681464-4	65FV6816324	65CSP681464-4/65FV6816324/A	65CSP681464-4/65FV6816324/B	E3SE/632	NC
65CSP681464-5	65FV6816325	65CSP681464-5/65FV6816325/A	65CSP681464-5/65FV6816325/B	E3SE/632	NC
65CSP681464-6	65FV6816326	65CSP681464-6/65FV6816326/A	65CSP681464-6/65FV6816326/B	E3SE/632	NO
65CSP681464-7	65FV6816227	65CSP681463-9/65FV6816227/A	65CSP681463-9/65FV6816227/B	E2SE/622	NO
65CSP681464-8	65FV6816228	65CSP681463-10/65FV6816228/A	65CSP681463-10/65FV6816228/B	E2SE/622	NC
65CSP681464-9	65FV6814541	65CSP681463-7/65FV6814541/A	65CSP681463-7/65FV6814541/B	CA-E2SE/454	NC
65CSP681464-10	65FV6814542	65CSP681463-8/65FV6814542/A	65CSP681463-8/65FV6814542/B	CA-E2SE/454	NC
65CSP681464-11	SPARE				
65CSP681464-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

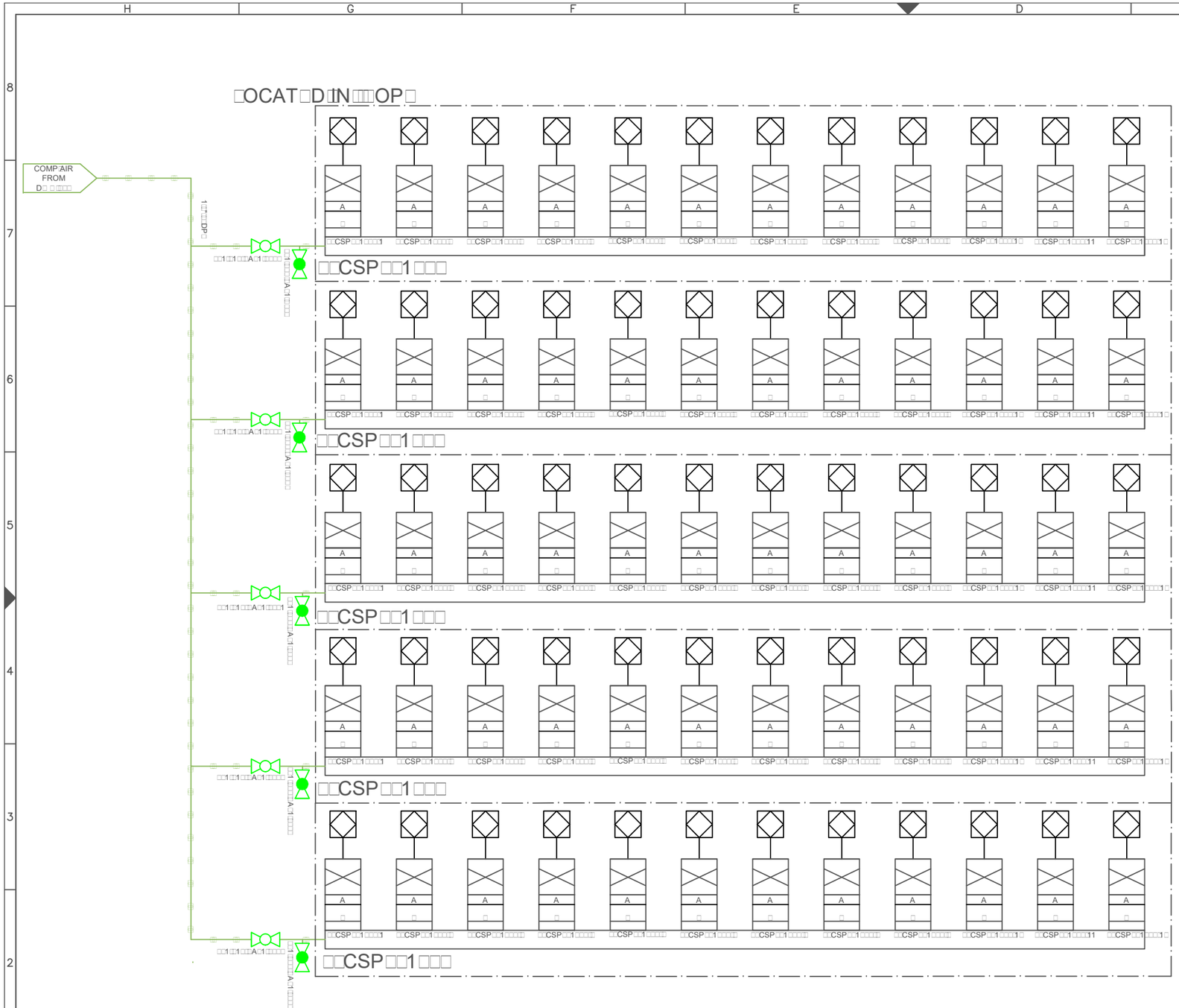
T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□DN□□□FOR□T□□P□RPOS□□AND□□□T□□□□NTIT□□FOR □□IC□□IT□□ AS□OR□INA□□□□S□□PP□I□D□□T□□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□□ IT□O□T□T□□□PRIOR□□ RITT□N□P□RMISSION□OF□SA□T□□ ORKS□□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 457: E2/E3 SE AIR SOLENOID BANK

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_457	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 79 OF117	



65CSP681456

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681456-1	65FV6815201	65CSP681456-1/65FV6815201/A	65CSP681456-1/65FV6815201/B	CW/520	NO
65CSP681456-2	65FV6815202	65CSP681456-2/65FV6815202/A	65CSP681456-2/65FV6815202/B	CW/520	NO
65CSP681456-3	65FV6815203	65CSP681456-3/65FV6815203/A	65CSP681456-3/65FV6815203/B	CW/520	NC
65CSP681456-4	65FV6815204	65CSP681456-4/65FV6815204/A	65CSP681456-4/65FV6815204/B	CW/520	NC
65CSP681456-5	65FV6815208	65CSP681456-5/65FV6815208/A	65CSP681456-5/65FV6815208/B	CW-ACD/520	NC
65CSP681456-6	65FV6815209	65CSP681456-6/65FV6815209/A	65CSP681456-6/65FV6815209/B	CW-UW/520	NC
65CSP681456-7	65FV6814501	65CSP681456-7/65FV6814501/A	65CSP681456-7/65FV6814501/B	CA/450	NC
65CSP681456-8		TBD - VALVE MAY NOT EXIST			
65CSP681456-9		TBD - VALVE MAY NOT EXIST			
65CSP681456-10	65FV6816120	65CSP681456-10/65FV6816120/A	65CSP681456-10/65FV6816120/B	E1/610	NC
65CSP681456-11	SPARE				
65CSP681456-12	SPARE				

65CSP681457

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681457-1	65FV6816101	65CSP681457-1/65FV6816101/A	65CSP681457-1/65FV6816101/B	E1/610	NC
65CSP681457-2	65FV6816103	65CSP681457-2/65FV6816103/A	65CSP681457-2/65FV6816103/B	E1/610	NC
65CSP681457-3	65FV6816104	65CSP681457-3/65FV6816104/A	65CSP681457-3/65FV6816104/B	E1/610	NC
65CSP681457-4	65FV6816105	65CSP681457-4/65FV6816105/A	65CSP681457-4/65FV6816105/B	E1/610	NC
65CSP681457-5	65FV6816106	65CSP681457-5/65FV6816106/A	65CSP681457-5/65FV6816106/B	E1/610	NO
65CSP681457-6	65FV6816107	65CSP681457-6/65FV6816107/A	65CSP681457-6/65FV6816107/B	E1/610	NC
65CSP681457-7	65FV6816108	65CSP681457-7/65FV6816108/A	65CSP681457-7/65FV6816108/B	E1/610	NC
65CSP681457-8	65FV6816109	65CSP681457-8/65FV6816109/A	65CSP681457-8/65FV6816109/B	E1/610	NC
65CSP681457-9	65FV6816110	65CSP681457-9/65FV6816110/A	65CSP681457-9/65FV6816110/B	E1/610	NC
65CSP681457-10	65FV6816111	65CSP681457-10/65FV6816111/A	65CSP681457-10/65FV6816111/B	E1/610	NO
65CSP681457-11	65FV6816112	65CSP681457-11/65FV6816112/A	65CSP681457-11/65FV6816112/B	E1/610	NC
65CSP681457-12	65FV6816113	65CSP681457-12/65FV6816113/A	65CSP681457-12/65FV6816113/B	E1/610	NC

65CSP681458

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681458-1	65FV6816114	65CSP681458-1/65FV6816114/A	65CSP681458-1/65FV6816114/B	E1/610	NC
65CSP681458-2	65FV6816115	65CSP681458-2/65FV6816115/A	65CSP681458-2/65FV6816115/B	E1/610	NC
65CSP681458-3	65FV6816118	65CSP681458-3/65FV6816118/A	65CSP681458-3/65FV6816118/B	E1-ACD/610	NC
65CSP681458-4	65FV6816119	65CSP681458-4/65FV6816119/A	65CSP681458-4/65FV6816119/B	E1-BSE/610	NC
65CSP681458-5	65FV6814531	65CSP681458-5/65FV6814531/A	65CSP681458-5/65FV6814531/B	CA-E1/453	NC
65CSP681458-6	65FV6814532	65CSP681458-6/65FV6814532/A	65CSP681458-6/65FV6814532/B	CA-E1/453	NC
65CSP681458-7	65FV6816402	65CSP681458-7/65FV6816402/A	65CSP681458-7/65FV6816402/B	E4/640	NC
65CSP681458-8	65FV6816403	65CSP681458-8/65FV6816403/A	65CSP681458-8/65FV6816403/B	E4/640	NC
65CSP681458-9	65FV6816404	65CSP681458-9/65FV6816404/A	65CSP681458-9/65FV6816404/B	E4/640	NC
65CSP681458-10	65FV6816405	65CSP681458-10/65FV6816405/A	65CSP681458-10/65FV6816405/B	E4/640	NC
65CSP681458-11	65FV6816406	65CSP681458-11/65FV6816406/A	65CSP681458-11/65FV6816406/B	E4/640	NO
65CSP681458-12	65FV6816407	65CSP681458-12/65FV6816407/A	65CSP681458-12/65FV6816407/B	E4/640	NC

65CSP681459

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681459-1	65FV6816408	65CSP681459-1/65FV6816408/A	65CSP681459-1/65FV6816408/B	E4/640	NC
65CSP681459-2	65FV6816411	65CSP681459-2/65FV6816411/A	65CSP681459-2/65FV6816411/B	E4/640	NO
65CSP681459-3	65FV6816412	65CSP681459-3/65FV6816412/A	65CSP681459-3/65FV6816412/B	E4/640	NC
65CSP681459-4	65FV6816413	65CSP681459-4/65FV6816413/A	65CSP681459-4/65FV6816413/B	E4/640	NC
65CSP681459-5	65FV6816414	65CSP681459-5/65FV6816414/A	65CSP681459-5/65FV6816414/B	E4/640	NC
65CSP681459-6	65FV6816401	65CSP681459-6/65FV6816401/A	65CSP681459-6/65FV6816401/B	E4/640	NC
65CSP681459-7	65FV6816400	65CSP681459-7/65FV6816400/A	65CSP681459-7/65FV6816400/B	E4-ACD	NC
65CSP681459-8	65FV6816409	65CSP681459-8/65FV6816409/A	65CSP681459-8/65FV6816409/B	E4-BSE	NC
65CSP681459-9	65FV6814537	65CSP681459-9/65FV6814537/A	65CSP681459-9/65FV6814537/B	CA-E4/453	NC
65CSP681459-10	65FV6814538	65CSP681459-10/65FV6814538/A	65CSP681459-10/65FV6814538/B	CA-E4/453	NC
65CSP681459-11	65FV6816116	65CSP681459-11/65FV6816116/A	65CSP681459-11/65FV6816116/B	E1/613	NC
65CSP681459-12	65FV6816416	65CSP681459-12/65FV6816416/A	65CSP681459-12/65FV6816416/B	E4/643	NC

65CSP681460

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681460-1	65FV6813115	65CSP681460-1/65FV6813115/A	65CSP681460-1/65FV6813115/B	TSW/311	NO
65CSP681460-2	65FV6813116	65CSP681460-2/65FV6813116/A	65CSP681460-2/65FV6813116/B	TSW/311	NC
65CSP681460-3	65FV6813117	65CSP681460-3/65FV6813117/A	65CSP681460-3/65FV6813117/B	TSW/311	NO
65CSP681460-4	65FV6813118	65CSP681460-4/65FV6813118/A	65CSP681460-4/65FV6813118/B	TSW/311	NC
65CSP681460-5	65FV6816500	65CSP681460-5/65FV6816500/A	65CSP681460-5/65FV6816500/B	E5-ACD/550	NC
65CSP681460-6	65FV6816509	65CSP681460-6/65FV6816509/A	65CSP681460-6/65FV6816509/B	E5-BSE/550	NC
65CSP681460-7	65FV6815516	65CSP681460-7/65FV6815516/A	65CSP681460-7/65FV6815516/B	CIP-ACD/550	NC
65CSP681460-8	65FV6815517	65CSP681460-8/65FV6815517/A	65CSP681460-8/65FV6815517/B	CIP-BSE/550	NC
65CSP681460-9	65FV6816230/65FV6816231	65CSP681460-9/65FV6816230/65FV6816231/A	65CSP681460-9/65FV6816230/65FV6816231/B	E2/620	NC/NO
65CSP681460-10	65FV6816330/65FV6816331	65CSP681460-10/65FV6816330/65FV6816331/A	65CSP681460-10/65FV6816330/65FV6816331/B	E3/630	NC/NO
65CSP681460-11	SPARE				
65CSP681460-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

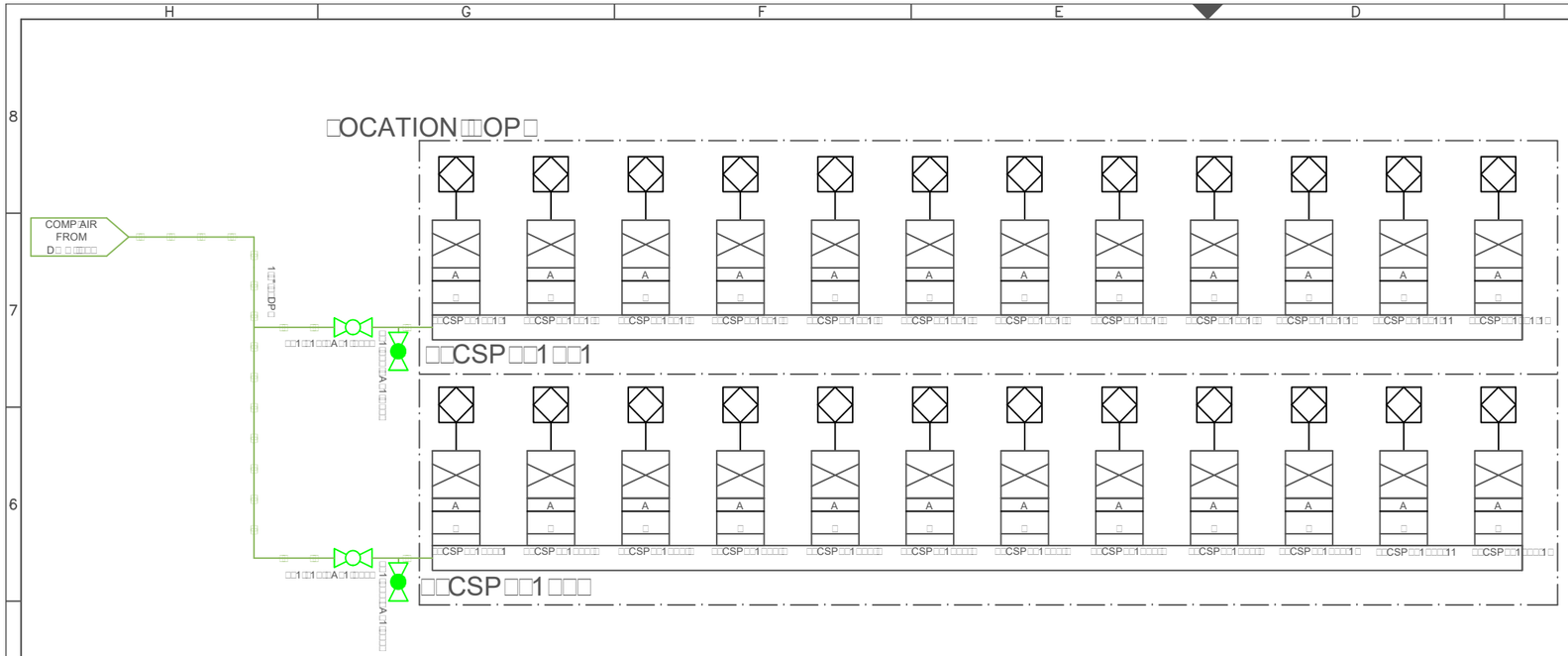
T IS DOC MENT M ODI S D SI NS AND INFORMATION T AT AR PROPRI TAR TO SA T ORKS IT IS TO S D ON FOR T P RPOS AND T NTIT FOR IC IT AS ORI INA S PP D D T DOC M NT MA NOT D P ICAT D OR DISC OS D TO OT R P RSON OR NTIT OR S D FOR MAN FACT R OF T IT M IN PART OR IN O IT O T T PRIOR RITT N P RMISSION OF SA T ORKS

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06-JUL-2018	NO CHANGES	–
O	18-OCT-2018	NO CHANGES	–
P	16-NOV-2018	NO CHANGES	–
Q	12-FEB-2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 458: BOP2 AIR SOLENOID BANK

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION Q
PREPARED BY:	SN	DATE: 22-FEB-2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_458	
CHECKED BY:	XXIAO	DATE: 23-FEB-2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	80 OF117	



65CSP681461

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681461-1	65FV6816502	65CSP681461-1/65FV6816502/A	65CSP681461-1/65FV6816502/B	E5/650	NC
65CSP681461-2	65FV6816503	65CSP681461-2/65FV6816503/A	65CSP681461-2/65FV6816503/B	E5/650	NC
65CSP681461-3	65FV6816504	65CSP681461-3/65FV6816504/A	65CSP681461-3/65FV6816504/B	E5/650	NC
65CSP681461-4	65FV6816505	65CSP681461-4/65FV6816505/A	65CSP681461-4/65FV6816505/B	E5/650	NC
65CSP681461-5	65FV6816506	65CSP681461-5/65FV6816506/A	65CSP681461-5/65FV6816506/B	E5/650	NO
65CSP681461-6	65FV6816507	65CSP681461-6/65FV6816507/A	65CSP681461-6/65FV6816507/B	E5/650	NC
65CSP681461-7	65FV6816508	65CSP681461-7/65FV6816508/A	65CSP681461-7/65FV6816508/B	E5/650	NC
65CSP681461-8	65FV6816501	65CSP681461-8/65FV6816501/A	65CSP681461-8/65FV6816501/B	E5/650	NC
65CSP681461-9	65FV6815101	65CSP681461-9/65FV6815101/A	65CSP681461-9/65FV6815101/B	HX/510	NO
65CSP681461-10	65FV6815102	65CSP681461-10/65FV6815102/A	65CSP681461-10/65FV6815102/B	HX/510	NC
65CSP681461-11	65FV6816511	65CSP681461-11/65FV6816511/A	65CSP681461-11/65FV6816511/B	E5/650	NO
65CSP681461-12	65FV6816512	65CSP681461-12/65FV6816512/A	65CSP681461-12/65FV6816512/B	E5/650	NC

65CSP681462

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681462-1	65FV6816513	65CSP681462-1/65FV6816513/A	65CSP681462-1/65FV6816513/B	E5/650	NC
65CSP681462-2	65FV6816514	65CSP681462-2/65FV6816514/A	65CSP681462-2/65FV6816514/B	E5/650	NC
65CSP681462-3	65FV6814539	65CSP681462-3/65FV6814539/A	65CSP681462-3/65FV6814539/B	CA-E5/453	NC
65CSP681462-4	65FV6814530	65CSP681462-4/65FV6814530/A	65CSP681462-4/65FV6814530/B	CA-E5/453	NC
65CSP681462-5	65FV6816516	65CSP681462-5/65FV6816516/A	65CSP681462-5/65FV6816516/B	E5/653	NC
65CSP681462-6		TBD - VALVE MAY NOT EXIST			
65CSP681462-7	65FV6815103	65CSP681462-7/65FV6815103/A	65CSP681462-7/65FV6815103/B	HX/510	NO
65CSP681462-8	65FV6815104	65CSP681462-8/65FV6815104/A	65CSP681462-8/65FV6815104/B	HX/510	NO
65CSP681462-9	65FV6815105	65CSP681462-9/65FV6815105/A	65CSP681462-9/65FV6815105/B	HX/510	NO
65CSP681462-10	65FV6815106	65CSP681462-10/65FV6815106/A	65CSP681462-10/65FV6815106/B	HX/510	NC
65CSP681462-11	65FV6815107	65CSP681462-11/65FV6815107/A	65CSP681462-11/65FV6815107/B	HX/510	NC
65CSP681462-12	65FV6815108	65CSP681462-12/65FV6815108/A	65CSP681462-12/65FV6815108/B	HX/510	NC

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

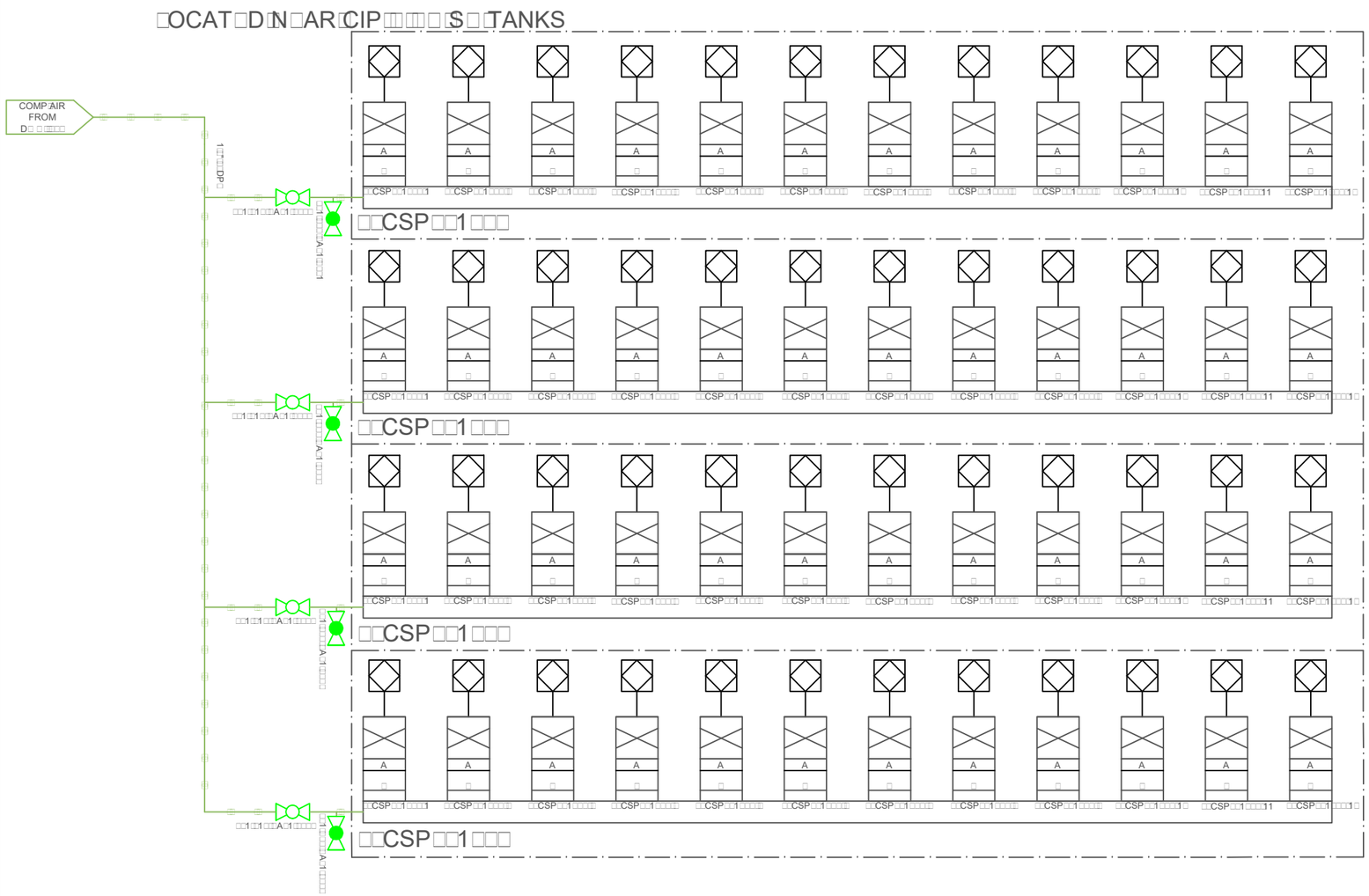
T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□DN□□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □□IC□□IT□□ AS□ORI□INA□□□□S□□PP□I□D□□T□□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□□ IT□O□T□T□□□PRIOR□□ RITT□N□P□RMISSION□OF□SA□T□□ ORKS□□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	ADDED HEX BACKFLUSH SYSTEM; AS BUILT UPDATE	DKAO

TITLE: (SM2) 459: BOP3 AIR BANK

PROJECT: SALTMAKER GEN III		CUSTOMER: AGNICO EAGLE MINES	REVISION: Q
PREPARED BY: SN	DATE: 22–FEB–2018	DWG. NO: SW_EN_SM_GEN III_PID_DWG_459	
CHECKED BY: XXIAO	DATE: 23–FEB–2018	JOB/CO NO: (JOB NO.)	
APPROVED BY: APPROVED BY	DATE: APPROVED DATE	SHEET: 81 OF117	



RESERVE PHYSICAL AND ELECTRICAL SPACE FOR 1 ADDITIONAL BANK

65CSP681465

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681465-1	65FV6815505	65CSP681465-1/65FV6815505/A	65CSP681465-1/65FV6815505/B	CIP/550	NC
65CSP681465-2	65FV6815511	65CSP681465-2/65FV6815511/A	65CSP681465-2/65FV6815511/B	CIP/550	NC
65CSP681465-3	65FV6815501	65CSP681465-3/65FV6815501/A	65CSP681465-3/65FV6815501/B	CIP/550	NC
65CSP681465-4	65FV6815502	65CSP681465-4/65FV6815502/A	65CSP681465-4/65FV6815502/B	CIP/550	NC
65CSP681465-5	SPARE				
65CSP681465-6	65FV6815504	65CSP681465-6/65FV6815504/A	65CSP681465-6/65FV6815504/B	CIP/550	NO
65CSP681465-7	65FV6815506	65CSP681465-7/65FV6815506/A	65CSP681465-7/65FV6815506/B	CIP/550	NC
65CSP681465-8	65FV6815507	65CSP681465-8/65FV6815507/A	65CSP681465-8/65FV6815507/B	CIP/550	NC
65CSP681465-9	SPARE				
65CSP681465-10	65FV6815508	65CSP681465-9/65FV6815508/A	65CSP681465-9/65FV6815508/B	CIP/550	NC
65CSP681465-11	65FV6815510	65CSP681465-11/65FV6815510/A	65CSP681465-11/65FV6815510/B	CIP/550	NO
65CSP681465-12	65FV6815512	65CSP681465-12/65FV6815512/A	65CSP681465-12/65FV6815512/B	CIP/550	NC

65CSP681466

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681466-1	SPARE				
65CSP681466-2	SPARE				
65CSP681466-3	65FV6815518	65CSP681466-3/65FV6815524/A	65CSP681466-3/65FV6815524/B	CIP-UW/550	NC
65CSP681466-4	65FV6815519	65CSP681466-4/65FV6815519/A	65CSP681466-4/65FV6815519/B	CIP-UW/550	NC
65CSP681466-5	65FV6815523	65CSP681466-5/65FV6815523/A	65CSP681466-5/65FV6815523/B	CIP/551	NC
65CSP681466-6	65FV6815525	65CSP681466-6/65FV6815525/A	65CSP681466-6/65FV6815525/B	CIP/551	NC
65CSP681466-7	65FV6815524	65CSP681466-7/65FV6815524/A	65CSP681466-7/65FV6815524/B	CIP/551	NC
65CSP681466-8	65FV6815526	65CSP681466-8/65FV6815526/A	65CSP681466-8/65FV6815526/B	CIP/551	NC
65CSP681466-9	65FV6814511	65CSP681466-9/65FV6814511/A	65CSP681466-9/65FV6814511/B	CA-CIP/451	NC
65CSP681466-10	65FV6814512	65CSP681466-10/65FV6814512/A	65CSP681466-10/65FV6814512/B	CA-CIP/451	NC
65CSP681466-11	65FV6814513	65CSP681466-11/65FV6814513/A	65CSP681466-11/65FV6814513/B	CA-CIP/451	NC
65CSP681466-12	65FV6814514	65CSP681466-12/65FV6814514/A	65CSP681466-12/65FV6814514/B	CA-CIP/451	NC

65CSP681467

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681467-1	65FV6815601	65CSP681467-1/65FV6815601/A	65CSP681467-1/65FV6815601/B	H1/560	NC
65CSP681467-2	65FV6815604	65CSP681467-2/65FV6815604/A	65CSP681467-2/65FV6815604/B	H1/560	NC
65CSP681467-3	65FV6815600	65CSP681467-3/65FV6815600/A	65CSP681467-3/65FV6815600/B	H1/560	NC
65CSP681467-4	65FV6814527	65CSP681467-4/65FV6814527/A	65CSP681467-4/65FV6814527/B	CA-H1/452	NC
65CSP681467-5	65FV6815605	65CSP681467-5/65FV6815613/A	65CSP681467-5/65FV6815613/B	H1/560	NC
65CSP681467-6	65FV6814521	65CSP681467-6/65FV6814521/A	65CSP681467-6/65FV6814521/B	CA-H1/452	NC
65CSP681467-7	65FV6814523	65CSP681467-7/65FV6814523/A	65CSP681467-7/65FV6814523/B	CA-H1/452	NC
65CSP681467-8	65FV6814524	65CSP681467-8/65FV6814524/A	65CSP681467-8/65FV6814524/B	CA-H1/452	NC
65CSP681467-9	65FV6815610	65CSP681467-9/65FV6815610/A	65CSP681467-9/65FV6815610/B	H2/561	NC
65CSP681467-10	65FV6815611	65CSP681467-10/65FV6815611/A	65CSP681467-10/65FV6815611/B	H2/561	NC
65CSP681467-11	65FV6815614	65CSP681467-11/65FV6815614/A	65CSP681467-11/65FV6815614/B	H2/561	NC
65CSP681467-12	65FV6814525	65CSP681467-12/65FV6814525/A	65CSP681467-12/65FV6814525/B	CA-H2/452	NC

65CSP681468

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681468-1	65FV6814526	65CSP681468-1/65FV6814526/A	65CSP681468-1/65FV6814526/B	CA-H2/452	NC
65CSP681468-2	65FV6815621	65CSP681468-2/65FV6815621/A	65CSP681468-2/65FV6815621/B	SY/562	NC
65CSP681468-3	65FV6815625	65CSP681468-3/65FV6815625/A	65CSP681468-3/65FV6815625/B	SY/562	NC
65CSP681468-4	65FV6815627	65CSP681468-4/65FV6815627/A	65CSP681468-4/65FV6815627/B	SY/562	NC
65CSP681468-5	65FV6815628	65CSP681468-5/65FV6815628/A	65CSP681468-5/65FV6815628/B	SY/562	NC
65CSP681468-6	65FV6815629	65CSP681468-6/65FV6815629/A	65CSP681468-6/65FV6815629/B	SY/562	NC
65CSP681468-7	65FV6814522	65CSP681468-7/65FV6814522/A	65CSP681468-7/65FV6814522/B	CA-SY/452	NC
65CSP681468-8	65FV6814528	65CSP681468-8/65FV6814528/A	65CSP681468-8/65FV6814528/B	CA-H2/452	NC
65CSP681468-9	65FV6810505	65CSP681468-9/65FV6810505/A	65CSP681468-9/65FV6810505/B	BD/050	NC
65CSP681468-10	SPARE				
65CSP681468-11	SPARE				
65CSP681468-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

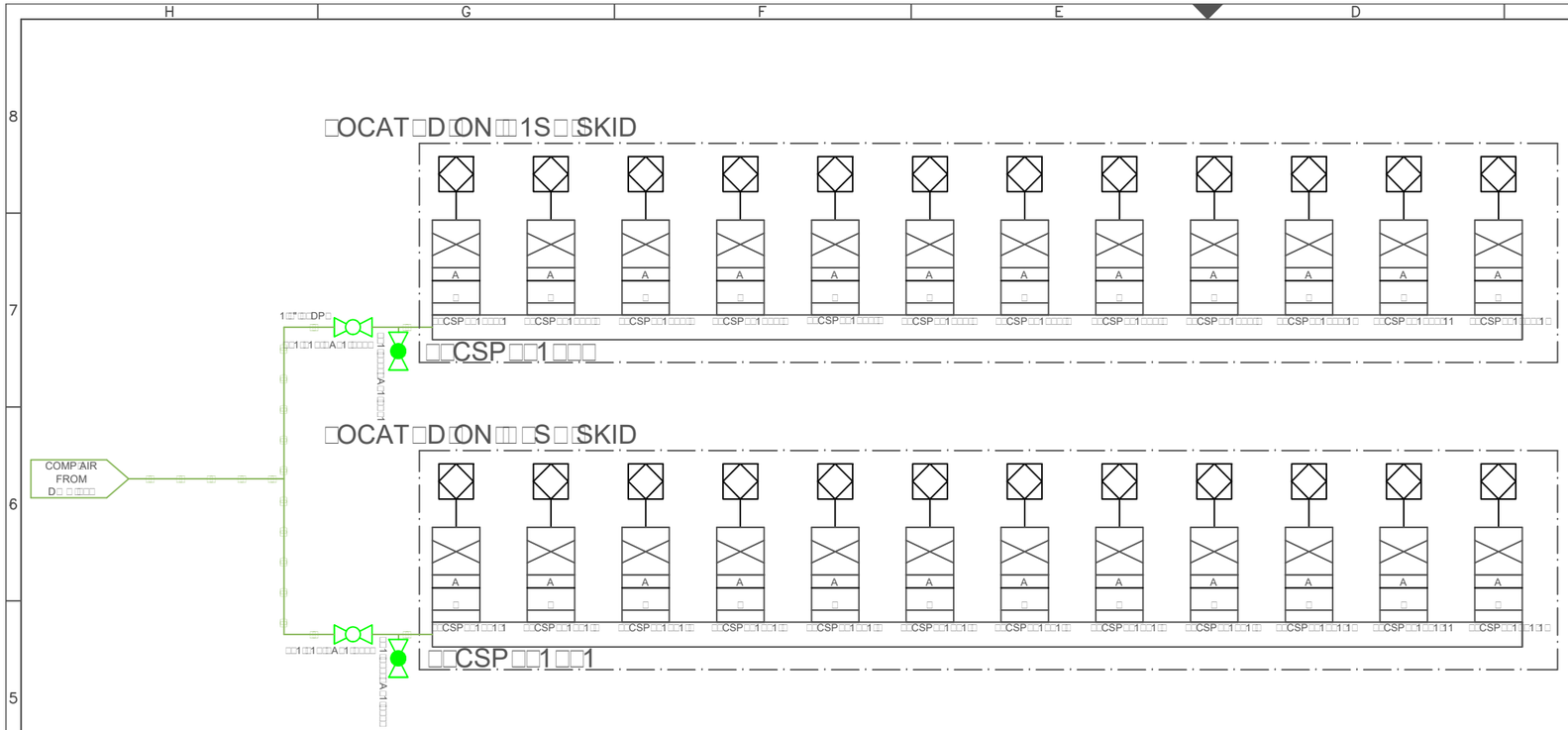
T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□PROPRI□TAR□□TO SA□T□ ORKS□IT□IS□TO□□□□S□D□ON□□□FOR□T□□P□RPOS□□AND□□□T□□□□NTIT□□FOR □ □IC□□IT□ AS□ORI□INA□□□S□PP□I□D□T□□□DOC□M□NT□MA□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□ □O□□□ IT□O□T□T□□PRIOR□ RITT□N□P□RMISSION□OF□SA□T□ ORKS□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	UPDATED SOLENOID TABLE	JLAU
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 460: CIP & EH/SH AIR BANK

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_460	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	82 OF117	



65CSP681470

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681470-1	65FV6815641	65CSP681470-1/65FV6815641/A	65CSP681470-1/65FV6815641/B	H1SE/564	NC
65CSP681470-2	65FV6815642	65CSP681470-2/65FV6815642/A	65CSP681470-2/65FV6815642/B	H1SE/564	NC
65CSP681470-3	65FV6815643	65CSP681470-3/65FV6815643/A	65CSP681470-3/65FV6815643/B	H1SE/564	NC
65CSP681470-4	65FV6815644	65CSP681470-4/65FV6815644/A	65CSP681470-4/65FV6815644/B	H1SE/564	NC
65CSP681470-5	65FV6815645	65CSP681470-5/65FV6815645/A	65CSP681470-5/65FV6815645/B	H1SE/564	NC
65CSP681470-6	65FV6815646	65CSP681470-6/65FV6815646/A	65CSP681470-6/65FV6815646/B	H1SE/564	NO
65CSP681470-7	65FV6815647	65CSP681470-7/65FV6815647/A	65CSP681470-7/65FV6815647/B	H1SE/564	NC
65CSP681470-8	65FV6815659	65CSP681471-10/65FV6815659/A	65CSP681471-10/65FV6815659/B	H2SE/565	NO
65CSP681470-9	65FV6815650	65CSP681471-11/65FV6815650/A	65CSP681471-11/65FV6815650/B	H2SE/565	NC
65CSP681470-10	RESERVED				
65CSP681470-11	65FV6814515	65CSP681470-11/65FV6814515/A	65CSP681470-11/65FV6814515/B	CA-H2SE/451	NC
65CSP681470-12	65FV6814516	65CSP681470-12/65FV6814516/A	65CSP681470-12/65FV6814516/B	CA-H2SE/451	NC

65CSP681471

SOLENOID	ABV	CONTROL LINE A	CONTROL LINE B	SYSTEM/DWG	NO/NC
65CSP681471-1	65FV6815651	65CSP681471-1/65FV6815651/A	65CSP681471-1/65FV6815651/B	H2SE/565	NC
65CSP681471-2	65FV6815652	65CSP681471-2/65FV6815652/A	65CSP681471-2/65FV6815652/B	H2SE/565	NC
65CSP681471-3	65FV6815653	65CSP681471-3/65FV6815653/A	65CSP681471-3/65FV6815653/B	H2SE/565	NC
65CSP681471-4	65FV6815654	65CSP681471-4/65FV6815654/A	65CSP681471-4/65FV6815654/B	H2SE/565	NC
65CSP681471-5	65FV6815655	65CSP681471-5/65FV6815655/A	65CSP681471-5/65FV6815655/B	H2SE/565	NC
65CSP681471-6	RESERVED				
65CSP681471-7	65FV6815656	65CSP681471-7/65FV6815656/A	65CSP681471-7/65FV6815656/B	H2SE/565	NO
65CSP681471-8	65FV6815657	65CSP681471-8/65FV6815657/A	65CSP681471-8/65FV6815657/B	H2SE/565	NC
65CSP681471-9	65FV6815658	65CSP681471-9/65FV6815658/A	65CSP681471-9/65FV6815658/B	H2SE/565	NC
65CSP681471-10	RESERVED				
65CSP681471-11	RESERVED				
65CSP681471-12	SPARE				

1. ALL ABV SUPPLIED IN NC CONFIGURATION
2. CONTROL LINE A ALWAYS START FROM SOLENOID A PORT
3. CONTROL LINE B ALWAYS START FROM SOLENOID B PORT
4. FOR NC ABV
   a. CONTROL LINE A TERMINATES AT ABV LEFT PORT
   b. CONTROL LINE B TERMINATES AT ABV RIGHT PORT
5. FOR NO ABV
   a. CONTROL LINE A TERMINATES AT ABV RIGHT PORT
   b. CONTROL LINE B TERMINATES AT ABV LEFT PORT

NOTE: ORIENTATION OF AIR PANEL AND AIRLINE FEEDING PANEL PENDING MECHANICAL LAYOUT. ALL SOLENOID VALVE POSITION 1 STARTS IMMEDIATELY ADJACENT TO D-SUB CONNECTOR

Saltworks
13800 Steveston Hwy
Richmond, BC, Canada, V6W 1A8
Tel: 604.628.6508 Fax: 604.676.2463
www.saltworkstech.com

DRAWING STATUS: AS BUILT

T□IS□DOC□M□NT□M□ODI□S□D□SI□NS□AND□INFORMATION□T□AT□AR□□PROPRI□TAR□□TO SA□T□ ORKS□□IT□IS□TO□□□□S□D□DN□□□FOR□T□□P□RPOS□□AND□□□T□□□NTIT□□FOR □□IC□□IT□□ AS□OR□INA□□□S□□PP□I□D□T□□DOC□M□NT□MA□□NOT□□□D□P□ICAT□D□OR DISC□OS□D□TO□OT□□R□P□RSON□OR□□NTIT□□OR□□S□D□FOR□MAN□FACT□R□□OF□T□□□IT□M IN□PART□OR□IN□□ □O□□□□ IT□O□T□T□□PRIOR□□ RITT□N□P□RMISSION□OF□SA□T□□ ORKS□□

DO NOT SCALE DRAWING

LTR	DATE	DESCRIPTION	REV. BY:
N	06–JUL–2018	NO CHANGES	–
O	18–OCT–2018	NO CHANGES	–
P	16–NOV–2018	NO CHANGES	–
Q	12–FEB–2019	AS BUILT UPDATE	DKAO

TITLE: (SM2) 461: H1/H2 SE AIR BANK

PROJECT:	SALTMAKER GEN III		CUSTOMER:	AGNICO EAGLE MINES	REVISION: Q
PREPARED BY:	SN	DATE: 22–FEB–2018	DWG. NO:	SW_EN_SM_GEN III_PID_DWG_461	
CHECKED BY:	XXIAO	DATE: 23–FEB–2018	JOB/CO NO:	(JOB NO.)	
APPROVED BY:	APPROVED BY	DATE: APPROVED DATE	SHEET:	83 OF117	

65CSP681303
TYPE: NEMA 4X **SIZE:** XX"T X XX"W X XX"D **MOTOR STARTERS:** VFD

600V, 3ϕ, 60 Hz

65PLC681304
TYPE: NEMA 4X **SIZE:** XX"T X XX"W X XX"D
PLC: Schneider MODICON M580 Series **HMI:** By Others

120V, 1ϕ, 60 Hz

65CSP681406
TYPE: NEMA 4X **SIZE:** XX"T X XX"W X XX"D

120V, 1ϕ, 60 Hz

5 SCFM @ 80 psig

100.01 1/2" 1 8

SHEET 2 UTILITY WATER 100.11 100.20 T.P.A

100.02 3" UTILITY WATER

1-3"-101-80P2X-0X

SHEET 2 T.P.B FROM 65TNK681301/ 65TNK681302 T.P.B

1-3"-103-80P2X-0X

FLUSH/ CIP RETURN SHEET 2 T.P.D

1-3"-107-80P2X-0X

DRAIN 100.03 3"

SPARE 100.08 3"

SHEET 2 TO 65TNK681301 100.49 T.P.J

AO AI DO DI VFD-101

3" x 2" 2" x 3" 3" x 2" 2" x 3" 3" x 2" 2" x 3" 3" x 2" 2" x 3"

681-080-BA17-3003 3" 681-080-BA17-3004 3" 681-080-BA17-3005 3" 681-080-BA17-3006 3" 681-080-BA17-3007 3" 681-080-BA17-3008 3" 681-080-BA17-3055 3" 681-080-BA17-3056 3" 681-080-BA17-3060 3" 681-080-BA17-3023 3"

YS-101 3"

65PWA681301 Make: Grundfos Model: CRN 15-4 HP: 7.5

FI-3301 0-100 gpm

0-100 PSI PI-3301 ¼" 0-100 PSI PI-3302 ½" 0-100 PSI PI-3303 ½"

681-008-BA15-3068 1/4" 681-008-BA15-3071 1/4" 681-008-BA15-3074 1/4" 681-008-BA15-3077 1/4"

65FIL681301A Model: BFS-2C Mat'l: 316SS ASME: NO 20 MICRON BAG FILTER

65FIL681302A Model: 7F054-316 Mat'l: 316SS ASME: NO 5 MICRON CARTRIDGE FILTER

65FIL681301B Model: BFS-2C Mat'l: 316SS ASME: NO 20 MICRON BAG FILTER

65FIL681302B Model: 7F054-316 Mat'l: 316SS ASME: NO 5 MICRON CARTRIDGE FILTER

681-015-BA15-3070 1/2" 681-015-BA15-3072 1/2" 681-015-BA15-3073 1/2" 681-015-BA15-3076 1/2" 681-015-BA15-3078 1/2" 681-015-BA15-3079 1/2"

IAS FV-3307 IAS DO

IAS FV-3302 IAS DO

IAS FV-3303 IAS DO

AI TIT-3304 TT-3304 AI FIT-3301 FE-3301

P.M. 0-100 PSI PI-3304 ½" P.M. BV-101 1/4" ½"

AI PIT-3301 PT-3301 DI PSL-3301 ½" ½" ½"

IAS

DI PSH-3301 ½"

1-2"-102-40S2X-0X

65RD681301 SET @ 1150 PSI ¼" DRAIN

LSHH-3301 DI

1" x 2" CV-101 2"

VFD-102 M 65PWA681302 Make: DANFOSS Model: APP 13 HP: 50

AO AI DO DI CPVC SS316L CV-102 3" 3" x 2"

AI PIT-3302 PT-3302 ½" 0-1500 PSI PI-3305 ½"

BV-105 1/4" ¼"

AI TIT-3303 TT-3303 AI AIT-3303 AE-3303 Cond ¾"

DI LSHH-3304 ¾"

65RD681304 SET @ 100PSI

CPVC SS316L

65RD681303 SET @ 100PSI

AI AIT-3301 TIT-3301 AE-3301 TT-3301 Cond ¾"

¾" LSHH-3303 DI

0-60 PSI PI-3308 ½" BV-106 1/4" P.M.

2" x 1" FI-3303 0-60 gpm 1" x 2" ¾"

HMI "VIRTUAL" FIT

9 65MIX681301

AI AIT-3304 AE-3304 pH ¾"

IAS FV-3305 IAS DO 681-050-BA17-3058 2"

100.04 2" RO REJECT

IAS FV-3308 IAS DO 681-050-BA17-3061 2"

SHEET 2 T.P.E 100.12 TO 65TNK681301

SHEET 2 T.P.F CAUSTIC T.P.F

1-0.25"-109-80P2X-0X

681-050-BA17-3022 2" 100.09 2" SPARE

DO IAS FV-3305 IAS 681-050-BA17-3058 2" 2-20 GPM

AI AIT-3304 AE-3304 pH ¾"

AI FIT-3302 FE-3302 0-1500 PSI PI-3307 ¼" ½" M CV-103 2"

VFD-103 3" 3" x 2" 2" x 3" 65PWA681303 Make: ERI Model: HP-8503 HP: 5

BV-102 1/4" ½" ½" PI-3306 0-1500 PSI

1-2"-106-40S2X-0X

2" 681-050-BA17-3017 2" 681-050-BA17-3016 2" 681-050-BA17-3014 2" 681-050-BA17-3013 2" 681-050-BA17-3011 2" 681-050-BA17-3010 2"

10 1" 1" x 2" CV-106 1/4" 681-050-BA17-3018 2"

10 1" 1" x 2" CV-105 1/4" 681-050-BA17-3015 2"

10 1" 1" x 2" CV-104 1/4" 681-050-BA17-3012 2"

(3) MEMBRANE HOUSING
8" x 40" LONG, 6 ELEMENTS PER HOUSING
1200 PSIG ASME
ELEMENTS: BY OTHERS

VB PSV-101 ½" DRAIN

65RD681302 SET @ 100PSI

681-050-CK99-3084 2" LSHH-3302 DI ¾"

AI TIT-3302 AIT-3302 TT-3302 AE-3302 Cond ¾"

AI FIT-3303 FE-3303 M ½" BV-103 1/4"

2" x 1" FI-3302 0-50 gpm 1" x 2"

1-2"-110-80P2X-0X OFF SPEC PERMEATE/ CIP RETURN

681-050-BA17-3057 2" IAS FV-3306 IAS DO

681-050-BA17-3019 2" 100.05 2" RO PERMEATE TO PERMEATE TANK 4-42 GPM

681-050-BA17-3020 2" 100.06 2" SPARE

681-050-BA17-3021 2" 100.07 2" DRAIN

SHEET 2 T.P.G 100.10 100.19 TO 65TNK681301 TO 65TNK681302

SHEET 2 T.P.H 100.47 TO 65TNK681301

T.P.I SHEET 2 100.48 TO 65TNK681301

SKID 100

NOTES:
1) OIL-FREE AIR BY OTHERS.
2) INTERCONNECTING PIPING BY OTHERS.
3) MEMBRANES ELEMENTS BY OTHERS.
4) TANK SHIPPED LOOSE. INSTALL BY OTHERS.
5) COLORED ITEMS WILL BE SUPPLIED BY SALTWORKS.
6) T.P.X (TIE POINT) DENOTES PAGE CONNECTOR. NO PHYSICAL CONNECTION POINT ON SKID.
7) P.M. DENOTES PANEL MOUNTED DEVICE.
8) H-8 AIR REGULATOR. REGULATOR TO BE EQUIPPED WITH DIGITAL PRESSURE INDICATOR AND SWITCH SIGNAL TO PLC
9) STATIC MIXER WITH HAVE 20 PIPE DIAMETERS BEFORE, AND 9 AFTER AS PER GA LAYOUT
10) ALL PERMEATE LINES TO BE CPVC AFTER FLEXIBLE HOSE

USWS SCOPE ◆ CUSTOMER SCOPE

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REV	DESCRIPTION	DATE	DRWN	CHK'D	APP'D
0	INITIAL RELEASE	10/30/17	KAE	KAE	ARS
1	Engineer Comments	11/20/17	KAE	KAE	ARS
2	Engineer Comments/ Design Update	12/6/17	KAE	KAE	ARS
3	See Page 2	1/23/18	KAE	KAE	ARS
4	Updated Tags per Engineer Request/ As-Builts	4/17/18	KAE	KAE	ARS

U.S. WATER The future of water

SYSTEM NAME: SYSTEM 100: POST TREATMENT RO

CUSTOMER: SALTWORKS TECHNOLOGIES, INC. **REV:** 4 **NAV NUMBER:** 49-0462

DATE: 10/30/2017 **PAGE:** 1 OF 2 **PROJECT NUMBER/ SHEET:** 17041_100D

HMI "VIRTUAL" FIT

SHEET 1 T.P.D FLUSH/ CIP RETURN

SALTMAKER CONDENSED WATER

SHEET 1 T.P.E BRINE RECYCLE

SHEET 1 T.P.A UTILITY WATER

SHEET 1 T.P.G OFF SPEC PERMEATE CIP RETURN

T.P.H 65RD681302 RECIRC LINE

T.P.I 65RD681303 RECIRC LINE

T.P.J 65RD681304 RECIRC LINE

65TNK681301
RO FEED TANK

1,000 gal.
XX"D x XX"H
HDPE

65TNK681302
CIP TANK

400 gal.
48"D x 63"H
HDPE

65HEA681301
575V/ 12kW

65TNK681303
CAUSTIC TANK

80 gal.
24"D x 49"H
HDPE

65TNK681304
RO CHEM CLEAN TANK

40 gal.
20"D x 37"H
HDPE

65TNK681305
ANTI-SCALANT TANK

40 gal.
20"D x 37"H
HDPE

65PWA681305
Make: MARCH
Model: AC-3CP-MD
HP: <1/4

65PWA681306
Make: MARCH
Model: AC-3CP-MD
HP: <1/4

65PME681301
Make: Grundfos
Model: DDA 7.5-16
HP: <1/4

65PME681302
Make: Grundfos
Model: DDA 7.5-16
HP: <1/4

65PWA681304
Make: Grundfos
Model: CRN 5-2
HP: 3/4

FI-3311
0-10 gpm

GV-101 3"
GV-102 3"
GV-103 1"
PV-101 1"

SHEET 1 T.P.F TO RO REJECT LINE

SHEET 1 T.P.B TO RO INLET

NOTES:
1) TANKS SIHIP LOOSE, AND ARE INSTALLED BY OTHERS.
2) COLORED ITEMS ARE SUPPLIED BY SALTWORKS.
3) T.P.X (TIE POINT) DENOTES PAGE CONNECTOR. NO PHYSICAL CONNECTION POINT ON SKID.
4) 7) P.M. DENOTES PANEL MOUNTED DEVICE.
5) ITEM(S) SHIPPED LOOSE & INSTALLED BY OTHERS.

USWS SCOPE ◆ CUSTOMER SCOPE

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REV	DESCRIPTION	DATE	DRWN	CHK'D	APP'D
0	INITIAL RELEASE	10/30/17	KAE	KAE	ARS
1	Engineer Comments	11/20/17	KAE	KAE	ARS
2	Engineer Comments/ Design Update	12/6/17	KAE	KAE	ARS
3	Updated Tag, and Electrical on CIP Heater	1/23/18	KAE	KAE	ARS
4	Updated Tags per Engineer Request/ As-Builts	4/17/18	KAE	KAE	ARS

U.S. WATER The future of water

DATE: 10/30/2017

SYSTEM NAME: **SYSTEM 100: POST TREATMENT RO**

CUSTOMER: SALTWORKS TECHNOLOGIES, INC.

REV: 4

NAV NUMBER: 49-0462

PAGE: 2 OF 2

PROJECT NUMBER/ SHEET: 17041_100D

Appendix E

AF-64

SAFETY DATA SHEET

SECTION 1 – IDENTIFICATION

Product Identifier: AF-64

Manufacturer: Aquaserv, Inc.
570 N. Rivergate Rd.
Memphis, TN 38109

24 Hour Emergency Phone: **(901) 525-7701**
CHEMTREC: **(800) 424-9300**

Recommended use: Defoamer

SECTION 2 – HAZARDS IDENTIFICATION

Hazard Classification
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard's 29CFR 1910.1200 implementation of the Globally Harmonized System (GHS), i.e., material is not a dangerous substance or mixture requiring GHS classification according to the US GHS regulations.

Other hazards which do not result in classification

Advice: Repeated or prolonged exposure may cause slight irritation of eyes and skin.
Inhalation: Prolonged or excessive inhalation may cause coughing or sneezing. May cause irritation of the respiratory tract.
Ingestion: Low acute oral toxicity.
Chronic Exposure: No known carcinogenic or other chronic effects.

SECTION 3 – COMPOSITION / INFORMATION ON INGREDIENTS

This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

SECTION 4 – FIRST AID MEASURES

Inhalation: If exposure by inhalation is suspected, immediately remove exposed individual to fresh air and provide oxygen. If not breathing, give artificial respiration. Get medical attention if cough or other symptoms develop.

Skin Contact: Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation develops and persists.

Eye Contact: Immediately flush eyes with large amounts of water for a minimum of 15 minutes, while holding eyelids apart to ensure flushing of entire surface. If easy to do remove contact lenses. Do not let exposed individual rub eyes. Seek medical attention if symptoms persist.

Ingestion: Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Contact Poison Control/physician immediately. Do not induce vomiting without medical advice.

Most Important Symptoms/Effects, Acute and Chronic: No severe effects after a single exposure.

Indication of Immediate Medical Attention and Special Treatment Needed: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically.

SECTION 5 – FIRE FIGHTING MEASURES

Extinguishing Media: Use dry chemicals, foam, or carbon dioxide.

Unsuitable Extinguishing Media: Water may be ineffective.

Special Firefighting Procedures: Use self-contained breathing apparatus (SCBA) and proper personal protection clothing. Use NIOSH/MSHA approved respiratory protection.

Unusual Fire and Explosive Hazards: In the event of fire the product burns. Containers can build up pressure if exposed to heat (fire). Thermal decomposition products: Carbon oxides, hydrocarbons, fumes, smoke.

Further Information: Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Contaminated fire extinguishing water must be disposed of in accordance with local regulations. Cool containers/tanks with water spray.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate personal protective equipment. Evacuate nonessential personnel. Avoid contact with eyes and skin. Contaminated surfaces will be slippery.

Environmental Precautions: Avoid discharge into drains, water courses or onto the ground. Close or cap valves and /or block or plug hole in leaking container and transfer to another container. Must be disposed of in accordance with local and national regulations.

Spill or Leak Cleanup Procedures: In case of large spillage, contain by damming up. Collect by pump. Take up mechanically and collect into suitable containers for disposal. Must be disposed of in accordance with local and national regulations.

Small amounts: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). After cleaning, flush away traces with water.

Review each section of this SDS before responding to a spill or leak of this product. For detailed disposal information see section 13.

SECTION 7 - HANDLING AND STORAGE

Conditions for Safe Handling: Prevent eye and skin contact. Wash thoroughly with soap and water after handling. Ensure adequate ventilation. Keep away from combustible material.

Conditions for Safe Storage: Store in a place accessible by authorized persons only. Store at 5 – 40 °C (40 – 104 °F). Keep containers tightly closed in a cool, well-ventilated place. Avoid extreme temperatures.

Incompatible Materials: Strong oxidizing agents

Other Precautions: Eyewash and safety showers are recommended in the immediate work area. Check with your state OSHA to determine the need and maximum distance for stations to be placed in regards to possible chemical exposure.

SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits:

Components	CAS No.	Value	Form of Exposure	Control Parameters	Update	Basis
Distillates (petroleum)	64742-65-0	--	Mist	5 mg/m^3	--	--

Engineering Controls: Ensure adequate ventilation. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting chemical safety goggles or safety glasses with side-shields are required.

Hand Protection: Chemical resistant gloves are required.

Skin Protection: Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Respiratory Protection: Respiratory protection is not normally required. However, it may be necessary in areas of high vapor concentration or in areas with little or no ventilation. Always wear NIOSH approved respiratory protective equipment where there may be potential for airborne exposure.

General Work Practices: Eye wash fountains and safety showers in the work place are strongly recommended. Do not eat, drink, or smoke in areas where chemicals are being stored or handled. Wash thoroughly before handling food or beverages.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance	White liquid
Odor	Mild
Odor Threshold	Not determined
pH	Not determined
Melting Point/Range	Freezing point </= 32 °F
Initial Boiling Point and Boiling Range	>212 °F
Flash Point	>300 °F
Evaporation Rate (Butyl Acetate=1)	<1
Upper and Lower Explosion Limit	Not applicable
Vapor Pressure	Not determined
Relative Vapor Density	Not determined
Density	Ca. 7.7 lb/gal (77 °F)
Relative Density	Ca. 0.92 (25 °C)
Solubility	Dispersible
Partition Coefficient	Not determined
Auto-ignition Temperature	Not applicable
Decomposition Temperature	Not determined
Viscosity, Dynamic	> 600 cP (25 °C)
Viscosity, Kinematic	> 300 cP (40 °C)

NOTE: The above represents typical values and should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable under recommended storage conditions.

Reactivity: Stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Keep away from sources of ignition.

Incompatible Materials: Oxidizing agents.

Hazardous Decomposition Products: In case of fire, hazardous decomposition products may be produced such as: Carbon oxides, hydrocarbons, fumes, smoke

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects
Acute Toxicity

Oral: No data available.

Dermal: No data is available on the product itself.

Mutagenicity: No data available.

Carcinogenicity: No known effect.

Sensitization: No data available.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic Toxicity
LC50/48 h/ Pimephales promelas (fathead minnow)/Acute fish toxicity: 2000 mg/l

Toxicity to Other Organisms
No data available on the product itself.

Persistence and Degradability

Biological degradability
No data available on the product itself.

Bioaccumulative Potential
No data available on the product itself.
Partition coefficient: n-octanol/water: Not determined.

Mobility in Soil
Water solubility: dispersible.

Other Adverse Effects:
None known.

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal Procedure: Not an EPA hazardous waste. For product disposal and disposal of contaminated packaging, dispose of at a supervised incineration facility or an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

SECTION 14 - TRANSPORT INFORMATION

DOT: Not classified as dangerous in the meaning of transport regulations.

IMDG: Not classified as dangerous in the meaning of transport regulations.

IATA: Not classified as dangerous in the meaning of transport regulations.

SECTION 15 - REGULATORY INFORMATION

SARA Title III Section 311 Categories
Immediate (Acute) Health Effects: No
Delayed (Chronic) Health Effects: No
Fire Hazard: No
Sudden Release of Pressure Hazard: No
Reactivity Hazard: No

SARA 313 – Specific Toxic Chemical Listing
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313

SARA 302 – Extremely Hazardous Substances
None present

US CERCLA – Comprehensive Environmental Response, Compensation and Liability Act List
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute. None present.

California Proposition 65
Remarks: This product does not contain any chemicals known to the state of California to cause cancer, birth defects or other reproduction harm.

United States TSCA Inventory (TSCA)
All components of this product are included in the United States TSCA Chemical Inventory or are not required to be listed on the United States TSCA Chemical Inventory.

Canada Domestic Substance List (DSL)
All components of this product are included in the Canada Domestic Substance List (DSL) or are not required to be listed on the Canada Domestic Substance List (DSL).

European Chemical Inventory (EINECS)
All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed.

Philippine Inventory Status (PICCS)
All components of this product are NOT included on the Philippine (PICCS).

Australian Inventory of Chemical Substances
All components of this product are NOT included in the Australian Inventory of Chemical Substances (AICS).

Japanese Inventory (ENCS)
All components of this product are NOT included on the Japanese (ENCS) inventory.

Korean Inventory (ECL)
All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory.

Chinese Inventory
All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

New Zealand Inventory (NZIoC)
All components of this product are not included on the New Zealand Inventory of Chemical Substances.

Taiwan Toxic Chemical Substances Control Act Inventory
This product's Taiwan Toxic Chemical Substances Control Act Inventory status has NOT been determined.

SECTION 16 – OTHER INFORMATION

Revision Date:	June 1, 2015
Date of Last Revision:	May 29, 2015
Revision Summary:	None
Prepared By:	Product Stewardship Team

HMIS Ratings:

HEALTH	**1**
FLAMMABILITY	**1**
REACTIVITY	**0**
PERSONAL PROTECTION	**-**

This Safety Data Sheet was prepared to comply with the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Aquaserv provides no warranties; either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. The data contained in this Safety Data Sheet reflects the latest information available to us on hazards, properties, and handling of this product under the recommended conditions of use. The information on this Safety Data Sheet relates only to the material as supplied and does not relate to combinations with other materials or processes.

CC 7430 Process Water Treatment-Scale Control

SECTION 1. IDENTIFICATION

Product Identifier	CC 7430 Process Water Treatment-Scale Control
Manufacturer	Control Chem Canada Ltd., 4460 Harvester Road, Burlington, Ontario, L7L 4X2, 905-319-2234, www.controlchem.com
Emergency Phone No.	CANUTEC, 613-996-6666 (*666 cell)
	Control Chem Canada Ltd., 1-866-882-2436
SDS No.	0392

SECTION 2. HAZARD IDENTIFICATION

Classified according to Canada's Hazardous Products Regulations (WHMIS 2015).

Classification

Corrosive to metals - Category 1; Acute toxicity (Oral) - Category 4; Skin corrosion - Category 1; Serious eye damage - Category 1; Skin sensitization - Category 1

Label Elements



Signal Word:
Danger
Hazard Statement(s):
May be corrosive to metals.
Harmful if swallowed or in contact with skin.
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
Precautionary Statement(s):
Prevention:
Keep only in original container.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF SWALLOWED: Call a POISON CENTRE or doctor if you feel unwell.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTRE or doctor.
If skin irritation or rash occurs: Get medical advice or attention.

Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.

Storage:

Store in corrosion resistant container with a resistant inner liner.
Store locked up.

Disposal:

Dispose of contents and container in accordance with local, regional, national and international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	%	Other Identifiers	Other Names
Copolymer, Maleic Acid	113221-69-5	10.5-25.0		
Sodium hydroxide	1310-73-2	8.5-10.0		
1,2,4-Butanetricarboxylic acid, 2-phosphono-	37971-36-1	2.5-3.5		
Maleic acid	110-16-7	1.5-4.5		
Phosphonic acid, (((phosphonomethyl)imino)bis(2, 1-ethanediylnitrilobis(methylene))) tetrakis-,sodium salt	22042-96-2	1.5-3.0		
Potassium hydroxide	1310-58-3	3.0-7.5		

SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation

Remove source of exposure or move to fresh air. Get medical advice or attention if you feel unwell or are concerned.

Skin Contact

Immediately and thoroughly flush with water for 15 minutes. Obtain medical attention immediately if irritation persists.

Eye Contact

Immediately and thoroughly flush eyes and under eyelids for at least 15 minutes. Seek medical attention immediately.

Ingestion

Do not induce vomiting. Rinse mouth with water. Call Poison Control Centre.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

Dry chemical, water, carbon dioxide or foam. Use water to keep non-leaking, fire-exposed containers cool.

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Product

Closed containers may rupture violently when heated releasing contents.
In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide; corrosive phosphorous oxides. sodium oxides potassium oxides corrosive, oxidizing nitrogen oxides.

Special Protective Equipment and Precautions for Fire-fighters

Wear full protective equipment including a self-contained breathing apparatus. Approach fire from upwind to avoid hazardous vapours or gases. For a massive fire, immediately evacuate the area and use unmanned hose holder or

monitor nozzles. Dike and recover contaminated water for appropriate disposal.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Use the personal protective equipment recommended in Section 8 of this safety data sheet. Avoid breathing mist, vapours or gas.

Environmental Precautions

Do not allow into any sewer, on the ground or into any waterway.

Methods and Materials for Containment and Cleaning Up

Stop or reduce leak if safe to do so. Contain and soak up spill with absorbent that does not react with spilled product. Contaminated absorbent poses the same hazard as the spilled product. Place used absorbent into suitable, covered, labelled containers for disposal. After cleaning, flush away traces with water.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

Do not get in eyes, on skin or on clothing. Handle in accordance with good industrial hygiene and safety practices. Ensure eyewash and shower station are close by. Avoid generating vapours or mists. Only use where there is adequate ventilation.

Conditions for Safe Storage

Store in a cool, dry, well-ventilated location. Store in an area that is: separate from incompatible materials (see Section 10: Stability and Reactivity).

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

	ACGIH TLV®		OSHA PEL		AIHA WEEL	
Chemical Name	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Sodium hydroxide	2 mg/m3		2 mg/m3			
1,2,4-Butanetricarboxylic acid, 2-phosphono-					10 mg/m3	
Potassium hydroxide	2 mg/m3			2 mg/m3		

Appropriate Engineering Controls

General ventilation is usually adequate. Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air.

Individual Protection Measures

Eye/Face Protection

Wear safety glasses with side shield, face shield or goggles when handling.

Skin Protection

When handling, wear impervious gloves, apron, pants and jacket.

Respiratory Protection

Not normally required if product is used as directed.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

Appearance	Clear amber liquid.
Odour	Not available
Odour Threshold	Not available

pH	9.0 - 11.5
Melting Point/Freezing Point	Not available (melting); Not available (freezing)
Initial Boiling Point/Range	Not available
Flash Point	Not available
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable
Upper/Lower Flammability or Explosive Limit	Not available (upper); Not available (lower)
Vapour Pressure	Not available
Relative Density (water = 1)	1.15 - 1.30
Solubility	Very soluble in water
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Viscosity	Not available (kinematic)

Other Information

Physical State	Liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity

None known.

Chemical Stability

Normally stable.

Possibility of Hazardous Reactions

None expected under normal conditions of storage and use.

Conditions to Avoid

High temperatures. Freezing. Incompatible materials.

Incompatible Materials

Strong oxidizing agents (e.g. perchloric acid), halogenated compounds (e.g. trichloroethylene), strong acids (e.g. hydrochloric acid), strong reducing agents (e.g. hydrides).
Corrosive to: aluminum alloys.

Hazardous Decomposition Products

Very toxic carbon monoxide, carbon dioxide; corrosive phosphorous oxides. sodium oxides potassium oxides corrosive, oxidizing nitrogen oxides.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Chemical Name	LC50	LD50 (oral)	LD50 (dermal)
Sodium hydroxide	Not available	340 mg/kg (rat)	1350 mg/kg (rabbit)
1,2,4-Butanetricarboxylic acid, 2-phosphono-	> 1.979 mg/L (rat) (vapour)	> 6500 mg/kg (rat)	> 4000 mg/kg (rat)
Maleic acid	Not available	708 mg/kg (rat)	1560 mg/kg (rabbit)
Potassium hydroxide	Not available	205 mg/kg (rat)	> 1260 mg/kg (rabbit)

LC50: No information was located.

LD50 (dermal): No information was located.

Skin Corrosion/Irritation

Corrosive based on information for closely related materials.

Serious Eye Damage/Irritation

May cause serious eye damage based on information for closely related materials.

STOT (Specific Target Organ Toxicity) - Single Exposure

Inhalation

No information was located.

Skin Absorption

No information was located.

Ingestion

Harmful if swallowed. Based on information for closely related materials.

STOT (Specific Target Organ Toxicity) - Repeated Exposure

No information was located.

Respiratory and/or Skin Sensitization

No information was located for respiratory sensitization. May cause an allergic reaction (skin sensitization) based on information for closely related chemicals. (Maleic acid)

Carcinogenicity

No information was located.

Reproductive Toxicity

Development of Offspring

No information was located.

Sexual Function and Fertility

No information was located.

Effects on or via Lactation

No information was located.

Germ Cell Mutagenicity

No information was located.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

May be harmful to aquatic life.

Acute Aquatic Toxicity

Chemical Name	LC50 Fish	EC50 Crustacea	ErC50 Aquatic Plants	ErC50 Algae
Sodium hydroxide	45.4 mg/L (Oncorhynchus mykiss (rainbow trout); 96-hour; static)	265 mg/L (Daphnia magna (water flea); 48-hour)		
1,2,4-Butanetricarboxylic acid, 2-phosphono-	> 1000 mg/L (Oncorhynchus mykiss (rainbow trout); 96-hour)	1071 mg/L (Daphnia magna (water flea); 48-hour)	33.3-65.5 mg/L (72-hour)	
Potassium hydroxide	80 mg/L (96-hour)			

Persistence and Degradability

No information was located.

Bioaccumulative Potential

This product and its degradation products are not expected to bioaccumulate.

Mobility in Soil

If released into the environment, this product is expected to move rapidly through the soil, based on physical and chemical properties.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal Methods

All disposals must be made in accordance with applicable government regulations only. Under no conditions is any product to be released into the natural environment (ie. air, water, ground).

SECTION 14. TRANSPORT INFORMATION

Regulation	UN No.	Proper Shipping Name	Transport Hazard Class(es)	Packing Group
Canadian TDG	UN 1760	CORROSIVE LIQUID, N.O.S. (Sodium Hydroxide, Potassium Hydroxide)	8	III

Special Precautions Not applicable

Transport in Bulk According to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations

None known.

SECTION 16. OTHER INFORMATION

Date of Preparation	July 26, 2017
Date of Last Revision	May 19, 2016
References	Supplier Safety Data Sheet cHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS). HSDB® database. US National Library of Medicine. Available from Canadian Centre for Occupational Health and Safety (CCOHS). Reptox eCHA-European Chemicals Agency.
Disclaimer	THIS SAFETY DATA SHEET IS OFFERED FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION, AS REQUIRED BY FEDERAL HAZARDOUS PRODUCTS ACT AND RELATED LEGISLATION. THE INFORMATION IS BELIEVED TO BE ACCURATE, BUT CONTROL CHEM CANADA LTD. PROVIDES NO WARRANTIES, EITHER EXPRESSED OR IMPLIED. THE USER ASSUMES ALL RISK TO PERSONS, PROPERTY AND ENVIRONMENT THROUGH USE OR MISUSE. ALL PRODUCT WARRANTIES ARE LIMITED TO THE REPLACEMENT VALUE OF THE PRODUCT.

CC 7430 Traitement des Eaux de Process-Contrôle D'échelle

SECTION 1: IDENTIFICATION

Identificateur du produit	CC 7430 Traitement des Eaux de Process-Contrôle D'échelle
Fabricant	Control Chem Canada Ltd., 4460 Harvester Road, Burlington, Ontario, L7L 4X2, 905-319-2234, www.controlchem.com
Numéro de téléphone d'urgence	CANUTEC, 613-996-6666 (*666 cell) Control Chem Canada Ltd., 1-866-882-2436
Numéro de la FDS	0392

SECTION 2: IDENTIFICATION DES DANGERS

Classifié selon le Règlement sur les produits dangereux du Canada (SIMDUT 2015).

Classification

Matières corrosives pour les métaux - catégorie 1; Toxicité aiguë (orale) - catégorie 4; Corrosion cutanée - catégorie 1; Lésions oculaires graves - catégorie 1; Sensibilisation cutanée - catégorie 1

Éléments d'étiquetage



Mention d'avertissement :
Danger
Mention(s) de(s) danger(s) :
Peut être corrosif pour les métaux.
Nocif en cas d'ingestion ou de contact cutané.
Provoque de graves brûlures de la peau et de graves lésions des yeux.
Peut provoquer une allergie cutanée.
Conseil(s) de prudence :
Prévention :
Conserver uniquement dans le récipient d'origine.
Éviter de respirer les poussières/fumées/gaz/brouillards/vapeurs/aérosols.
Se laver soigneusement les mains et la peau après avoir manipulé.
Ne pas manger, boire ou fumer en manipulant ce produit.
Les vêtements de travail contaminés ne devraient pas sortir du lieu de travail.
Porter des gants de protection/des vêtements de protection/un équipement de protection des yeux/du visage.
Intervention :
EN CAS D'INGESTION : Rincer la bouche. Ne PAS faire vomir.
EN CAS D'INGESTION : Appeler un Centre antipoison ou un médecin en cas de malaise.
EN CAS DE CONTACT AVEC LA PEAU (ou les cheveux) : Enlever immédiatement les vêtements contaminés. Rincer la peau à l'eau/se doucher.
EN CAS D'INHALATION : Transporter la personne à l'extérieur et la maintenir dans une position où elle peut confortablement respirer.
EN CAS DE CONTACT AVEC LES YEUX : Rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les

lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer.
Appeler immédiatement un Centre antipoison ou un médecin.
En cas d'irritation ou d'éruption cutanée: Demander un avis médical ou consulter un médecin.
Laver les vêtements contaminés avant réutilisation.
Absorber toute substance répandue pour éviter qu'elle attaque les matériaux environnants.

Stockage :

Stocker dans un récipient résistant à la corrosion avec doublure intérieure.
Garder sous clef.

Élimination :

Éliminer le contenu et le récipient conformément à la réglementation locale, régionale, nationale et internationale.

SECTION 3: COMPOSITION/INFORMATION SUR LES INGRÉDIENTS

Nom chimique	Numéro de CAS	%	Autres identificateurs	Autres noms
Copolymère d'acide maléique	113221-69-5	10.5-25.0		
Acide 1,2,4-butanetricarboxylique, acide 2-phosphono-	37971-36-1	2.5-3.5		
Hydroxyde de Sodium	1310-73-2	8.5-10.0		
Acide Maléique	110-16-7	1.5-4.5		
Acide phosphonique, (((phosphonométhyl) imino) bis (2, 1-éthanediylnitrilobis (méthylène))) tétrakis-, sel de sodium	22042-96-2	1.5-3.0		
L'hydroxyde de potassium	1310-58-3	3.0-7.5		

SECTION 4: PREMIERS SOINS

Mesures de premiers soins

Inhalation

Enlever la source d'exposition ou déplacer à l'air frais. Consulter un médecin si vous vous sentez mal ou si vous êtes inquiet.

Contact avec la peau

Rincer immédiatement et abondamment avec de l'eau pendant 15 minutes. Consulter un médecin si l'irritation persiste.

Contact avec les yeux

Immédiatement et soigneusement rincer les yeux et sous les paupières pendant au moins 15 minutes. Consulter immédiatement un médecin.

Ingestion

Ne pas faire vomir. Rincer la bouche avec de l'eau. Appelez le centre antipoison.

SECTION 5: MESURES À PRENDRE EN CAS D'INCENDIE

Agents extincteurs

Agents extincteurs appropriés

Produit chimique sec, eau, dioxyde de carbone ou mousse. Utiliser de l'eau pour refroidir les récipients exposés au feu qui ne fuient pas.

Agents extincteurs inappropriés

Aucun connu.

Dangers spécifiques du produit

Les récipients fermés peuvent se rompre violemment s'ils sont chauffés et peuvent alors libérer leur contenu.
Durant un incendie, les matières dangereuses suivantes peuvent être produites : monoxyde de carbone très toxique et

dioxyde de carbone; anhydrides phosphoriques corrosifs. oxydes de sodium potassium oxides oxydes de nitrogènes corrosifs et comburants.

Équipements de protection spéciaux et précautions spéciales pour les pompiers

Portez des vêtements protecteurs complets, y compris un appareil respiratoire individuel. Approcher l'incendie en amont afin d'éviter les vapeurs ou les gaz dangereux. Dans le cas d'un incendie de grande surface, évacuer immédiatement le secteur et utiliser une lance sur tourelle ou un support de lance télécommandé. Endiguer et recueillir l'eau contaminée afin de l'éliminer de façon appropriée.

SECTION 6: MESURES À PRENDRE EN CAS DE DÉVERSEMENT ACCIDENTEL

Précautions individuelles, équipements de protection et mesures d'urgence

Évacuer les lieux immédiatement. Isoler la zone de danger. Ne pas laisser entrer le personnel superflu ou non protégé. Utiliser l'équipement de protection individuel recommandé à la Section 8 de la présente fiche de données de sécurité. Éviter de respirer les brouillards, vapeurs ou gaz.

Précautions relatives à l'environnement

Empêcher la pénétration dans les égouts, le sol, ou les cours d'eau.

Méthodes et matériaux pour le confinement et le nettoyage

Colmater ou réduire la fuite s'il est sécuritaire de le faire. Contenir et absorber le déversement avec un absorbant qui ne réagit pas avec le produit déversé. L'absorbant contaminé présente le même risque que le produit déversé. Placer l'absorbant utilisé dans des récipients appropriés scellés et étiquetés en vue de leur élimination. Après le nettoyage, rincer les traces avec de l'eau.

SECTION 7: MANUTENTION ET STOCKAGE

Précautions relatives à la sûreté en matière de manutention

Éviter tout contact avec les yeux, la peau ou les vêtements. Manipuler conformément aux bonnes pratiques d'hygiène et de sécurité industrielles. Assurer une douche oculaire et d'une station d'eau sont à proximité. Éviter de produire de la vapeur ou des brouillards. N'utiliser qu'aux endroits où la ventilation est adéquate.

Conditions de sûreté en matière de stockage

Conservez dans un endroit frais , sec et bien ventilé. Stocker dans une zone ayant les caractéristiques suivantes : isolé des matériaux incompatibles (voir la Section 10 : Stabilité et réactivité).

SECTION 8: CONTRÔLE DE L'EXPOSITION/PROTECTION INDIVIDUELLE

Paramètres de contrôle

	ACGIH TLV®		OSHA PEL		AIHA WEEL	
Nom chimique	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Hydroxyde de Sodium	2 mg/m3		2 mg/m3			
Acide 1,2,4-butanetricarboxylique, acide 2-phosphono-					10 mg/m3	
L'hydroxyde de potassium	2 mg/m3			2 mg/m3		

Contrôles d'ingénierie appropriés

La ventilation générale est habituellement adéquate. Utiliser un système de ventilation par aspiration à la source, si la ventilation générale ne suffit pas à contrôler la quantité de produit dans l'air.

Mesures de protection individuelle

Protection des yeux et du visage

Porter des lunettes de sécurité avec protection latérale, un écran facial ou des lunettes lors de la manipulation.

Protection de la peau

Lors de la manipulation, porter des gants imperméables, tablier, pantalon et veste.

Protection des voies respiratoires

Habituellement non requis si le produit est utilisé selon les directives.

SECTION 9: PROPRIÉTÉS PHYSIQUES ET CHIMIQUES

Propriétés physiques et chimiques de base

Apparence	Liquide ambre claire.
Odeur	Pas disponible
Seuil olfactif	Pas disponible
pH	9.0 - 11.5
Point de fusion/Point de congélation	Pas disponible (fusion); Pas disponible (congélation)
Point initial d'ébullition et domaine d'ébullition	Pas disponible
Point d'éclair	Pas disponible
Taux d'évaporation	Pas disponible
Inflammabilité (solides et gaz)	Sans objet
Limites supérieures/inférieures d'Inflammabilité ou d'Explosibilité	Pas disponible (supérieure); Pas disponible (inférieure)
Tension de vapeur	Pas disponible
Densité relative (eau = 1)	1.15 - 1.30
Solubilité	Très soluble dans l'eau
Coéfficient de partage n-octanol/eau	Pas disponible
Température d'auto-inflammation	Pas disponible
Température de décomposition	Pas disponible
Viscosité	Pas disponible (cinématique)

Autres informations

État physique	Liquide

SECTION 10: STABILITÉ ET RÉACTIVITÉ

Réactivité

Inconnu.

Stabilité chimique

Habituellement stable.

Risque de réactions dangereuses

Aucun prévu dans les conditions normales de stockage et d'utilisation.

Conditions à éviter

Hautes températures. Congélation. Matières incompatibles.

Matériaux incompatibles

Agents oxydants forts (p. ex. acide perchlorique), composés halogénés (p. ex. trichloroéthylène), acides forts (p. ex. acide chlorhydrique), agents réducteurs forts (p. ex. hydrures).
Corrosif pour : alliages d'aluminium.

Produits de décomposition dangereux

Monoxyde de carbone très toxique et dioxyde de carbone; anhydrides phosphoriques corrosifs. oxydes de sodium oxydes de potassium oxydes d'azote.

SECTION 11: DONNÉES TOXICOLOGIQUES

Toxicité aiguë

Nom chimique	CL50	DL50 (orale)	DL50 (cutanée)
Hydroxyde de Sodium	Pas disponible	340 mg/kg (rat)	1350 mg/kg (lapin)
Acide 1,2, 4-butanetricarboxylique, acide 2-phosphono-	> 1.979 mg/L (rat) (vapeur)	> 6500 mg/kg (rat)	> 4000 mg/kg (rat)
Acide Maléique	Pas disponible	708 mg/kg (rat)	1560 mg/kg (lapin)
L'hydroxyde de potassium	Pas disponible	205 mg/kg (rat)	> 1260 mg/kg (lapin)

CL50: Aucun renseignement trouvé.

DL50 (cutanée): Aucun renseignement trouvé.

Corrosion/Irritation cutanée

Corrosif selon les renseignements relatifs à des matières très semblables.

Lésions oculaires graves/Irritation oculaire

Peut causer une grave affection oculaire selon les renseignements relatifs à des matières très semblables.

Toxicité pour certains organes cibles - Exposition unique

Inhalation

Aucun renseignement trouvé.

Absorption par la peau

Aucun renseignement trouvé.

Ingestion

Nocif en cas d'ingestion. Selon les renseignements relatifs à des produits chimiques très semblables.

Toxicité pour certains organes cibles - Expositions répétées

Aucun renseignement trouvé.

Sensibilisation respiratoire ou cutanée

Aucun renseignement n'a été trouvé concernant la sensibilisation des voies respiratoires. Peut causer une réaction allergique (sensibilisation de la peau) selon les renseignements relatifs à des produits chimiques très semblables. (Acide Maléique)

Cancérogénicité

Aucun renseignement n'a été trouvé.

Toxicité pour la reproduction

Développement de la progéniture

Aucun renseignement n'a été trouvé.

Fonction sexuelle et la fertilité

Aucun renseignement n'a été trouvé.

Effets sur ou via l'allaitement

Aucun renseignement n'a été trouvé.

Mutagénicité sur les cellules germinales

Aucun renseignement n'a été trouvé.

SECTION 12: DONNÉES ÉCOLOGIQUES

Écotoxicité

Peut être nocif pour la vie aquatique.

Dangers aigus pour le milieu aquatique

Nom chimique	CL50 pour les poissons	CE50 pour les crustacés	CEr50 pour les plantes aquatiques	CEr50 pour les algues

Hydroxyde de Sodium	45.4 mg/L (Oncorhynchus mykiss (truite arc-en-ciel); 96 heures; statique)	265 mg/L (Daphnia magna (puce d'eau); 48 heures)		
Acide 1,2, 4-butanetricarboxylique, acide 2-phosphono-	> 1000 mg/L (Oncorhynchus mykiss (truite arc-en-ciel); 96 heures)	1071 mg/L (Daphnia magna (puce d'eau); 48 heures)	33.3-65.5 mg/L (72 heures)	
L'hydroxyde de potassium	80 mg/L (96 heures)			

Persistance et dégradation

Aucun renseignement n'a été trouvé.

Potentiel de bioaccumulation

Ce produit et ses produits de dégradation ne devraient pas être bioaccumulables.

Mobilité dans le sol

S'il y a rejet dans l'environnement, ce produit devrait migrer rapidement à travers le sol, selon ses propriétés physiques et chimiques.

SECTION 13: DONNÉES SUR L'ÉLIMINATION

Les méthodes d'élimination

Toutes les cessions doivent être effectués conformément à la réglementation gouvernementale applicable uniquement. En aucun cas, tout produit à être libéré dans l'environnement naturel (p. Air, eau, sol).

SECTION 14: INFORMATIONS RELATIVES AU TRANSPORT

Réglementation	Numéro ONU	Désignation officielle de transport	Classe(s) de danger relative(s) au transport	Groupe d'emballage
Canadian TDG	UN 1760	LIQUIDE CORROSIF, N.S.A. (Hydroxyde de Sodium, Hydroxyde de Potassium)	8	III

Précautions spéciales Sans objet

Transport en vrac aux termes de l'annexe II de la Convention MARPOL 73/78 et du Recueil IBC

Sans objet

SECTION 15: INFORMATIONS SUR LA RÉGLEMENTATION

Réglementation relative à la sécurité, à la santé et à l'environnement

Aucun connu.

SECTION 16: AUTRES INFORMATIONS

Date de préparation	le 26 juillet, 2017
Date de la plus récente version révisée	le 19 mai, 2016
Références	Fournisseur de données de sécurité base de données CHEMINFO. Centre canadien d'hygiène et de sécurité au travail (CCHST). Base de données HSDB®. National Library of Medicine des États-Unis. Accessible via le Centre canadien d'hygiène et de sécurité au travail (CCHST). Reptox eCHA-Agence européenne des produits chimiques.
Avis	CETTE FICHE SIGNALÉTIQUE EST OFFERTE POUR VOTRE INFORMATION,

CONSIDÉRATION ET ENQUÊTE COMME REQUIS PAR LA LOI FÉDÉRALE SUR LES PRODUITS DANGEREUX ET TOUTES LÉGISLATION RELIÉS. LES INFORMATIONS SONT CONSIDÉRÉES COMME PRÉCISES, MAIS CONTROL CHEM CANADA LTÉE NE FOURNIT AUCUNES GARANTIES, EXPLICITES OU IMPLICITES. L'UTILISATEUR ASSUME TOUS LES RISQUES AUX PERSONNES, À LA PROPRIÉTÉ OU À L'ENVIRONNEMENT ASSOCIÉS À L'UTILISATION ADÉQUATE OU NON DE CE PRODUIT. TOUTES LES GARANTIES POUR CE PRODUIT SONT LIMITÉES AU REMPLACEMENT DE LA VALEUR DU PRODUIT.

SAFETY DATA SHEET

THE DOW CHEMICAL COMPANY

Product name: AQUCAR™ DB 20 Water Treatment Microbiocide **Issue Date:** 03/24/2015
Print Date: 03/25/2015

THE DOW CHEMICAL COMPANY encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: AQUCAR™ DB 20 Water Treatment Microbiocide

Recommended use of the chemical and restrictions on use
Identified uses:
COMPANY IDENTIFICATION
THE DOW CHEMICAL COMPANY
2030 WILLARD H DOW CENTER
MIDLAND MI 48674-0000
UNITED STATES

Customer Information Number: 800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 800-424-9300
Local Emergency Contact: 989-636-4400

2. HAZARDS IDENTIFICATION

Hazard classification
This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.
Acute toxicity - Category 4 - Oral
Acute toxicity - Category 4 - Inhalation
Skin corrosion - Category 1
Serious eye damage - Category 1
Skin sensitisation - Sub-category 1B
Specific target organ toxicity - single exposure - Category 3

Label elements
Hazard pictograms



Signal word: **DANGER!**

Hazards
Harmful if swallowed or if inhaled
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
May cause drowsiness or dizziness.

Precautionary statements

Prevention
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/ physician.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
If skin irritation or rash occurs: Get medical advice/ attention.
Wash contaminated clothing before reuse.

Storage
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.

Disposal
Dispose of contents/ container to an approved waste disposal plant.

Other hazards
Toxic fumes may be released in fire situations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Concentration
Polyethylene glycol	25322-68-3	>= 46.5 - <= 54.5 %
2,2-Dibromo-3-nitrilopropionamide	10222-01-2	20.0%
Dibromoacetonitrile	3252-43-5	<= 3.0 %
Sodium bromide	7647-15-6	<= 4.0 %

4. FIRST AID MEASURES

Description of first aid measures
General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly. Suitable emergency safety shower facility should be immediately available.

Eye contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed
Notes to physician: Chemical eye burns may require extended irrigation. Obtain prompt consultation, preferably from an ophthalmologist. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. Probable mucosal damage may contraindicate the use of gastric lavage. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture
Hazardous combustion products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen bromide. Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn. Container may rupture from gas generation in a fire situation.

Advice for firefighters
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. If product becomes contaminated with water, monitor product for heat generation and/or decomposition. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Move container from fire area if this is possible without hazard. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Evacuate area. Keep upwind of spill. Refer to section 7, Handling, for additional precautionary measures. Only trained and properly protected personnel must be involved in clean-up operations. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Attempt to neutralize by adding materials such as Sodium bisulphite. Sodium metabisulfite. Neutralize with approximately 17.2 grams sodium bisulfite (NaHSO3) or 15.7 grams sodium meta

bisulphite (Na2S2O5) for every 100 grams biocidal product. Absorb with materials such as: Dirt. Sand. Vermiculite. Zorb-all®. Hazorb®. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep out of reach of children. Do not get in eyes, on skin, on clothing. Avoid breathing mist. Avoid prolonged or repeated contact with skin. Do not swallow. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Conditions for safe storage: Store in original container. Keep container tightly closed. Do not store in: Aluminum. Brass. Copper. Copper alloys. Mild steel. Stainless steel.

Storage stability
Shelf life: Use within 12 Month
Storage temperature: <= 35 °C (<= 95 °F)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Polyethylene glycol	US WEEL	TWA aerosol	10 mg/m3
2,2-Dibromo-3-nitrilopropionamide	Dow IHG	C	2 mg/m3
Dibromoacetonitrile	Dow IHG	C	0.1 ppm
	Dow IHG	C	Absorbed via skin
Sodium bromide	Dow IHG	TWA	6 mg/m3

Exposure controls
Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use chemical goggles.

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Polyethylene. Chlorinated polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Viton. Neoprene. Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical state	Liquid.
Color	Colorless to brown
Odor	Odorless to mild
Odor Threshold	No test data available
pH	1.5 - 5.0 *Literature*
Melting point/range	Not applicable
Freezing point	< -50 °C (< -58 °F) *Literature*
Boiling point (760 mmHg)	> 70 °C (> 158 °F) *Literature* Decomposition
Flash point	**closed cup** *Literature* none to 100°C (212 °F) **open cup** >= 182 °C (>= 360 °F) *Cleveland Open Cup*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	18.9 mmHg at 25 °C (77 °F) *Estimated.*
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	1.20 - 1.30 at 23 °C (73 °F) *Literature*
Water solubility	7.5 % at 20 °C (68 °F) *Literature*
Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	No test data available
Decomposition temperature	No test data available
Dynamic Viscosity	20 cP at 25 °C (77 °F) (Brookfield Viscosity - @ 100 rpm, #0 spindle)
Kinematic Viscosity	16 cSt at 25 °C (77 °F) *Calculated.*
Explosive properties	no data available
Oxidizing properties	no data available

Molecular weight No test data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: no data available

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Avoid temperatures above 70°C (158°F) Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible materials: Avoid contact with: Oxidizers. Strong bases. Avoid contact with metals such as: Aluminum.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Carbon dioxide. Bromine. Cyanogen bromide. Dibromoacetonitrile.

11. TOXICOLOGICAL INFORMATION

Toxicological information on this product or its components appear in this section when such data is available.

Acute toxicity

Acute oral toxicity
Low toxicity if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract. May cause dizziness and drowsiness.

LD50, Rat, 510 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 2,000 mg/kg

Acute inhalation toxicity
Mist may cause irritation of upper respiratory tract (nose and throat).

LC50, Rat, female, 4 Hour, dust/mist, 1.25 mg/l
LC50, Rat, male, 4 Hour, dust/mist, 1.40 mg/l

Skin corrosion/irritation
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Serious eye damage/eye irritation
May cause pain disproportionate to the level of irritation to eye tissues.
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Sensitization
For similar material(s):
Has caused allergic skin reactions when tested in guinea pigs.
Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:
No relevant information found.

Specific Target Organ Systemic Toxicity (Single Exposure)
May cause drowsiness or dizziness.
Route of Exposure: Oral
Target Organs: Central nervous system

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Excessive exposure may increase the blood and tissue levels of bromine.
Observations in animals include kidney effects following repeated ingestion of active ingredient, but no evidence of systemic toxicity following repeated dermal exposure at maximum attainable doses

Carcinogenicity
Active ingredient did not cause cancer in laboratory animals. There is evidence that dibromoacetonitrile (DBAN), a possible degradation product of 2,2-dibromo-3-nitrilopropionamide (DBNPA), can produce cancer in laboratory animals. However, the relevance of this to humans is unknown.

Teratogenicity
For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity
No relevant data found.

Mutagenicity
For the active ingredient(s): In vitro genetic toxicity studies were negative. For the major component(s): Animal genetic toxicity studies were negative.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

Carcinogenicity

Component	**List**	**Classification**
Dibromoacetonitrile	IARC	Group 2B: Possibly carcinogenic to humans

12. ECOLOGICAL INFORMATION

Ecotoxicological information on this product or its components appear in this section when such data is available.

Toxicity

Acute toxicity to fish
Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), 96 Hour, 3.6 mg/l

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, 2.5 mg/l

Acute toxicity to algae/aquatic plants
ErC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Growth rate inhibition, 1.5 mg/l

NOEC, Pseudokirchneriella subcapitata (green algae), Growth rate inhibition, 0.1 mg/l

Persistence and degradability

Polyethylene glycol
Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
10-day Window: Pass
Biodegradation: 85 %
Exposure time: 28 d
Method: OECD Test Guideline 301F or Equivalent

Theoretical Oxygen Demand: 1.67 mg/mg

2,2-Dibromo-3-nitrilopropionamide
Biodegradability: Abiotic degradation: The material is rapidly degradable by abiotic means.
10-day Window: Fail
Biodegradation: 35 - 78 %
Exposure time: 28 d
Method: OECD Test Guideline 301B or Equivalent
10-day Window: Not applicable
Biodegradation: 83.3 %
Exposure time: 28 d
Method: OECD Test Guideline 303A or Equivalent
10-day Window: Not applicable
Biodegradation: 17 - 22 %
Exposure time: 28 d
Method: OECD Test Guideline 306 or Equivalent

Theoretical Oxygen Demand: 0.59 mg/mg

Chemical Oxygen Demand: 0.26 mg/mg

Stability in Water (1/2-life)
Hydrolysis, half-life, 65 hrs, pH 7

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitizer: OH radicals
Atmospheric half-life: 5.3 d
Method: Estimated.

Dibromoacetonitrile
Biodegradability: No relevant data found.

Theoretical Oxygen Demand: 0.48 mg/mg

Sodium bromide
Biodegradability: Biodegradation is not applicable.

Bioaccumulative potential

Polyethylene glycol
Bioaccumulation: No relevant data found.

2,2-Dibromo-3-nitrilopropionamide
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 0.79 Measured
Bioconcentration factor (BCF): 13 Fish. Measured

Dibromoacetonitrile
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 1.56 Measured

Sodium bromide
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Bioconcentration factor (BCF): < 40 Fish. Measured

Mobility in soil

Polyethylene glycol
No relevant data found.

2,2-Dibromo-3-nitrilopropionamide
Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient(Koc): 15 Estimated.

Dibromoacetonitrile
Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient(Koc): 13 Estimated.

Sodium bromide
No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	Corrosive liquid, acidic, organic, n.o.s.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III

Classification for SEA transport (IMO-IMDG):

Proper shipping name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III
Marine pollutant	No
Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Corrosive liquid, acidic, organic, n.o.s.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Acute Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Pennsylvania Worker and Community Right-To-Know Act:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances knownto the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

United States TSCA Inventory (TSCA)
This product contains chemical substance(s) exempt from U.S. EPA TSCA Inventory requirements. It is regulated as a pesticide subject to Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.

Federal Insecticide, Fungicide and Rodenticide Act
EPA Registration Number: 464-426
This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

DANGER

Corrosive
Causes irreversible eye damage
May be fatal if swallowed.
Causes skin irritation
Harmful if inhaled or absorbed through skin
Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.
This product is toxic to fish and invertebrates.

16. OTHER INFORMATION

Revision
Identification Number: 101189115 / A001 / Issue Date: 03/24/2015 / Version: 15.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

Absorbed via skin	Absorbed via skin
C	Ceiling limit
Dow IHG	Dow Industrial Hygiene Guideline
TWA	8-hr TWA
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

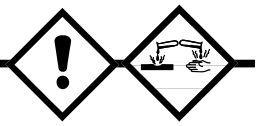
THE DOW CHEMICAL COMPANY urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	Chemical Treatment CL2150
Product Use:	Cooling Water Microbiocide and Paper Slimicide
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424−9300 (Toll Free) (703) 527−3887
Address (Corporate Headquarters):	5640 COX ROAD Glen Allen, VA 23060
Telephone Number for Information:	(800) 648−4579
Date of MSDS:	October 16, 2012

Section 2. Hazard(s) Identification



Signal Word: **DANGER!**

Hazard Statement(s):
Causes severe skin burns and eye damage.
Causes serious eye damage.
Harmful in contact with skin.
Harmful if inhaled.
Harmful if swallowed.
Harmful to aquatic life.

Precautionary Statement(s): Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well−ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
5−chloro−2−methyl−4−isothiazolin−3−one	26172−55−4	1.11
2−methyl−4−isothiazolin−3−one	2682−20−4	0.39

Section 4. First Aid Measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
Eyes:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
Skin:	Immediately remove/take off all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before re−use. Immediately call a poison center or doctor/physician.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.
Notes to Physician:	Probable mucosal damage may contraindicate the use of gastric lavage.
Additional First Aid Remarks:	Have the product container, label or MSDS with you when calling a poison control center or doctor, or when going for treatment.

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	Use water spray to keep containers cool.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	This pesticide is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, ponds, streams, estuaries, oceans or public waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit, and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1−800−424−8802.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.
Store in corrosive resistant container with a resistant inliner.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
5−chloro−2−methyl−4−isothiazolin−3−one		N/E
2−methyl−4−isothiazolin−3−one		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
5−chloro−2−methyl−4−isothiazolin−3−one			N/E
2−methyl−4−isothiazolin−3−one			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full−face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick−drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual

cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Green, Clear
Specific Gravity:	1.025 @ 20°C
pH:	3.6 @ 20°C, 100.0%
Freezing Point:	32°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	N/D
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	N/D
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.55 lb/ga
Vapor Pressure:	N/D
% VOC	0.24

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers, Strong bases

Hazardous Decomposition Products: Oxides of nitrogen, Oxides of sulfur, Oxides of carbon, Halogenated compounds

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
Chemical Treatment CL2150	Oral	LD50	3810 mg/kg	Rat
	Dermal	LD50	>5000 mg/kg	Rabbit
	Inhalation	LD50	13.7 mg/l	Rat

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Daphnia magna	48h	LC50	10.7 mg/l
Bluegill Sunfish	96h	LC50	18.6 mg/l
Ceriodaphnia dubia	48h	EC50	10.7 mg/l
Rainbow Trout	96h	LC50	12.6 mg/l
Sheepshead Minnow	96h	LC50	70.7 mg/l
Mysid Shrimp	48h	LC50	46.1 mg/l
Daphnia pulex	48h	LC50	17 mg/l
Fathead Minnow	48h	LC50	8.7 mg/l

Comments: None.

Section 13. Disposal Considerations

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.
CONTAINER DISPOSAL: Non−refillable container. Do not reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by procedures approved by state and local authorities.

Section 14. Transport Information

DOT

Proper Shipping Name: CORROSIVE LIQUIDS, N.O.S.
Technical Name: (5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class: Corrosive
UN/NA#: UN1760
Packing Group: PGII

IMDG

Proper Shipping Name: CORROSIVE LIQUIDS, N.O.S.
Technical Name: (5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class: Corrosive
UN/NA#: UN1760
Packing Group: PGII

TDG

Proper Shipping Name:	CORROSIVE LIQUIDS, N.O.S.
Technical Name:	(5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class:	Corrosive
UN/NA#:	UN1760
Packing Group:	PGII

ICAO

Proper Shipping Name:	CORROSIVE LIQUIDS, N.O.S.
Technical Name:	(5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class:	Corrosive
UN/NA#:	UN1760
Packing Group:	PGII

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
5−chloro−2−methyl−4−isothiazolin−3−one	N/A	N/A	N/A
2−methyl−4−isothiazolin−3−one	N/A	N/A	N/A

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
5−chloro−2−methyl−4−isothiazolin−3−one	None
2−methyl−4−isothiazolin−3−one	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health: 3
Flammability: 0
Physical Hazard: 0
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

NSF: N/A

FDA/USDA/GRAS: All ingredients in this product are authorized in 21 CFR 176.170 and 21 CFR 176.180.

KOSHER: This product is certified by the Orthodox Union as Kosher for Passover and year−round use.
Only when prepared by the following ChemTreat facilities: Ashland, VA; Eldridge, IA; Nederland, TX; Vernon, CA.

FIFRA: This product is an EPA registered biocide. 15300−24

Other: PMRA biocide registration NO. 26537.

Abbreviations

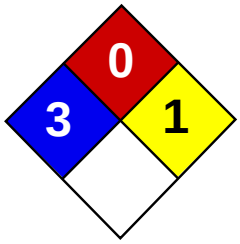
Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.







Material Safety Data Sheet
Calcium hypochlorite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium hypochlorite

Catalog Codes: SLC3310, SLC5098, SLC5099

CAS#: 7778-54-3

RTECS: NH3485000

TSCA: TSCA 8(b) inventory: Calcium hypochlorite

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Ca(OCl)2

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
Calcium hypochlorite	7778-54-3	100

Toxicological Data on Ingredients: Calcium hypochlorite: ORAL (LD50): Acute: 850 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Corrosive to eyes and skin. 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. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. 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 is toxic to lungs, mucous membranes. 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. 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:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : 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. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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.

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.

Large Spill:
Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material.

Clean up spills in a manner that does not disperse dust into the air. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible 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 reducing agents, combustible materials, organic materials, acids, moisture.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate safety storage cabinet or room.

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. Lab coat. 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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 142.99 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: Decomposes.

Melting Point: 100°C (212°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

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: Soluble in cold water, hot 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: Reactive with reducing agents, combustible materials, organic materials, acids, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of zinc. Corrosive in presence of steel, of copper. Slightly corrosive to corrosive in presence of glass, of stainless steel(304), of stainless steel(316).

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 850 mg/kg [Rat].

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Calcium hypochlorite, dry : UN1748 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium hypochlorite Massachusetts RTK: Calcium hypochlorite TSCA 8(b) inventory: Calcium hypochlorite CERCLA: Hazardous substances.: Calcium hypochlorite

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

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive solid.

DSCL (EEC):
R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

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

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. 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: 10/11/2005 11:31 AM

Last Updated: 05/21/2013 12:00 PM

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1-800-387-9799 or 519-451-1614
www.anchemsales.com

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Caustic Soda 30% CA500-30

SECTION 01: PRODUCT INFORMATION AND COMPANY INFORMATION

MANUFACTURER: Same as above
PREPARED BY: Production Department
VERSION DATE: 27-Jan-14
TELEPHONE NO.: (519) 451-1614
EMERGENCY PHONE NO.: (613) 996-6666
CHEMICAL FAMILY Not Available **CHEMICAL FORMULA** Not Applicable
MOLECULAR WEIGHT Not applicable **MATERIAL USE:** Please Refer to technical literature
SYNONYMS:

SECTION 02: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredients	Conc. Approx. %	C.A.S. #	LD/50 (RTE/SPEC)	LC/50 (RTE/SPEC)	TLV
Sodium Hydroxide	30%	1310-73-2	3000 mg/kg (Rat/oral)	N.Av.	N.Av.
Water	Balance	N.Av.	N.Av.	N.Av.	N.Av.

SECTION 03: HAZARD IDENTIFICATION

ROUTE OF ENTRY

Eyes: Very hazardous. (irritant) Liquid or spray mist may produce tissue damage on mucous membranes of eyes. Inflammation of the eye is characterized by redness, watering, and itching.

Skin: Extremely hazardous. (corrosive, irritant) Liquid or spray mist may produce tissue damage on mucous membranes of skin. Contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation Very hazardous. Liquid or spray mist may produce tissue damage on mucous membranes of respiratory tract. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe overexposure can result in death.

Ingestion: Very hazardous.

SECTION 04: FIRSTAID

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 30 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Get medical attention immediately.

Inhalation, Acute If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. If inhalation is accute, 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. Have conscious person drink several glasses of water or milk. Never give anything by mouth to an unconscious person. Seek medical attention.

Notes to physician: May cause tissue destruction/stricture. If lavage is performed, suggest endortracheal and/or esophageal control. Material is strong alkali. If burn is present, treat as any thermal burn, after decontamination. For burns of skin only. Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

SECTION 05: FIRE EXPLOSION HAZARD AND FIRE FIGHTING MEASURES

FLAMMABLE?	No
IF YES, UNDER WHICH CONDITIONS?	
FLASH POINT (TCC) (C):	Not Applicable
FLAMMABLE LIMITS:	**LEL(% BY VOL.):** Not Applicable. **UEL(% BY VOL):** Not Applicable.
AUTO IGNITION TEMPERATURE (C)	Not Applicable.
EXTINGUISHING MEDIA	Use extinguishing media suitable for surrounding materials.
SPECIAL PROCEDURES:	Not Available
HAZARDOUS COMBUSTION PRODUCTS:	These products are nitrogen oxides (NO, NO2…)
UNUSUAL FIRE AND EXPLOSION HAZARDS	Product reacts with water. Reaction may produce heat and/or gases. This reaction may be violent. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. This material does not burn.
SENSITIVITY TO STATIC DISCHARGE	Not Available
SENSITIVITY TO MECHANICAL IMPACT:	Not Available

SECTION 06: ACCIDENTAL RELEASE MEASURES

Leak and Spill Procedure: SMALL SPILL: Absorb with an inert material and place in an appropriate waste disposal container. If necessary, neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.
LARGE SPILL: Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other not-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapour drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above the TLV. Check TLV on the MSDS and with local authorities.

SECTION 07: HANDLING AND STORAGE

Handling Procedures and Storage Requirements

Keep container dry. DO NOT ingest. Do not breath gas/fumes/vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. Keep away from incompatibles such as metals, acids.
SPECIAL PRECAUTIONS FOR DILUTING CAUSTIC SODA SOLUTION:
1. ALWAYS add caustic soda solution to water with constant agitation. NEVER add water to the caustic soda solution.
2. The water should be lukewarm (80-100F). NEVER start with hot or cold water.
The addition fo caustic soda to liquid will cause a rise in themperature. If caustic soda becomes concentrated in one area, is added too rapidly, or is added to hot or cold liquid, a rapid temperature increase can result in DANGEROUS mists, boiling or spattering which can cause an immediate VIOLENT ERUPTION.
Keep container tightly closed. Store above 16 C (60 F). Store in a dry and well-ventilated area.

SECTION 08: PERSONAL PROTECTIVE EQUIPMENT / EXPOSURE CONTROLS

GLOVES/TYPE:	Impervious chemical resistant gloves.
RESPIRATOR/TYPE:	A full face NIOSH/MSHA respirator with organic vapor cartridge.
EYE/TYPE:	Safety glasses. Face shield.
OTHER/TYPE:	Not Available
ENGINEERING CONTROL	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIE

PHYSICAL STATE/APPEARANCE: Liquid. (Clear to slightly hazy)

ODOUR:	Odorless.	**ODOUR THRESHOLD:**	N. Av.
VAPOUR PRESSURE (mm Hg @ 20C):	.2 (50%)	**VAPOUR DENSITY (Air=1):**	N. Av.
EVAPORATION RATE (Ether = 1):	N. Av.	**SPECIFIC GRAVITY:**	1..5 (50%)
BOILING POINT (C):	115-140 °C	**FREEZING POINT (C)**	1-12 °C
Ph (% SOLUTION):	14	**% VOLATILE (WT):**	0
SOLUBILITY IN WATER (% W/W)	Completely soluble.		

SECTION 10: STABILITY AND REACTIVITY

CHEMICALLY STABLE? Yes

IF NO, UNDER WHICH CONDITIONS? Heat is generated when mixed withwater. Spattering and boiling can occur. Avoid contact with halogenated organics, organic nitro compounds, glycols.

INCOMPATIBILITY WITH OTHER SUBTANCES Yes

IF YES, WITH WHICH ONES: Common metals and their alloys. Acids. Acid anhydrides. Oxidizable material. Contact with water causes an exothermic reaction.

SPECIAL REACTIVITY AND UNDER WHAT CONDITIONS Heat is generated when mixed withwater. Spattering and boiling can occur. Flammable hydrogen may be generated from contact with metals such as: aluminum, brass, tin, zinc. Avoid contact with acids, halogenated organics, organic nitro compounds, glycols. Caustic soda solution reacts readily with various reducing sugars (ie, fructose, glacatose, maltose, dry whey solids) to produce carbon monoxide.

HAZARDOUS DECOMPOSITION PRODUCTS: Not Available.

SECTION 11: TOXICOLOGICAL INFORMATION

EXPOSURE LIMIT OF MATERIAL	N. Av.
LC 50 OF MATERIAL, SPECIES AND ROUTE	See Sec. 2
LD 50 OF MATERIAL, SPECIES AND ROUTE	See Sec. 2
CARCINOGENICITY OF MATERIAL	N. Av.
REPRODUCTIVE EFFECTS:	N. Av.
IRRITANCY OF MATERIAL	N. Av.
SENSITIZING CAPABILITY OF MATERIAL	N. Av.
SYNERGISTIC MATERIALS	N. Av.

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY 180ppm/23hr/oysters/lethal/salt water pH 12.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

SECTION 14: TRANSPORT INFORMATION

TDG CLASSIFICATION Class 8, Sodium Hydroxide Solution

UN NUMBER: 1824

PACKING GROUP: II

Special Provisions for Transport

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION E

E CORROSIVE MATERIAL

SECTION 16: OTHER INFORMATION

ABBREVIATIONS USED: N.Av. = Not Available
N.App. / N.Ap. = Not Applicable

DISCLAIMER: Although the information herein is to the best of our knowledge accurate, no guarantee expressed or implied, is made regarding the information or the performance of any product. We assume no liability for incidental or direct damages of any kind, no matter what, including negligence.

SOURCES: Supplier MSDS

For updated copies of an MSDS, please contact Anchem Sales at the address/phone number on Page 1 or fax the MSDS Co-ordinator at (519) 451-4593.

LAST PAGE

Form 074 Revised Aug 2016

A Division of Appropriate Chemical International Ltd.

120 Stronach Crescent, London, ON, N5V 3A1
1-800-387-9799 or 519-451-1614
www.anchemsales.com

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Caustic Soda Beads CA550-00

SECTION 01: PRODUCT INFORMATION AND COMPANY INFORMATION

MANUFACTURER:	Same as above		
PREPARED BY:	Production Department		
VERSION DATE:	09-Mar-15		
TELEPHONE NO.:	(519) 451-1614		
EMERGENCY PHONE NO.:	(613) 996-6666		
CHEMICAL FAMILY	Not Available	**CHEMICAL FORMULA**	Not Applicable
MOLECULAR WEIGHT	Not Applicable	**MATERIAL USE:**	Please Refer to technical literature
SYNONYMS:	Sodium Hydroxide, Lye		

SECTION 02: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredients	Conc. Approx. %	C.A.S. #	LD/50 (RTE/SPEC)	LC/50 (RTE/SPEC)	TLV
Sodium Hydroxide	95-99	1310-73-2	500mg/kg	N.Av.	N.Av.

SECTION 03: HAZARD IDENTIFICATION

ROUTE OF ENTRY

Eyes: Causes severe eye burns. Small quantities can result in permanent damage and/or loss of vision.

Skin: Causes severe burns. Corrosive action causes burns and frequently deep ulcerations with subsequent scarring. Prolonged contact destroys tissue. May cause dermatitis.

Inhalation Corrosive to respiratory passages. Inhalation of dusts or mists can cause damage to the upper respiratory tract and to the lung tissue depending on severity of exposure. Effects can range from mild irritation of mucous membranes, severe pneumonitis and destruction of lung tissue.

Ingestion: Ingestion can cause damage to the mucous membranes, mouth and digestive system. Ingestion of product may result in death.

SECTION 04: FIRSTAID

Skin Contact: Flush with copious amounts of water. If wearing goggles, flush head and face thoroughly before removing goggles. Obtain medical attention immediately.

Eye Contact: Flush eyes with gently flowing water for at least 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse the contaminated water into the unaffected eye or face. Utmost speed is essential. Have an opthamologist make an evaluation of eye injury.

Inhalation, Acute

If symptoms are experienced, remove source of contamination or move victim to fresh air. If symptoms persist, get medical attention. If the affected person is not breathing, apply artificial respiration. If breathing is difficult, give oxygen. In situations where administering oxygen is appropriate, first aiders must be trained in the safe use and handling of oxygen. It is preferable to administer oxygen under a doctor's supervision or advice. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation (CPR) immediately. Immediate medical assistance is required.

Ingestion: Seek immediate medical attention. Do not induce vomiting. Administer artificial respiration if breathing has stopped. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation (CPR) immediately. Never give anything by mouth if victim is rapidly losing consciousness, unconscious or convulsing.

Notes to physician: Treatment based on sound judgment of physician and individual reactions of patient.

SECTION 05: FIRE EXPLOSION HAZARD AND FIRE FIGHTING MEASURES

FLAMMABLE?	No
IF YES, UNDER WHICH CONDITIONS?	
FLASH POINT (TCC) (C):	Not Available
FLAMMABLE LIMITS:	**LEL(% BY VOL.):** Not Available **UEL(% BY VOL):** Not Available
AUTO IGNITION TEMPERATURE (C)	Not Available
EXTINGUISHING MEDIA	Not flammable. Use extinguishing media appropriate for surrounding fire.
SPECIAL PROCEDURES:	Fire fighters should wear full protective clothing, including self-contained breathing equipment.
HAZARDOUS COMBUSTION PRODUCTS:	Not Available
UNUSUAL FIRE AND EXPLOSION HAZARDS	Not Available
SENSITIVITY TO STATIC DISCHARGE	Not Available
SENSITIVITY TO MECHANICAL IMPACT:	Not Available

SECTION 06: ACCIDENTAL RELEASE MEASURES

Leak and Spill Procedure: Procedure for Clean Up: Sweep up or vacuum up and place in an appropriate closed container. Avoid raising dust. Isolate spill and stop leak where safe. If the material has been mixed with water or any other liquid, then dike area to contain spill. Dilute spill with large amounts of water and neutralize with dilute acid. Use vacuum truck to pick up neutralized material for proper disposal. Flush area with water to remove trace residue.
Personal Precautionary Measures: Wear appropriate protective equipment.
Environmental Precautionary Measures: Prevent from entering sewers, waterways or low areas.

SECTION 07: HANDLING AND STORAGE

Handling Procedures and Storage Requirements

Handling: Avoid dust generation and provide for room ventilation during handling. Avoid breathing vapors, mist, fume or dust. Avoid contact with eyes, skin and clothing. Keep the containers closed when not in use.
SPECIAL PRECAUTIONS FOR DILUTING CAUSTIC SODA:
1. ALWAYS add caustic soda to water with constant agitation. NEVER add water to the caustic soda.
2. The water should be lukewarm (80 - 100F). NEVER start with hot or cold water.
The addition of caustic soda to liquid will cause a rise in temperature. If caustic soda becomes concentrated in one area, is added too rapidly, or is added to hot or cold liquid, a rapid temperature increase can result in DANGEROUS mists, boiling or spattering which can cause an immediate VIOLENT ERUPTION. Avoid contact with organic materials and concentrated acids- may cause violent reactions. Caustic soda reacts with magnesium, aluminum, zinc (galvanized), tin, chromium, brass and bronze, generating hydrogen which is explosive. Caustic soda may react with various sugars to generate carbon monoxide. Hazardous carbon monoxide gas can form upon contact with food and beverage products in enclosed vessels and can cause death. Containers, even those that have been emptied, will retain product residue and vapour and should be handled as if they were full until they have been cleaned. Wash thoroughly after handling.
Storage: Store in a dry, well ventilated area, separate from acids, peroxides, metals, easily ignitable materials and other incompatibles. Protect against moisture, water and physical damage. Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen can be generated.

SECTION 08: PERSONAL PROTECTIVE EQUIPMENT / EXPOSURE CONTROLS

GLOVES/TYPE:	Appropriate chemical resistant gloves should be worn. Nitrile gloves. Neoprene gloves. Rubber gloves.
RESPIRATOR/TYPE:	If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.
EYE/TYPE:	Chemical goggles; also wear a face shield if splashing hazard exists.
OTHER/TYPE:	Ensure that eyewash stations and safety showers are proximal to the work-station location.
ENGINEERING CONTROL	Provide local exhaust to meet TLV requirements if making solutions or grinding up and mist or dust is generated. Ventilation facilities should be corrosion resistant. Localized ventilation should be used to control dust levels.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIE

PHYSICAL STATE/APPEARANCE:	Solid		
ODOUR:	Odorless	**ODOUR THRESHOLD:**	N. Av.
VAPOUR PRESSURE (mm Hg @ 20C):	N. Av.	**VAPOUR DENSITY (Air=1):**	N. Av.
EVAPORATION RATE (Ether = 1):	N. Av.	**SPECIFIC GRAVITY:**	2.13@20 C
BOILING POINT (C):	1388 (F)	**FREEZING POINT (C)**	318 (F)
Ph (% SOLUTION):	0.01 moles/litre - pH 12	**% VOLATILE (WT):**	N. Av.
SOLUBILITY IN WATER (% W/W)	N. Av.		

SECTION 10: STABILITY AND REACTIVITY

CHEMICALLY STABLE? Stable

IF NO, UNDER WHICH CONDITIONS?

INCOMPATIBILITY WITH OTHER SUBTANCES

IF YES, WITH WHICH ONES: Tin. Aluminum. Zinc. Leather. Wool. Acids. Organic halogen compounds or organic nitro compounds. Magnesium metal. Brass. Bronze. Carbon monoxide gas may be produced on contact with reducing sugars. Water can cause violent reaction.

SPECIAL REACTIVITY AND UNDER WHAT CONDITIONS

HAZARDOUS DECOMPOSITION PRODUCTS: None anticipated

SECTION 11: TOXICOLOGICAL INFORMATION

EXPOSURE LIMIT OF MATERIAL

LC 50 OF MATERIAL, SPECIES AND ROUTE

LD 50 OF MATERIAL, SPECIES AND ROUTE

CARCINOGENICITY OF MATERIAL

REPRODUCTIVE EFFECTS:

IRRITANCY OF MATERIAL

SENSITIZING CAPABILITY OF MATERIAL

SYNERGISTIC MATERIALS

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:

SECTION 14: TRANSPORT INFORMATION

TDG CLASSIFICATION Class 8, CAUSTIC SODA SOLIDS

UN NUMBER: 1823

PACKING GROUP: II

Special Provisions for Transport

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION E

E- CORROSIVE MATERIAL

SECTION 16: OTHER INFORMATION

ABBREVIATIONS USED: N.Av. = Not Available

N.App. / N.Ap. = Not Applicable

DISCLAIMER: Although the information herein is to the best of our knowledge accurate, no guarantee expressed or implied, is made regarding the information or the performance of any product. We assume no liability for incidental or direct damages of any kind, no matter what, including negligence.

SOURCES: Supplier MSDS

For updated copies of an MSDS, please contact Anchem Sales at the address/phone number on Page 1 or fax the MSDS Co-ordinator at (519) 451-4593.

LAST PAGE

Form 074 Revised Aug 2016

MATERIAL SAFETY DATA SHEET.

SECTION (1) PRODUCT IDENTIFICATION AND USE:

PRODUCT NAME: BAR COR CWS-55.

PRODUCT USE: CLOSED SYSTEM WATER TREATMENT.

WHMIS CLASSIFICATION: D2b.

SUPPLIERS NAME: PACE CHEMICALS LTD.
8321 WILLARD STREET,
BURNABY, B.C. V3N 2X3.

TELEPHONE: (604) 520-6211
FAX: (604) 521-5927

EMERGENCY PHONE,(Canutec): (613) 996-6666.

SECTION (2) HAZARDOUS INGREDIENTS:

Sodium Nitrite: 10-30%w/w CAS # 7632-00-0
LD50: (Oral,Rat): 85 mg/kg
LC50: (Rat, 4 Hrs) 1.45 mg/l

Sodium Borate: 3-7%w/w CAS # 7775-19-1
LD50: (Oral, Rabbit): 2330 mg/kg
LD50: (Dermal, Rabbit): >10000 mg/kg
LC50: No data available.

Sodium Mercaptobenzothiazole:
1-5%w/w CAS # 149-30-4
LD50: No data available.
LC50: No data available.

SECTION (3) PHYSICAL DATA:

Physical state:	Liquid.
Appearance:	Clear pale Yellow.
Odour:	Almost Odourless.
Odour threshold,(ppm):	No data available.
Vapour pressure,(mm Hg)	No data available.
Vapour density,(Air=1):	No data available.
Evaporation rate,(Butyl Acetate=1):	<1
Boiling point:	100°C Approx.
Freezing point:	No data available.
pH,(½ % soln):	9.6
Specific Gravity:	1.15
Water/oil distribution coefficient:	No data available.

SECTION (4) FIRE & EXPLOSION DATA:

Flammability: Yes ( ) No (X)
If yes under what conditions?
Means of extinction: As for surrounding fire.
Flash point & method: None. (tcc)
Flammability limits,(v/v in air): Upper: Not applicable.
Lower: Not applicable.
Auto ignition temperature,(°C): None known.
Hazardous combustion products: None.
Explosion data: Sensitivity to impact: None known.
Sensitivity to static discharge: None known.

SECTION (5) REACTIVITY DATA:

Chemical stability: No ( ) Yes (X)
If no, under what conditions?
Incompatibility with other substances: No ( ) Yes (X)
If yes, which ones? Acids.
Reactivity data: Stable (X) Unstable ( )
If unstable, Under which conditions?
Hazardous decomposition products: Oxides of Sulphur, Carbon & Nitrogen may be liberated on thermal decomposition. Acids may liberate oxides of nitrogen & Sulphur compounds.

SECTION (6) TOXICOLOGICAL PROPERTIES:

Route of entry: Skin contact (X) Skin absorption ( )
Eye contact (X) Inhalation (X) Ingestion (X)
Effects of acute exposure to product:

SKIN CONTACT: May cause irritation on prolonged contact.

EYE CONTACT: Irritant.

INHALATION: Mist may be irritating to the respiratory tract.

INGESTION: May cause irritation and nausea.

Effects of chronic exposure to product: No data available.
Exposure limits: No data available.
Irritancy of product: May be irritating to all parts of the body.
Sensitization to product: No data available.
Synergistic products: No data available.
Teratogenicity: No data available.
Reproductive toxicity: No data available.
Mutagenicity: Sodium nitrite has caused metagenetic effects in laboratory animals studies.
Carcinogenicity: The ingredients of this product are not considered to be carcinogens by the National Toxicity Program, the International Agency for Research on Cancer or the Occupational Safety and Health Administration.

SECTION (7) PREVENTIVE MEASURES:

Gloves: PVC or Nitrile Rubber.
Respirator: Not usually required.
Eye protection: Chemical Goggles or Face Shield recommended.
Footwear: No special requirements.
Clothing: Impervious clothing (Rubber, PVC) recommended.
Other: Eye wash station recommended.
Engineering controls: Normal ventilation is adequate.
Leak & spill procedure: Stop leak. Pick up spilled material with inert absorbent (Floor-Dry) & place in disposable container. Wash down floor.
Waste disposal procedure: Dispose of in accordance with local municipal regulations.
Handling procedure & equipment: No special requirements.
Storage requirements: Store between 0° & 40°C. Keep container closed when not in use.
SPECIAL SHIPPING INSTRUCTIONS: NONE.

SECTION (8) FIRST AID MEASURES:

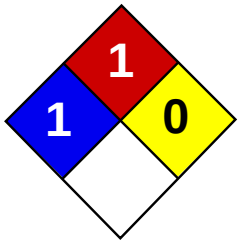
SKIN CONTACT: Wash well with plenty of soap and water. If irritation develops contact a physician.
EYE CONTACT: Immediately wash with plenty of running water, lifting eyelids occasionally. Contact a physician at once.
INHALATION: Remove to fresh air. Contact a physician at once.
INGESTION: If awake, Give plenty of water to drink & induce vomiting. Consult physician at once.

SECTION (9) PREPARATION DATA:

The information supplied in this data sheet is derived from sources believed to be reliable, however PACE CHEMICALS LTD offers no warranty, written or implied, as to the accuracy of its contents. We advise recipients to confirm in advance of need that the information is current, suitable and applicable to their requirements.

Prepared by : Technical Services
Telephone number : (604) 520-6211
Preparation date : October 14, 2014
Product number : 30055





Health	1
Fire	1
Reactivity	0
Personal Protection	C

Material Safety Data Sheet
Dowtherm SR1 MSDS

Section 1: Chemical Product and Company Identification

Product Name: Dowtherm SR1

Catalog Codes: SLD4267

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Ethylene glycol; Water; Potassium phosphate dibasic

CI#: Not available.

Synonym: Dowtherm* SR-1 Heat Transfer Fluid; Dowtherm* SR-1

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
Ethylene glycol	107-21-1	>95
Water	7732-18-5	<3
Potassium phosphate dibasic	7758-11-4	<3

Toxicological Data on Ingredients: Ethylene glycol: ORAL (LD50): Acute: 4700 mg/kg [Rat]. 5500 mg/kg [Mouse]. 6610 mg/kg [Guinea pig]. VAPOR (LC50): Acute: >200 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH [Ethylene glycol]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Ethylene glycol]. Non-mutagenic for bacteria and/or yeast. [Ethylene glycol]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs

damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

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.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get 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:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation: Not available.

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:
Medical Conditions Aggravated by Exposure: Persons with pre-existiing kidney, respiratory, eye, or neurological problems might be more sensitive to Ethylene Glycol. Notes to Physician: 1. Support vital functions, correct for dehydration and shock, and manage fluid balance. 2. The currently recommended medical management of Ethylene Glycol poisoning includes elimination of Ethylene Glycol and metabolites. Elimination of Ethylene Glycol may be achieved by the following methods: a. Emptying the stomach by gastric lavage. It is useful if initiated within < 1 of ingestion. b. Correct metabolic acidosis with intravenous administration of sodium bicarbonate, adjusting the administration rate accoridng to repeated and frequent measurement of acid/base status. c. Administer ethanol (orally or by IV (intravenously)) or fomepizole (4-methylpyrazole or Antizol)) therapy by IV as an antidote to inhibit the ormation of toxic metabolites. d. If patients are diagnosed and treated early in the course with the above methods, hemodialysis may be avoided if fomepizole or ethanol therapy is effective and has corrected the metabolic acidosis, and no renal failure is present. However, once severe acidosis and renal failure occured, however, hemodialysis is necessary. It is effective in removing Ethylene Glycol and toxic metabolites, and correcting metabolic acidosis.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: The lowest known value is 398°C (748.4°F) (Ethylene glycol).

Flash Points: CLOSED CUP: 111°C (231.8°F). (Tagliabue.)

Flammable Limits: LOWER: 3.2% (Ethylene Glycol)

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

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, 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: Not available.

Special Remarks on Explosion Hazards:
Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. (Ethylene glycol)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Poisonous liquid. 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 acetic acid. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 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 gas/fumes/ vapor/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Ethylene glycol STEL: 120 (mg/m3) [Australia] TWA: 100 (mg/m3) from ACGIH (TLV) [United States] CEIL: 125 (mg/m3) from OSHA (PEL) [United States] CEIL: 50 (ppm) from OSHA (PEL) [United States] TWA: 52 STEL: 104 (mg/m3) [United Kingdom (UK)] Inhalation TWA: 10 (mg/m3) [United Kingdom (UK)] SKINConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Glycol like

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colored

pH (1% soln/water): Not available

Boiling Point: 163°C (325.4°F)

Melting Point: May start to solidify at -13°C (8.6°F) based on data for: Ethylene glycol.

Critical Temperature: Not available.

Specific Gravity: 1.1295 (Water = 1)

Vapor Pressure: 0.3 kPa (@ 20°C)

Vapor Density: >1 (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, acetone.

Solubility:
Soluble in cold water, hot water, acetone. Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Absorbs moisture from the air. Avoid contamination with materials with hydroxyl compounds. Also incompatible with aliphatic amines, isocyanates, chlorosulfonic acid, and oleum (Ethylene glycol)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): >8200 mg/kg [Rat]. Acute dermal toxicity (LD50): >2000 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH [Ethylene glycol]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Ethylene glycol]. Non-mutagenic for bacteria and/or yeast. [Ethylene glycol]. May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:

Lowest Published Toxic Dose/Conc: TDL [Man] - Route: oral; Dose: 15gm/kg Lethal Dose/Conc 50% Kill LD50 [Rabbit] - Route: dermal; Dose: 9530 ul/kg (Ethylene glycol)

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. No human data has been reported at this time. May affect genetic material (mutagenic) (Ethylene glycol)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 41000 mg/l 96 hours [Trout]. 46300 mg/l 48 hours [water flea]. 34250 mg/l 96 hours [bluegill fish]. 34250 mg/l 72 hours [Goldfish]. (Ethylene Glycol)

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: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: No products were found. California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: No products were found. Illinois toxic substances disclosure to employee act: Ethylene glycol Illinois chemical safety act: Ethylene glycol New York release reporting list: Ethylene glycol Rhode Island RTK hazardous substances: Ethylene glycol Pennsylvania RTK: Ethylene glycol Minnesota: Ethylene glycol Massachusetts RTK: Ethylene glycol Massachusetts spill list: Ethylene glycol New Jersey: Ethylene glycol Louisiana spill reporting: Ethylene glycol California Director's List of Hazardous Substances: Ethylene Glycol TSCA 8(b) inventory: Ethylene glycol; Water; Potassium phosphate dibasic TSCA 4(a) proposed test rules: Ethylene glycol SARA 313 toxic chemical notification and release reporting: Ethylene glycol 95.95% CERCLA: Hazardous substances.: Ethylene glycol: 5000 lbs. (2268 kg);

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

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R22- Harmful if swallowed. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

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

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 01:04 AM

Last Updated: 05/21/2013 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.

AF-64

SAFETY DATA SHEET

SECTION 1 – IDENTIFICATION

Product Identifier: AF-64

Manufacturer: Aquaserv, Inc.
570 N. Rivergate Rd.
Memphis, TN 38109

24 Hour Emergency Phone: **(901) 525-7701**
CHEMTREC: **(800) 424-9300**

Recommended use: Defoamer

SECTION 2 – HAZARDS IDENTIFICATION

Hazard Classification
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard's 29CFR 1910.1200 implementation of the Globally Harmonized System (GHS), i.e., material is not a dangerous substance or mixture requiring GHS classification according to the US GHS regulations.

Other hazards which do not result in classification

Advice: Repeated or prolonged exposure may cause slight irritation of eyes and skin.
Inhalation: Prolonged or excessive inhalation may cause coughing or sneezing. May cause irritation of the respiratory tract.
Ingestion: Low acute oral toxicity.
Chronic Exposure: No known carcinogenic or other chronic effects.

SECTION 3 – COMPOSITION / INFORMATION ON INGREDIENTS

This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

SECTION 4 – FIRST AID MEASURES

Inhalation: If exposure by inhalation is suspected, immediately remove exposed individual to fresh air and provide oxygen. If not breathing, give artificial respiration. Get medical attention if cough or other symptoms develop.

Skin Contact: Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation develops and persists.

Eye Contact: Immediately flush eyes with large amounts of water for a minimum of 15 minutes, while holding eyelids apart to ensure flushing of entire surface. If easy to do remove contact lenses. Do not let exposed individual rub eyes. Seek medical attention if symptoms persist.

Ingestion: Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Contact Poison Control/physician immediately. Do not induce vomiting without medical advice.

Most Important Symptoms/Effects, Acute and Chronic: No severe effects after a single exposure.

Indication of Immediate Medical Attention and Special Treatment Needed: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically.

SECTION 5 – FIRE FIGHTING MEASURES

Extinguishing Media: Use dry chemicals, foam, or carbon dioxide.

Unsuitable Extinguishing Media: Water may be ineffective.

Special Firefighting Procedures: Use self-contained breathing apparatus (SCBA) and proper personal protection clothing. Use NIOSH/MSHA approved respiratory protection.

Unusual Fire and Explosive Hazards: In the event of fire the product burns. Containers can build up pressure if exposed to heat (fire). Thermal decomposition products: Carbon oxides, hydrocarbons, fumes, smoke.

Further Information: Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Contaminated fire extinguishing water must be disposed of in accordance with local regulations. Cool containers/tanks with water spray.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate personal protective equipment. Evacuate nonessential personnel. Avoid contact with eyes and skin. Contaminated surfaces will be slippery.

Environmental Precautions: Avoid discharge into drains, water courses or onto the ground. Close or cap valves and /or block or plug hole in leaking container and transfer to another container. Must be disposed of in accordance with local and national regulations.

Spill or Leak Cleanup Procedures: In case of large spillage, contain by damming up. Collect by pump. Take up mechanically and collect into suitable containers for disposal. Must be disposed of in accordance with local and national regulations.

Small amounts: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). After cleaning, flush away traces with water.

Review each section of this SDS before responding to a spill or leak of this product. For detailed disposal information see section 13.

SECTION 7 - HANDLING AND STORAGE

Conditions for Safe Handling: Prevent eye and skin contact. Wash thoroughly with soap and water after handling. Ensure adequate ventilation. Keep away from combustible material.

Conditions for Safe Storage: Store in a place accessible by authorized persons only. Store at 5 – 40 °C (40 – 104 °F). Keep containers tightly closed in a cool, well-ventilated place. Avoid extreme temperatures.

Incompatible Materials: Strong oxidizing agents

Other Precautions: Eyewash and safety showers are recommended in the immediate work area. Check with your state OSHA to determine the need and maximum distance for stations to be placed in regards to possible chemical exposure.

SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits:

Components	CAS No.	Value	Form of Exposure	Control Parameters	Update	Basis
Distillates (petroleum)	64742-65-0	--	Mist	5 mg/m^3	--	--

Engineering Controls: Ensure adequate ventilation. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting chemical safety goggles or safety glasses with side-shields are required.

Hand Protection: Chemical resistant gloves are required.

Skin Protection: Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Respiratory Protection: Respiratory protection is not normally required. However, it may be necessary in areas of high vapor concentration or in areas with little or no ventilation. Always wear NIOSH approved respiratory protective equipment where there may be potential for airborne exposure.

General Work Practices: Eye wash fountains and safety showers in the work place are strongly recommended. Do not eat, drink, or smoke in areas where chemicals are being stored or handled. Wash thoroughly before handling food or beverages.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance	White liquid
Odor	Mild
Odor Threshold	Not determined
pH	Not determined
Melting Point/Range	Freezing point </= 32 °F
Initial Boiling Point and Boiling Range	>212 °F
Flash Point	>300 °F
Evaporation Rate (Butyl Acetate=1)	<1
Upper and Lower Explosion Limit	Not applicable
Vapor Pressure	Not determined
Relative Vapor Density	Not determined
Density	Ca. 7.7 lb/gal (77 °F)
Relative Density	Ca. 0.92 (25 °C)
Solubility	Dispersible
Partition Coefficient	Not determined
Auto-ignition Temperature	Not applicable
Decomposition Temperature	Not determined
Viscosity, Dynamic	> 600 cP (25 °C)
Viscosity, Kinematic	> 300 cP (40 °C)

NOTE: The above represents typical values and should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable under recommended storage conditions.

Reactivity: Stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Keep away from sources of ignition.

Incompatible Materials: Oxidizing agents.

Hazardous Decomposition Products: In case of fire, hazardous decomposition products may be produced such as: Carbon oxides, hydrocarbons, fumes, smoke

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects
Acute Toxicity

Oral: No data available.

Dermal: No data is available on the product itself.

Mutagenicity: No data available.

Carcinogenicity: No known effect.

Sensitization: No data available.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic Toxicity
LC50/48 h/ Pimephales promelas (fathead minnow)/Acute fish toxicity: 2000 mg/l

Toxicity to Other Organisms
No data available on the product itself.

Persistence and Degradability

Biological degradability
No data available on the product itself.

Bioaccumulative Potential
No data available on the product itself.
Partition coefficient: n-octanol/water: Not determined.

Mobility in Soil
Water solubility: dispersible.

Other Adverse Effects:
None known.

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal Procedure: Not an EPA hazardous waste. For product disposal and disposal of contaminated packaging, dispose of at a supervised incineration facility or an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

SECTION 14 - TRANSPORT INFORMATION

DOT: Not classified as dangerous in the meaning of transport regulations.

IMDG: Not classified as dangerous in the meaning of transport regulations.

IATA: Not classified as dangerous in the meaning of transport regulations.

SECTION 15 - REGULATORY INFORMATION

SARA Title III Section 311 Categories
Immediate (Acute) Health Effects: No
Delayed (Chronic) Health Effects: No
Fire Hazard: No
Sudden Release of Pressure Hazard: No
Reactivity Hazard: No

SARA 313 – Specific Toxic Chemical Listing
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313

SARA 302 – Extremely Hazardous Substances
None present

US CERCLA – Comprehensive Environmental Response, Compensation and Liability Act List
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute. None present.

California Proposition 65
Remarks: This product does not contain any chemicals known to the state of California to cause cancer, birth defects or other reproduction harm.

United States TSCA Inventory (TSCA)
All components of this product are included in the United States TSCA Chemical Inventory or are not required to be listed on the United States TSCA Chemical Inventory.

Canada Domestic Substance List (DSL)
All components of this product are included in the Canada Domestic Substance List (DSL) or are not required to be listed on the Canada Domestic Substance List (DSL).

European Chemical Inventory (EINECS)
All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed.

Philippine Inventory Status (PICCS)
All components of this product are NOT included on the Philippine (PICCS).

Australian Inventory of Chemical Substances
All components of this product are NOT included in the Australian Inventory of Chemical Substances (AICS).

Japanese Inventory (ENCS)
All components of this product are NOT included on the Japanese (ENCS) inventory.

Korean Inventory (ECL)
All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory.

Chinese Inventory
All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

New Zealand Inventory (NZIoC)
All components of this product are not included on the New Zealand Inventory of Chemical Substances.

Taiwan Toxic Chemical Substances Control Act Inventory
This product's Taiwan Toxic Chemical Substances Control Act Inventory status has NOT been determined.

SECTION 16 – OTHER INFORMATION

Revision Date:	June 1, 2015
Date of Last Revision:	May 29, 2015
Revision Summary:	None
Prepared By:	Product Stewardship Team

HMIS Ratings:

HEALTH	**1**
FLAMMABILITY	**1**
REACTIVITY	**0**
PERSONAL PROTECTION	**-**

This Safety Data Sheet was prepared to comply with the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Aquaserv provides no warranties; either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. The data contained in this Safety Data Sheet reflects the latest information available to us on hazards, properties, and handling of this product under the recommended conditions of use. The information on this Safety Data Sheet relates only to the material as supplied and does not relate to combinations with other materials or processes.

CC 7430 Process Water Treatment-Scale Control

SECTION 1. IDENTIFICATION

Product Identifier	CC 7430 Process Water Treatment-Scale Control
Manufacturer	Control Chem Canada Ltd., 4460 Harvester Road, Burlington, Ontario, L7L 4X2, 905-319-2234, www.controlchem.com
Emergency Phone No.	CANUTEC, 613-996-6666 (*666 cell)
	Control Chem Canada Ltd., 1-866-882-2436
SDS No.	0392

SECTION 2. HAZARD IDENTIFICATION

Classified according to Canada's Hazardous Products Regulations (WHMIS 2015).

Classification

Corrosive to metals - Category 1; Acute toxicity (Oral) - Category 4; Skin corrosion - Category 1; Serious eye damage - Category 1; Skin sensitization - Category 1

Label Elements



Signal Word:
Danger
Hazard Statement(s):
May be corrosive to metals.
Harmful if swallowed or in contact with skin.
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
Precautionary Statement(s):
Prevention:
Keep only in original container.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF SWALLOWED: Call a POISON CENTRE or doctor if you feel unwell.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTRE or doctor.
If skin irritation or rash occurs: Get medical advice or attention.

Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.

Storage:

Store in corrosion resistant container with a resistant inner liner.
Store locked up.

Disposal:

Dispose of contents and container in accordance with local, regional, national and international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	%	Other Identifiers	Other Names
Copolymer, Maleic Acid	113221-69-5	10.5-25.0		
Sodium hydroxide	1310-73-2	8.5-10.0		
1,2,4-Butanetricarboxylic acid, 2-phosphono-	37971-36-1	2.5-3.5		
Maleic acid	110-16-7	1.5-4.5		
Phosphonic acid, (((phosphonomethyl)imino)bis(2, 1-ethanediylnitrilobis(methylene))) tetrakis-,sodium salt	22042-96-2	1.5-3.0		
Potassium hydroxide	1310-58-3	3.0-7.5		

SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation

Remove source of exposure or move to fresh air. Get medical advice or attention if you feel unwell or are concerned.

Skin Contact

Immediately and thoroughly flush with water for 15 minutes. Obtain medical attention immediately if irritation persists.

Eye Contact

Immediately and thoroughly flush eyes and under eyelids for at least 15 minutes. Seek medical attention immediately.

Ingestion

Do not induce vomiting. Rinse mouth with water. Call Poison Control Centre.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

Dry chemical, water, carbon dioxide or foam. Use water to keep non-leaking, fire-exposed containers cool.

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Product

Closed containers may rupture violently when heated releasing contents.
In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide; corrosive phosphorous oxides. sodium oxides potassium oxides corrosive, oxidizing nitrogen oxides.

Special Protective Equipment and Precautions for Fire-fighters

Wear full protective equipment including a self-contained breathing apparatus. Approach fire from upwind to avoid hazardous vapours or gases. For a massive fire, immediately evacuate the area and use unmanned hose holder or

monitor nozzles. Dike and recover contaminated water for appropriate disposal.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Use the personal protective equipment recommended in Section 8 of this safety data sheet. Avoid breathing mist, vapours or gas.

Environmental Precautions

Do not allow into any sewer, on the ground or into any waterway.

Methods and Materials for Containment and Cleaning Up

Stop or reduce leak if safe to do so. Contain and soak up spill with absorbent that does not react with spilled product. Contaminated absorbent poses the same hazard as the spilled product. Place used absorbent into suitable, covered, labelled containers for disposal. After cleaning, flush away traces with water.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

Do not get in eyes, on skin or on clothing. Handle in accordance with good industrial hygiene and safety practices. Ensure eyewash and shower station are close by. Avoid generating vapours or mists. Only use where there is adequate ventilation.

Conditions for Safe Storage

Store in a cool, dry, well-ventilated location. Store in an area that is: separate from incompatible materials (see Section 10: Stability and Reactivity).

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

	ACGIH TLV®		OSHA PEL		AIHA WEEL	
Chemical Name	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Sodium hydroxide	2 mg/m3		2 mg/m3			
1,2,4-Butanetricarboxylic acid, 2-phosphono-					10 mg/m3	
Potassium hydroxide	2 mg/m3			2 mg/m3		

Appropriate Engineering Controls

General ventilation is usually adequate. Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air.

Individual Protection Measures

Eye/Face Protection

Wear safety glasses with side shield, face shield or goggles when handling.

Skin Protection

When handling, wear impervious gloves, apron, pants and jacket.

Respiratory Protection

Not normally required if product is used as directed.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

Appearance	Clear amber liquid.
Odour	Not available
Odour Threshold	Not available

pH	9.0 - 11.5
Melting Point/Freezing Point	Not available (melting); Not available (freezing)
Initial Boiling Point/Range	Not available
Flash Point	Not available
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable
Upper/Lower Flammability or Explosive Limit	Not available (upper); Not available (lower)
Vapour Pressure	Not available
Relative Density (water = 1)	1.15 - 1.30
Solubility	Very soluble in water
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Viscosity	Not available (kinematic)

Other Information

Physical State	Liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity

None known.

Chemical Stability

Normally stable.

Possibility of Hazardous Reactions

None expected under normal conditions of storage and use.

Conditions to Avoid

High temperatures. Freezing. Incompatible materials.

Incompatible Materials

Strong oxidizing agents (e.g. perchloric acid), halogenated compounds (e.g. trichloroethylene), strong acids (e.g. hydrochloric acid), strong reducing agents (e.g. hydrides).
Corrosive to: aluminum alloys.

Hazardous Decomposition Products

Very toxic carbon monoxide, carbon dioxide; corrosive phosphorous oxides. sodium oxides potassium oxides corrosive, oxidizing nitrogen oxides.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Chemical Name	LC50	LD50 (oral)	LD50 (dermal)
Sodium hydroxide	Not available	340 mg/kg (rat)	1350 mg/kg (rabbit)
1,2,4-Butanetricarboxylic acid, 2-phosphono-	> 1.979 mg/L (rat) (vapour)	> 6500 mg/kg (rat)	> 4000 mg/kg (rat)
Maleic acid	Not available	708 mg/kg (rat)	1560 mg/kg (rabbit)
Potassium hydroxide	Not available	205 mg/kg (rat)	> 1260 mg/kg (rabbit)

LC50: No information was located.

LD50 (dermal): No information was located.

Skin Corrosion/Irritation

Corrosive based on information for closely related materials.

Serious Eye Damage/Irritation

May cause serious eye damage based on information for closely related materials.

STOT (Specific Target Organ Toxicity) - Single Exposure

Inhalation

No information was located.

Skin Absorption

No information was located.

Ingestion

Harmful if swallowed. Based on information for closely related materials.

STOT (Specific Target Organ Toxicity) - Repeated Exposure

No information was located.

Respiratory and/or Skin Sensitization

No information was located for respiratory sensitization. May cause an allergic reaction (skin sensitization) based on information for closely related chemicals. (Maleic acid)

Carcinogenicity

No information was located.

Reproductive Toxicity

Development of Offspring

No information was located.

Sexual Function and Fertility

No information was located.

Effects on or via Lactation

No information was located.

Germ Cell Mutagenicity

No information was located.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

May be harmful to aquatic life.

Acute Aquatic Toxicity

Chemical Name	LC50 Fish	EC50 Crustacea	ErC50 Aquatic Plants	ErC50 Algae
Sodium hydroxide	45.4 mg/L (Oncorhynchus mykiss (rainbow trout); 96-hour; static)	265 mg/L (Daphnia magna (water flea); 48-hour)		
1,2,4-Butanetricarboxylic acid, 2-phosphono-	> 1000 mg/L (Oncorhynchus mykiss (rainbow trout); 96-hour)	1071 mg/L (Daphnia magna (water flea); 48-hour)	33.3-65.5 mg/L (72-hour)	
Potassium hydroxide	80 mg/L (96-hour)			

Persistence and Degradability

No information was located.

Bioaccumulative Potential

This product and its degradation products are not expected to bioaccumulate.

Mobility in Soil

If released into the environment, this product is expected to move rapidly through the soil, based on physical and chemical properties.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal Methods

All disposals must be made in accordance with applicable government regulations only. Under no conditions is any product to be released into the natural environment (ie. air, water, ground).

SECTION 14. TRANSPORT INFORMATION

Regulation	UN No.	Proper Shipping Name	Transport Hazard Class(es)	Packing Group
Canadian TDG	UN 1760	CORROSIVE LIQUID, N.O.S. (Sodium Hydroxide, Potassium Hydroxide)	8	III

Special Precautions Not applicable

Transport in Bulk According to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations

None known.

SECTION 16. OTHER INFORMATION

Date of Preparation	July 26, 2017
Date of Last Revision	May 19, 2016
References	Supplier Safety Data Sheet cHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS). HSDB® database. US National Library of Medicine. Available from Canadian Centre for Occupational Health and Safety (CCOHS). Reptox eCHA-European Chemicals Agency.
Disclaimer	THIS SAFETY DATA SHEET IS OFFERED FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION, AS REQUIRED BY FEDERAL HAZARDOUS PRODUCTS ACT AND RELATED LEGISLATION. THE INFORMATION IS BELIEVED TO BE ACCURATE, BUT CONTROL CHEM CANADA LTD. PROVIDES NO WARRANTIES, EITHER EXPRESSED OR IMPLIED. THE USER ASSUMES ALL RISK TO PERSONS, PROPERTY AND ENVIRONMENT THROUGH USE OR MISUSE. ALL PRODUCT WARRANTIES ARE LIMITED TO THE REPLACEMENT VALUE OF THE PRODUCT.

CC 7430 Traitement des Eaux de Process-Contrôle D'échelle

SECTION 1: IDENTIFICATION

Identificateur du produit	CC 7430 Traitement des Eaux de Process-Contrôle D'échelle
Fabricant	Control Chem Canada Ltd., 4460 Harvester Road, Burlington, Ontario, L7L 4X2, 905-319-2234, www.controlchem.com
Numéro de téléphone d'urgence	CANUTEC, 613-996-6666 (*666 cell) Control Chem Canada Ltd., 1-866-882-2436
Numéro de la FDS	0392

SECTION 2: IDENTIFICATION DES DANGERS

Classifié selon le Règlement sur les produits dangereux du Canada (SIMDUT 2015).

Classification

Matières corrosives pour les métaux - catégorie 1; Toxicité aiguë (orale) - catégorie 4; Corrosion cutanée - catégorie 1; Lésions oculaires graves - catégorie 1; Sensibilisation cutanée - catégorie 1

Éléments d'étiquetage



Mention d'avertissement :
Danger
Mention(s) de(s) danger(s) :
Peut être corrosif pour les métaux.
Nocif en cas d'ingestion ou de contact cutané.
Provoque de graves brûlures de la peau et de graves lésions des yeux.
Peut provoquer une allergie cutanée.
Conseil(s) de prudence :
Prévention :
Conserver uniquement dans le récipient d'origine.
Éviter de respirer les poussières/fumées/gaz/brouillards/vapeurs/aérosols.
Se laver soigneusement les mains et la peau après avoir manipulé.
Ne pas manger, boire ou fumer en manipulant ce produit.
Les vêtements de travail contaminés ne devraient pas sortir du lieu de travail.
Porter des gants de protection/des vêtements de protection/un équipement de protection des yeux/du visage.
Intervention :
EN CAS D'INGESTION : Rincer la bouche. Ne PAS faire vomir.
EN CAS D'INGESTION : Appeler un Centre antipoison ou un médecin en cas de malaise.
EN CAS DE CONTACT AVEC LA PEAU (ou les cheveux) : Enlever immédiatement les vêtements contaminés. Rincer la peau à l'eau/se doucher.
EN CAS D'INHALATION : Transporter la personne à l'extérieur et la maintenir dans une position où elle peut confortablement respirer.
EN CAS DE CONTACT AVEC LES YEUX : Rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les

lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer.
Appeler immédiatement un Centre antipoison ou un médecin.
En cas d'irritation ou d'éruption cutanée: Demander un avis médical ou consulter un médecin.
Laver les vêtements contaminés avant réutilisation.
Absorber toute substance répandue pour éviter qu'elle attaque les matériaux environnants.

Stockage :

Stocker dans un récipient résistant à la corrosion avec doublure intérieure.
Garder sous clef.

Élimination :

Éliminer le contenu et le récipient conformément à la réglementation locale, régionale, nationale et internationale.

SECTION 3: COMPOSITION/INFORMATION SUR LES INGRÉDIENTS

Nom chimique	Numéro de CAS	%	Autres identificateurs	Autres noms
Copolymère d'acide maléique	113221-69-5	10.5-25.0		
Acide 1,2,4-butanetricarboxylique, acide 2-phosphono-	37971-36-1	2.5-3.5		
Hydroxyde de Sodium	1310-73-2	8.5-10.0		
Acide Maléique	110-16-7	1.5-4.5		
Acide phosphonique, (((phosphonométhyl) imino) bis (2, 1-éthanediylnitrilobis (méthylène))) tétrakis-, sel de sodium	22042-96-2	1.5-3.0		
L'hydroxyde de potassium	1310-58-3	3.0-7.5		

SECTION 4: PREMIERS SOINS

Mesures de premiers soins

Inhalation

Enlever la source d'exposition ou déplacer à l'air frais. Consulter un médecin si vous vous sentez mal ou si vous êtes inquiet.

Contact avec la peau

Rincer immédiatement et abondamment avec de l'eau pendant 15 minutes. Consulter un médecin si l'irritation persiste.

Contact avec les yeux

Immédiatement et soigneusement rincer les yeux et sous les paupières pendant au moins 15 minutes. Consulter immédiatement un médecin.

Ingestion

Ne pas faire vomir. Rincer la bouche avec de l'eau. Appelez le centre antipoison.

SECTION 5: MESURES À PRENDRE EN CAS D'INCENDIE

Agents extincteurs

Agents extincteurs appropriés

Produit chimique sec, eau, dioxyde de carbone ou mousse. Utiliser de l'eau pour refroidir les récipients exposés au feu qui ne fuient pas.

Agents extincteurs inappropriés

Aucun connu.

Dangers spécifiques du produit

Les récipients fermés peuvent se rompre violemment s'ils sont chauffés et peuvent alors libérer leur contenu.
Durant un incendie, les matières dangereuses suivantes peuvent être produites : monoxyde de carbone très toxique et

dioxyde de carbone; anhydrides phosphoriques corrosifs. oxydes de sodium potassium oxides oxydes de nitrogènes corrosifs et comburants.

Équipements de protection spéciaux et précautions spéciales pour les pompiers

Portez des vêtements protecteurs complets, y compris un appareil respiratoire individuel. Approcher l'incendie en amont afin d'éviter les vapeurs ou les gaz dangereux. Dans le cas d'un incendie de grande surface, évacuer immédiatement le secteur et utiliser une lance sur tourelle ou un support de lance télécommandé. Endiguer et recueillir l'eau contaminée afin de l'éliminer de façon appropriée.

SECTION 6: MESURES À PRENDRE EN CAS DE DÉVERSEMENT ACCIDENTEL

Précautions individuelles, équipements de protection et mesures d'urgence

Évacuer les lieux immédiatement. Isoler la zone de danger. Ne pas laisser entrer le personnel superflu ou non protégé. Utiliser l'équipement de protection individuel recommandé à la Section 8 de la présente fiche de données de sécurité. Éviter de respirer les brouillards, vapeurs ou gaz.

Précautions relatives à l'environnement

Empêcher la pénétration dans les égouts, le sol, ou les cours d'eau.

Méthodes et matériaux pour le confinement et le nettoyage

Colmater ou réduire la fuite s'il est sécuritaire de le faire. Contenir et absorber le déversement avec un absorbant qui ne réagit pas avec le produit déversé. L'absorbant contaminé présente le même risque que le produit déversé. Placer l'absorbant utilisé dans des récipients appropriés scellés et étiquetés en vue de leur élimination. Après le nettoyage, rincer les traces avec de l'eau.

SECTION 7: MANUTENTION ET STOCKAGE

Précautions relatives à la sûreté en matière de manutention

Éviter tout contact avec les yeux, la peau ou les vêtements. Manipuler conformément aux bonnes pratiques d'hygiène et de sécurité industrielles. Assurer une douche oculaire et d'une station d'eau sont à proximité. Éviter de produire de la vapeur ou des brouillards. N'utiliser qu'aux endroits où la ventilation est adéquate.

Conditions de sûreté en matière de stockage

Conservez dans un endroit frais , sec et bien ventilé. Stocker dans une zone ayant les caractéristiques suivantes : isolé des matériaux incompatibles (voir la Section 10 : Stabilité et réactivité).

SECTION 8: CONTRÔLE DE L'EXPOSITION/PROTECTION INDIVIDUELLE

Paramètres de contrôle

	ACGIH TLV®		OSHA PEL		AIHA WEEL	
Nom chimique	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Hydroxyde de Sodium	2 mg/m3		2 mg/m3			
Acide 1,2,4-butanetricarboxylique, acide 2-phosphono-					10 mg/m3	
L'hydroxyde de potassium	2 mg/m3			2 mg/m3		

Contrôles d'ingénierie appropriés

La ventilation générale est habituellement adéquate. Utiliser un système de ventilation par aspiration à la source, si la ventilation générale ne suffit pas à contrôler la quantité de produit dans l'air.

Mesures de protection individuelle

Protection des yeux et du visage

Porter des lunettes de sécurité avec protection latérale, un écran facial ou des lunettes lors de la manipulation.

Protection de la peau

Lors de la manipulation, porter des gants imperméables, tablier, pantalon et veste.

Protection des voies respiratoires

Habituellement non requis si le produit est utilisé selon les directives.

SECTION 9: PROPRIÉTÉS PHYSIQUES ET CHIMIQUES

Propriétés physiques et chimiques de base

Apparence	Liquide ambre claire.
Odeur	Pas disponible
Seuil olfactif	Pas disponible
pH	9.0 - 11.5
Point de fusion/Point de congélation	Pas disponible (fusion); Pas disponible (congélation)
Point initial d'ébullition et domaine d'ébullition	Pas disponible
Point d'éclair	Pas disponible
Taux d'évaporation	Pas disponible
Inflammabilité (solides et gaz)	Sans objet
Limites supérieures/inférieures d'Inflammabilité ou d'Explosibilité	Pas disponible (supérieure); Pas disponible (inférieure)
Tension de vapeur	Pas disponible
Densité relative (eau = 1)	1.15 - 1.30
Solubilité	Très soluble dans l'eau
Coéfficient de partage n-octanol/eau	Pas disponible
Température d'auto-inflammation	Pas disponible
Température de décomposition	Pas disponible
Viscosité	Pas disponible (cinématique)

Autres informations

État physique	Liquide

SECTION 10: STABILITÉ ET RÉACTIVITÉ

Réactivité

Inconnu.

Stabilité chimique

Habituellement stable.

Risque de réactions dangereuses

Aucun prévu dans les conditions normales de stockage et d'utilisation.

Conditions à éviter

Hautes températures. Congélation. Matières incompatibles.

Matériaux incompatibles

Agents oxydants forts (p. ex. acide perchlorique), composés halogénés (p. ex. trichloroéthylène), acides forts (p. ex. acide chlorhydrique), agents réducteurs forts (p. ex. hydrures).
Corrosif pour : alliages d'aluminium.

Produits de décomposition dangereux

Monoxyde de carbone très toxique et dioxyde de carbone; anhydrides phosphoriques corrosifs. oxydes de sodium oxydes de potassium oxydes d'azote.

SECTION 11: DONNÉES TOXICOLOGIQUES

Toxicité aiguë

Nom chimique	CL50	DL50 (orale)	DL50 (cutanée)
Hydroxyde de Sodium	Pas disponible	340 mg/kg (rat)	1350 mg/kg (lapin)
Acide 1,2, 4-butanetricarboxylique, acide 2-phosphono-	> 1.979 mg/L (rat) (vapeur)	> 6500 mg/kg (rat)	> 4000 mg/kg (rat)
Acide Maléique	Pas disponible	708 mg/kg (rat)	1560 mg/kg (lapin)
L'hydroxyde de potassium	Pas disponible	205 mg/kg (rat)	> 1260 mg/kg (lapin)

CL50: Aucun renseignement trouvé.

DL50 (cutanée): Aucun renseignement trouvé.

Corrosion/Irritation cutanée

Corrosif selon les renseignements relatifs à des matières très semblables.

Lésions oculaires graves/Irritation oculaire

Peut causer une grave affection oculaire selon les renseignements relatifs à des matières très semblables.

Toxicité pour certains organes cibles - Exposition unique

Inhalation

Aucun renseignement trouvé.

Absorption par la peau

Aucun renseignement trouvé.

Ingestion

Nocif en cas d'ingestion. Selon les renseignements relatifs à des produits chimiques très semblables.

Toxicité pour certains organes cibles - Expositions répétées

Aucun renseignement trouvé.

Sensibilisation respiratoire ou cutanée

Aucun renseignement n'a été trouvé concernant la sensibilisation des voies respiratoires. Peut causer une réaction allergique (sensibilisation de la peau) selon les renseignements relatifs à des produits chimiques très semblables. (Acide Maléique)

Cancérogénicité

Aucun renseignement n'a été trouvé.

Toxicité pour la reproduction

Développement de la progéniture

Aucun renseignement n'a été trouvé.

Fonction sexuelle et la fertilité

Aucun renseignement n'a été trouvé.

Effets sur ou via l'allaitement

Aucun renseignement n'a été trouvé.

Mutagénicité sur les cellules germinales

Aucun renseignement n'a été trouvé.

SECTION 12: DONNÉES ÉCOLOGIQUES

Écotoxicité

Peut être nocif pour la vie aquatique.

Dangers aigus pour le milieu aquatique

Nom chimique	CL50 pour les poissons	CE50 pour les crustacés	CEr50 pour les plantes aquatiques	CEr50 pour les algues

Hydroxyde de Sodium	45.4 mg/L (Oncorhynchus mykiss (truite arc-en-ciel); 96 heures; statique)	265 mg/L (Daphnia magna (puce d'eau); 48 heures)		
Acide 1,2, 4-butanetricarboxylique, acide 2-phosphono-	> 1000 mg/L (Oncorhynchus mykiss (truite arc-en-ciel); 96 heures)	1071 mg/L (Daphnia magna (puce d'eau); 48 heures)	33.3-65.5 mg/L (72 heures)	
L'hydroxyde de potassium	80 mg/L (96 heures)			

Persistance et dégradation

Aucun renseignement n'a été trouvé.

Potentiel de bioaccumulation

Ce produit et ses produits de dégradation ne devraient pas être bioaccumulables.

Mobilité dans le sol

S'il y a rejet dans l'environnement, ce produit devrait migrer rapidement à travers le sol, selon ses propriétés physiques et chimiques.

SECTION 13: DONNÉES SUR L'ÉLIMINATION

Les méthodes d'élimination

Toutes les cessions doivent être effectués conformément à la réglementation gouvernementale applicable uniquement. En aucun cas, tout produit à être libéré dans l'environnement naturel (p. Air, eau, sol).

SECTION 14: INFORMATIONS RELATIVES AU TRANSPORT

Réglementation	Numéro ONU	Désignation officielle de transport	Classe(s) de danger relative(s) au transport	Groupe d'emballage
Canadian TDG	UN 1760	LIQUIDE CORROSIF, N.S.A. (Hydroxyde de Sodium, Hydroxyde de Potassium)	8	III

Précautions spéciales Sans objet

Transport en vrac aux termes de l'annexe II de la Convention MARPOL 73/78 et du Recueil IBC

Sans objet

SECTION 15: INFORMATIONS SUR LA RÉGLEMENTATION

Réglementation relative à la sécurité, à la santé et à l'environnement

Aucun connu.

SECTION 16: AUTRES INFORMATIONS

Date de préparation	le 26 juillet, 2017
Date de la plus récente version révisée	le 19 mai, 2016
Références	Fournisseur de données de sécurité base de données CHEMINFO. Centre canadien d'hygiène et de sécurité au travail (CCHST). Base de données HSDB®. National Library of Medicine des États-Unis. Accessible via le Centre canadien d'hygiène et de sécurité au travail (CCHST). Reptox eCHA-Agence européenne des produits chimiques.
Avis	CETTE FICHE SIGNALÉTIQUE EST OFFERTE POUR VOTRE INFORMATION,

CONSIDÉRATION ET ENQUÊTE COMME REQUIS PAR LA LOI FÉDÉRALE SUR LES PRODUITS DANGEREUX ET TOUTES LÉGISLATION RELIÉS. LES INFORMATIONS SONT CONSIDÉRÉES COMME PRÉCISES, MAIS CONTROL CHEM CANADA LTÉE NE FOURNIT AUCUNES GARANTIES, EXPLICITES OU IMPLICITES. L'UTILISATEUR ASSUME TOUS LES RISQUES AUX PERSONNES, À LA PROPRIÉTÉ OU À L'ENVIRONNEMENT ASSOCIÉS À L'UTILISATION ADÉQUATE OU NON DE CE PRODUIT. TOUTES LES GARANTIES POUR CE PRODUIT SONT LIMITÉES AU REMPLACEMENT DE LA VALEUR DU PRODUIT.

SAFETY DATA SHEET

THE DOW CHEMICAL COMPANY

Product name: AQUCAR™ DB 20 Water Treatment Microbiocide **Issue Date:** 03/24/2015
Print Date: 03/25/2015

THE DOW CHEMICAL COMPANY encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: AQUCAR™ DB 20 Water Treatment Microbiocide

Recommended use of the chemical and restrictions on use
Identified uses:
COMPANY IDENTIFICATION
THE DOW CHEMICAL COMPANY
2030 WILLARD H DOW CENTER
MIDLAND MI 48674-0000
UNITED STATES

Customer Information Number: 800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 800-424-9300
Local Emergency Contact: 989-636-4400

2. HAZARDS IDENTIFICATION

Hazard classification
This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.
Acute toxicity - Category 4 - Oral
Acute toxicity - Category 4 - Inhalation
Skin corrosion - Category 1
Serious eye damage - Category 1
Skin sensitisation - Sub-category 1B
Specific target organ toxicity - single exposure - Category 3

Label elements
Hazard pictograms



Signal word: **DANGER!**

Hazards
Harmful if swallowed or if inhaled
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
May cause drowsiness or dizziness.

Precautionary statements

Prevention
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/ physician.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
If skin irritation or rash occurs: Get medical advice/ attention.
Wash contaminated clothing before reuse.

Storage
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.

Disposal
Dispose of contents/ container to an approved waste disposal plant.

Other hazards
Toxic fumes may be released in fire situations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Concentration
Polyethylene glycol	25322-68-3	>= 46.5 - <= 54.5 %
2,2-Dibromo-3-nitrilopropionamide	10222-01-2	20.0%
Dibromoacetonitrile	3252-43-5	<= 3.0 %
Sodium bromide	7647-15-6	<= 4.0 %

4. FIRST AID MEASURES

Description of first aid measures
General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly. Suitable emergency safety shower facility should be immediately available.

Eye contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed
Notes to physician: Chemical eye burns may require extended irrigation. Obtain prompt consultation, preferably from an ophthalmologist. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. Probable mucosal damage may contraindicate the use of gastric lavage. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture
Hazardous combustion products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen bromide. Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: This material will not burn until the water has evaporated. Residue can burn. Container may rupture from gas generation in a fire situation.

Advice for firefighters
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. If product becomes contaminated with water, monitor product for heat generation and/or decomposition. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Move container from fire area if this is possible without hazard. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Evacuate area. Keep upwind of spill. Refer to section 7, Handling, for additional precautionary measures. Only trained and properly protected personnel must be involved in clean-up operations. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Attempt to neutralize by adding materials such as Sodium bisulphite. Sodium metabisulfite. Neutralize with approximately 17.2 grams sodium bisulfite (NaHSO3) or 15.7 grams sodium meta

bisulphite (Na2S2O5) for every 100 grams biocidal product. Absorb with materials such as: Dirt. Sand. Vermiculite. Zorb-all®. Hazorb®. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep out of reach of children. Do not get in eyes, on skin, on clothing. Avoid breathing mist. Avoid prolonged or repeated contact with skin. Do not swallow. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Conditions for safe storage: Store in original container. Keep container tightly closed. Do not store in: Aluminum. Brass. Copper. Copper alloys. Mild steel. Stainless steel.

Storage stability
Shelf life: Use within 12 Month
Storage temperature: <= 35 °C (<= 95 °F)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Polyethylene glycol	US WEEL	TWA aerosol	10 mg/m3
2,2-Dibromo-3-nitrilopropionamide	Dow IHG	C	2 mg/m3
Dibromoacetonitrile	Dow IHG	C	0.1 ppm
	Dow IHG	C	Absorbed via skin
Sodium bromide	Dow IHG	TWA	6 mg/m3

Exposure controls
Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use chemical goggles.

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Polyethylene. Chlorinated polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Viton. Neoprene. Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical state	Liquid.
Color	Colorless to brown
Odor	Odorless to mild
Odor Threshold	No test data available
pH	1.5 - 5.0 *Literature*
Melting point/range	Not applicable
Freezing point	< -50 °C (< -58 °F) *Literature*
Boiling point (760 mmHg)	> 70 °C (> 158 °F) *Literature* Decomposition
Flash point	**closed cup** *Literature* none to 100°C (212 °F) **open cup** >= 182 °C (>= 360 °F) *Cleveland Open Cup*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	18.9 mmHg at 25 °C (77 °F) *Estimated.*
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	1.20 - 1.30 at 23 °C (73 °F) *Literature*
Water solubility	7.5 % at 20 °C (68 °F) *Literature*
Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	No test data available
Decomposition temperature	No test data available
Dynamic Viscosity	20 cP at 25 °C (77 °F) (Brookfield Viscosity - @ 100 rpm, #0 spindle)
Kinematic Viscosity	16 cSt at 25 °C (77 °F) *Calculated.*
Explosive properties	no data available
Oxidizing properties	no data available

Molecular weight No test data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: no data available

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Avoid temperatures above 70°C (158°F) Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible materials: Avoid contact with: Oxidizers. Strong bases. Avoid contact with metals such as: Aluminum.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Carbon dioxide. Bromine. Cyanogen bromide. Dibromoacetonitrile.

11. TOXICOLOGICAL INFORMATION

Toxicological information on this product or its components appear in this section when such data is available.

Acute toxicity

Acute oral toxicity
Low toxicity if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract. May cause dizziness and drowsiness.

LD50, Rat, 510 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 2,000 mg/kg

Acute inhalation toxicity
Mist may cause irritation of upper respiratory tract (nose and throat).

LC50, Rat, female, 4 Hour, dust/mist, 1.25 mg/l
LC50, Rat, male, 4 Hour, dust/mist, 1.40 mg/l

Skin corrosion/irritation
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Serious eye damage/eye irritation
May cause pain disproportionate to the level of irritation to eye tissues.
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Sensitization
For similar material(s):
Has caused allergic skin reactions when tested in guinea pigs.
Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:
No relevant information found.

Specific Target Organ Systemic Toxicity (Single Exposure)
May cause drowsiness or dizziness.
Route of Exposure: Oral
Target Organs: Central nervous system

Specific Target Organ Systemic Toxicity (Repeated Exposure)
Excessive exposure may increase the blood and tissue levels of bromine.
Observations in animals include kidney effects following repeated ingestion of active ingredient, but no evidence of systemic toxicity following repeated dermal exposure at maximum attainable doses

Carcinogenicity
Active ingredient did not cause cancer in laboratory animals. There is evidence that dibromoacetonitrile (DBAN), a possible degradation product of 2,2-dibromo-3-nitrilopropionamide (DBNPA), can produce cancer in laboratory animals. However, the relevance of this to humans is unknown.

Teratogenicity
For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity
No relevant data found.

Mutagenicity
For the active ingredient(s): In vitro genetic toxicity studies were negative. For the major component(s): Animal genetic toxicity studies were negative.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

Carcinogenicity

Component	**List**	**Classification**
Dibromoacetonitrile	IARC	Group 2B: Possibly carcinogenic to humans

12. ECOLOGICAL INFORMATION

Ecotoxicological information on this product or its components appear in this section when such data is available.

Toxicity

Acute toxicity to fish
Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), 96 Hour, 3.6 mg/l

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, 2.5 mg/l

Acute toxicity to algae/aquatic plants
ErC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Growth rate inhibition, 1.5 mg/l

NOEC, Pseudokirchneriella subcapitata (green algae), Growth rate inhibition, 0.1 mg/l

Persistence and degradability

Polyethylene glycol
Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
10-day Window: Pass
Biodegradation: 85 %
Exposure time: 28 d
Method: OECD Test Guideline 301F or Equivalent

Theoretical Oxygen Demand: 1.67 mg/mg

2,2-Dibromo-3-nitrilopropionamide
Biodegradability: Abiotic degradation: The material is rapidly degradable by abiotic means.
10-day Window: Fail
Biodegradation: 35 - 78 %
Exposure time: 28 d
Method: OECD Test Guideline 301B or Equivalent
10-day Window: Not applicable
Biodegradation: 83.3 %
Exposure time: 28 d
Method: OECD Test Guideline 303A or Equivalent
10-day Window: Not applicable
Biodegradation: 17 - 22 %
Exposure time: 28 d
Method: OECD Test Guideline 306 or Equivalent

Theoretical Oxygen Demand: 0.59 mg/mg

Chemical Oxygen Demand: 0.26 mg/mg

Stability in Water (1/2-life)
Hydrolysis, half-life, 65 hrs, pH 7

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitizer: OH radicals
Atmospheric half-life: 5.3 d
Method: Estimated.

Dibromoacetonitrile
Biodegradability: No relevant data found.

Theoretical Oxygen Demand: 0.48 mg/mg

Sodium bromide
Biodegradability: Biodegradation is not applicable.

Bioaccumulative potential

Polyethylene glycol
Bioaccumulation: No relevant data found.

2,2-Dibromo-3-nitrilopropionamide
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 0.79 Measured
Bioconcentration factor (BCF): 13 Fish. Measured

Dibromoacetonitrile
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): 1.56 Measured

Sodium bromide
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Bioconcentration factor (BCF): < 40 Fish. Measured

Mobility in soil

Polyethylene glycol
No relevant data found.

2,2-Dibromo-3-nitrilopropionamide
Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient(Koc): 15 Estimated.

Dibromoacetonitrile
Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient(Koc): 13 Estimated.

Sodium bromide
No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	Corrosive liquid, acidic, organic, n.o.s.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III

Classification for SEA transport (IMO-IMDG):

Proper shipping name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III
Marine pollutant	No
Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Corrosive liquid, acidic, organic, n.o.s.(2,2-Dibromo-3-nitrilopropionamide)
UN number	UN 3265
Class	8
Packing group	III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Acute Health Hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Pennsylvania Worker and Community Right-To-Know Act:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances knownto the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

United States TSCA Inventory (TSCA)
This product contains chemical substance(s) exempt from U.S. EPA TSCA Inventory requirements. It is regulated as a pesticide subject to Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.

Federal Insecticide, Fungicide and Rodenticide Act
EPA Registration Number: 464-426
This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

DANGER

Corrosive
Causes irreversible eye damage
May be fatal if swallowed.
Causes skin irritation
Harmful if inhaled or absorbed through skin
Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.
This product is toxic to fish and invertebrates.

16. OTHER INFORMATION

Revision
Identification Number: 101189115 / A001 / Issue Date: 03/24/2015 / Version: 15.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

Absorbed via skin	Absorbed via skin
C	Ceiling limit
Dow IHG	Dow Industrial Hygiene Guideline
TWA	8-hr TWA
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

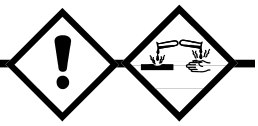
THE DOW CHEMICAL COMPANY urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	Chemical Treatment CL2150
Product Use:	Cooling Water Microbiocide and Paper Slimicide
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424−9300 (Toll Free) (703) 527−3887
Address (Corporate Headquarters):	5640 COX ROAD Glen Allen, VA 23060
Telephone Number for Information:	(800) 648−4579
Date of MSDS:	October 16, 2012

Section 2. Hazard(s) Identification



Signal Word: **DANGER!**

Hazard Statement(s):
Causes severe skin burns and eye damage.
Causes serious eye damage.
Harmful in contact with skin.
Harmful if inhaled.
Harmful if swallowed.
Harmful to aquatic life.

Precautionary Statement(s): Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well−ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
5−chloro−2−methyl−4−isothiazolin−3−one	26172−55−4	1.11
2−methyl−4−isothiazolin−3−one	2682−20−4	0.39

Section 4. First Aid Measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
Eyes:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
Skin:	Immediately remove/take off all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before re−use. Immediately call a poison center or doctor/physician.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.
Notes to Physician:	Probable mucosal damage may contraindicate the use of gastric lavage.
Additional First Aid Remarks:	Have the product container, label or MSDS with you when calling a poison control center or doctor, or when going for treatment.

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	Use water spray to keep containers cool.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	This pesticide is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, ponds, streams, estuaries, oceans or public waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit, and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1−800−424−8802.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.
Store in corrosive resistant container with a resistant inliner.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
5−chloro−2−methyl−4−isothiazolin−3−one		N/E
2−methyl−4−isothiazolin−3−one		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
5−chloro−2−methyl−4−isothiazolin−3−one			N/E
2−methyl−4−isothiazolin−3−one			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full−face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick−drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual

cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Green, Clear
Specific Gravity:	1.025 @ 20°C
pH:	3.6 @ 20°C, 100.0%
Freezing Point:	32°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	N/D
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	N/D
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.55 lb/ga
Vapor Pressure:	N/D
% VOC	0.24

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers, Strong bases

Hazardous Decomposition Products: Oxides of nitrogen, Oxides of sulfur, Oxides of carbon, Halogenated compounds

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
Chemical Treatment CL2150	Oral	LD50	3810 mg/kg	Rat
	Dermal	LD50	>5000 mg/kg	Rabbit
	Inhalation	LD50	13.7 mg/l	Rat

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Daphnia magna	48h	LC50	10.7 mg/l
Bluegill Sunfish	96h	LC50	18.6 mg/l
Ceriodaphnia dubia	48h	EC50	10.7 mg/l
Rainbow Trout	96h	LC50	12.6 mg/l
Sheepshead Minnow	96h	LC50	70.7 mg/l
Mysid Shrimp	48h	LC50	46.1 mg/l
Daphnia pulex	48h	LC50	17 mg/l
Fathead Minnow	48h	LC50	8.7 mg/l

Comments: None.

Section 13. Disposal Considerations

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.
CONTAINER DISPOSAL: Non−refillable container. Do not reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by procedures approved by state and local authorities.

Section 14. Transport Information

DOT

Proper Shipping Name: CORROSIVE LIQUIDS, N.O.S.
Technical Name: (5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class: Corrosive
UN/NA#: UN1760
Packing Group: PGII

IMDG

Proper Shipping Name: CORROSIVE LIQUIDS, N.O.S.
Technical Name: (5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class: Corrosive
UN/NA#: UN1760
Packing Group: PGII

TDG

Proper Shipping Name:	CORROSIVE LIQUIDS, N.O.S.
Technical Name:	(5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class:	Corrosive
UN/NA#:	UN1760
Packing Group:	PGII

ICAO

Proper Shipping Name:	CORROSIVE LIQUIDS, N.O.S.
Technical Name:	(5−CHLORO−2−METHYL−4−ISOTHIAZOLIN−3−ONE AND 2−METHYL−4−ISOTHIAZOLIN−3−ONE)
Hazard Class:	Corrosive
UN/NA#:	UN1760
Packing Group:	PGII

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
5−chloro−2−methyl−4−isothiazolin−3−one	N/A	N/A	N/A
2−methyl−4−isothiazolin−3−one	N/A	N/A	N/A

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
5−chloro−2−methyl−4−isothiazolin−3−one	None
2−methyl−4−isothiazolin−3−one	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health: 3
Flammability: 0
Physical Hazard: 0
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

NSF: N/A

FDA/USDA/GRAS: All ingredients in this product are authorized in 21 CFR 176.170 and 21 CFR 176.180.

KOSHER: This product is certified by the Orthodox Union as Kosher for Passover and year−round use.
Only when prepared by the following ChemTreat facilities: Ashland, VA; Eldridge, IA; Nederland, TX; Vernon, CA.

FIFRA: This product is an EPA registered biocide. 15300−24

Other: PMRA biocide registration NO. 26537.

Abbreviations

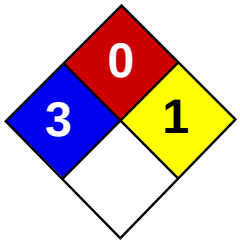
Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.







Material Safety Data Sheet
Calcium hypochlorite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium hypochlorite

Catalog Codes: SLC3310, SLC5098, SLC5099

CAS#: 7778-54-3

RTECS: NH3485000

TSCA: TSCA 8(b) inventory: Calcium hypochlorite

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Ca(OCl)2

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
Calcium hypochlorite	7778-54-3	100

Toxicological Data on Ingredients: Calcium hypochlorite: ORAL (LD50): Acute: 850 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Corrosive to eyes and skin. 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. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. 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 is toxic to lungs, mucous membranes. 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. 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:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : 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. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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.

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.

Large Spill:
Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material.

Clean up spills in a manner that does not disperse dust into the air. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible 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 reducing agents, combustible materials, organic materials, acids, moisture.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate safety storage cabinet or room.

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. Lab coat. 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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 142.99 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: Decomposes.

Melting Point: 100°C (212°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

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: Soluble in cold water, hot 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: Reactive with reducing agents, combustible materials, organic materials, acids, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of zinc. Corrosive in presence of steel, of copper. Slightly corrosive to corrosive in presence of glass, of stainless steel(304), of stainless steel(316).

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 850 mg/kg [Rat].

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Calcium hypochlorite, dry : UN1748 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium hypochlorite Massachusetts RTK: Calcium hypochlorite TSCA 8(b) inventory: Calcium hypochlorite CERCLA: Hazardous substances.: Calcium hypochlorite

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

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive solid.

DSCL (EEC):
R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

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

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. 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: 10/11/2005 11:31 AM

Last Updated: 05/21/2013 12:00 PM

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1-800-387-9799 or 519-451-1614
www.anchemsales.com

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Caustic Soda 30% CA500-30

SECTION 01: PRODUCT INFORMATION AND COMPANY INFORMATION

MANUFACTURER: Same as above
PREPARED BY: Production Department
VERSION DATE: 27-Jan-14
TELEPHONE NO.: (519) 451-1614
EMERGENCY PHONE NO.: (613) 996-6666
CHEMICAL FAMILY Not Available **CHEMICAL FORMULA** Not Applicable
MOLECULAR WEIGHT Not applicable **MATERIAL USE:** Please Refer to technical literature
SYNONYMS:

SECTION 02: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredients	Conc. Approx. %	C.A.S. #	LD/50 (RTE/SPEC)	LC/50 (RTE/SPEC)	TLV
Sodium Hydroxide	30%	1310-73-2	3000 mg/kg (Rat/oral)	N.Av.	N.Av.
Water	Balance	N.Av.	N.Av.	N.Av.	N.Av.

SECTION 03: HAZARD IDENTIFICATION

ROUTE OF ENTRY

Eyes: Very hazardous. (irritant) Liquid or spray mist may produce tissue damage on mucous membranes of eyes. Inflammation of the eye is characterized by redness, watering, and itching.

Skin: Extremely hazardous. (corrosive, irritant) Liquid or spray mist may produce tissue damage on mucous membranes of skin. Contact may produce burns. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation Very hazardous. Liquid or spray mist may produce tissue damage on mucous membranes of respiratory tract. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe overexposure can result in death.

Ingestion: Very hazardous.

SECTION 04: FIRSTAID

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 30 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Get medical attention immediately.

Inhalation, Acute If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. If inhalation is accute, 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. Have conscious person drink several glasses of water or milk. Never give anything by mouth to an unconscious person. Seek medical attention.

Notes to physician: May cause tissue destruction/stricture. If lavage is performed, suggest endortracheal and/or esophageal control. Material is strong alkali. If burn is present, treat as any thermal burn, after decontamination. For burns of skin only. Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

SECTION 05: FIRE EXPLOSION HAZARD AND FIRE FIGHTING MEASURES

FLAMMABLE?	No
IF YES, UNDER WHICH CONDITIONS?	
FLASH POINT (TCC) (C):	Not Applicable
FLAMMABLE LIMITS:	**LEL(% BY VOL.):** Not Applicable. **UEL(% BY VOL):** Not Applicable.
AUTO IGNITION TEMPERATURE (C)	Not Applicable.
EXTINGUISHING MEDIA	Use extinguishing media suitable for surrounding materials.
SPECIAL PROCEDURES:	Not Available
HAZARDOUS COMBUSTION PRODUCTS:	These products are nitrogen oxides (NO, NO2…)
UNUSUAL FIRE AND EXPLOSION HAZARDS	Product reacts with water. Reaction may produce heat and/or gases. This reaction may be violent. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. This material does not burn.
SENSITIVITY TO STATIC DISCHARGE	Not Available
SENSITIVITY TO MECHANICAL IMPACT:	Not Available

SECTION 06: ACCIDENTAL RELEASE MEASURES

Leak and Spill Procedure: SMALL SPILL: Absorb with an inert material and place in an appropriate waste disposal container. If necessary, neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.
LARGE SPILL: Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other not-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapour drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above the TLV. Check TLV on the MSDS and with local authorities.

SECTION 07: HANDLING AND STORAGE

Handling Procedures and Storage Requirements

Keep container dry. DO NOT ingest. Do not breath gas/fumes/vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. Keep away from incompatibles such as metals, acids.
SPECIAL PRECAUTIONS FOR DILUTING CAUSTIC SODA SOLUTION:
1. ALWAYS add caustic soda solution to water with constant agitation. NEVER add water to the caustic soda solution.
2. The water should be lukewarm (80-100F). NEVER start with hot or cold water.
The addition fo caustic soda to liquid will cause a rise in themperature. If caustic soda becomes concentrated in one area, is added too rapidly, or is added to hot or cold liquid, a rapid temperature increase can result in DANGEROUS mists, boiling or spattering which can cause an immediate VIOLENT ERUPTION.
Keep container tightly closed. Store above 16 C (60 F). Store in a dry and well-ventilated area.

SECTION 08: PERSONAL PROTECTIVE EQUIPMENT / EXPOSURE CONTROLS

GLOVES/TYPE:	Impervious chemical resistant gloves.
RESPIRATOR/TYPE:	A full face NIOSH/MSHA respirator with organic vapor cartridge.
EYE/TYPE:	Safety glasses. Face shield.
OTHER/TYPE:	Not Available
ENGINEERING CONTROL	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIE

PHYSICAL STATE/APPEARANCE: Liquid. (Clear to slightly hazy)

ODOUR:	Odorless.	**ODOUR THRESHOLD:**	N. Av.
VAPOUR PRESSURE (mm Hg @ 20C):	.2 (50%)	**VAPOUR DENSITY (Air=1):**	N. Av.
EVAPORATION RATE (Ether = 1):	N. Av.	**SPECIFIC GRAVITY:**	1..5 (50%)
BOILING POINT (C):	115-140 °C	**FREEZING POINT (C)**	1-12 °C
Ph (% SOLUTION):	14	**% VOLATILE (WT):**	0
SOLUBILITY IN WATER (% W/W)	Completely soluble.		

SECTION 10: STABILITY AND REACTIVITY

CHEMICALLY STABLE? Yes

IF NO, UNDER WHICH CONDITIONS? Heat is generated when mixed withwater. Spattering and boiling can occur. Avoid contact with halogenated organics, organic nitro compounds, glycols.

INCOMPATIBILITY WITH OTHER SUBTANCES Yes

IF YES, WITH WHICH ONES: Common metals and their alloys. Acids. Acid anhydrides. Oxidizable material. Contact with water causes an exothermic reaction.

SPECIAL REACTIVITY AND UNDER WHAT CONDITIONS Heat is generated when mixed withwater. Spattering and boiling can occur. Flammable hydrogen may be generated from contact with metals such as: aluminum, brass, tin, zinc. Avoid contact with acids, halogenated organics, organic nitro compounds, glycols. Caustic soda solution reacts readily with various reducing sugars (ie, fructose, glacatose, maltose, dry whey solids) to produce carbon monoxide.

HAZARDOUS DECOMPOSITION PRODUCTS: Not Available.

SECTION 11: TOXICOLOGICAL INFORMATION

EXPOSURE LIMIT OF MATERIAL	N. Av.
LC 50 OF MATERIAL, SPECIES AND ROUTE	See Sec. 2
LD 50 OF MATERIAL, SPECIES AND ROUTE	See Sec. 2
CARCINOGENICITY OF MATERIAL	N. Av.
REPRODUCTIVE EFFECTS:	N. Av.
IRRITANCY OF MATERIAL	N. Av.
SENSITIZING CAPABILITY OF MATERIAL	N. Av.
SYNERGISTIC MATERIALS	N. Av.

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY 180ppm/23hr/oysters/lethal/salt water pH 12.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

SECTION 14: TRANSPORT INFORMATION

TDG CLASSIFICATION Class 8, Sodium Hydroxide Solution

UN NUMBER: 1824

PACKING GROUP: II

Special Provisions for Transport

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION E

E CORROSIVE MATERIAL

SECTION 16: OTHER INFORMATION

ABBREVIATIONS USED: N.Av. = Not Available
N.App. / N.Ap. = Not Applicable

DISCLAIMER: Although the information herein is to the best of our knowledge accurate, no guarantee expressed or implied, is made regarding the information or the performance of any product. We assume no liability for incidental or direct damages of any kind, no matter what, including negligence.

SOURCES: Supplier MSDS

For updated copies of an MSDS, please contact Anchem Sales at the address/phone number on Page 1 or fax the MSDS Co-ordinator at (519) 451-4593.

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Form 074 Revised Aug 2016

A Division of Appropriate Chemical International Ltd.

120 Stronach Crescent, London, ON, N5V 3A1
1-800-387-9799 or 519-451-1614
www.anchemsales.com

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Caustic Soda Beads CA550-00

SECTION 01: PRODUCT INFORMATION AND COMPANY INFORMATION

MANUFACTURER:	Same as above		
PREPARED BY:	Production Department		
VERSION DATE:	09-Mar-15		
TELEPHONE NO.:	(519) 451-1614		
EMERGENCY PHONE NO.:	(613) 996-6666		
CHEMICAL FAMILY	Not Available	**CHEMICAL FORMULA**	Not Applicable
MOLECULAR WEIGHT	Not Applicable	**MATERIAL USE:**	Please Refer to technical literature
SYNONYMS:	Sodium Hydroxide, Lye		

SECTION 02: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredients	Conc. Approx. %	C.A.S. #	LD/50 (RTE/SPEC)	LC/50 (RTE/SPEC)	TLV
Sodium Hydroxide	95-99	1310-73-2	500mg/kg	N.Av.	N.Av.

SECTION 03: HAZARD IDENTIFICATION

ROUTE OF ENTRY

Eyes: Causes severe eye burns. Small quantities can result in permanent damage and/or loss of vision.

Skin: Causes severe burns. Corrosive action causes burns and frequently deep ulcerations with subsequent scarring. Prolonged contact destroys tissue. May cause dermatitis.

Inhalation Corrosive to respiratory passages. Inhalation of dusts or mists can cause damage to the upper respiratory tract and to the lung tissue depending on severity of exposure. Effects can range from mild irritation of mucous membranes, severe pneumonitis and destruction of lung tissue.

Ingestion: Ingestion can cause damage to the mucous membranes, mouth and digestive system. Ingestion of product may result in death.

SECTION 04: FIRSTAID

Skin Contact: Flush with copious amounts of water. If wearing goggles, flush head and face thoroughly before removing goggles. Obtain medical attention immediately.

Eye Contact: Flush eyes with gently flowing water for at least 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse the contaminated water into the unaffected eye or face. Utmost speed is essential. Have an opthamologist make an evaluation of eye injury.

Inhalation, Acute

If symptoms are experienced, remove source of contamination or move victim to fresh air. If symptoms persist, get medical attention. If the affected person is not breathing, apply artificial respiration. If breathing is difficult, give oxygen. In situations where administering oxygen is appropriate, first aiders must be trained in the safe use and handling of oxygen. It is preferable to administer oxygen under a doctor's supervision or advice. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation (CPR) immediately. Immediate medical assistance is required.

Ingestion: Seek immediate medical attention. Do not induce vomiting. Administer artificial respiration if breathing has stopped. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation (CPR) immediately. Never give anything by mouth if victim is rapidly losing consciousness, unconscious or convulsing.

Notes to physician: Treatment based on sound judgment of physician and individual reactions of patient.

SECTION 05: FIRE EXPLOSION HAZARD AND FIRE FIGHTING MEASURES

FLAMMABLE?	No
IF YES, UNDER WHICH CONDITIONS?	
FLASH POINT (TCC) (C):	Not Available
FLAMMABLE LIMITS:	**LEL(% BY VOL.):** Not Available **UEL(% BY VOL):** Not Available
AUTO IGNITION TEMPERATURE (C)	Not Available
EXTINGUISHING MEDIA	Not flammable. Use extinguishing media appropriate for surrounding fire.
SPECIAL PROCEDURES:	Fire fighters should wear full protective clothing, including self-contained breathing equipment.
HAZARDOUS COMBUSTION PRODUCTS:	Not Available
UNUSUAL FIRE AND EXPLOSION HAZARDS	Not Available
SENSITIVITY TO STATIC DISCHARGE	Not Available
SENSITIVITY TO MECHANICAL IMPACT:	Not Available

SECTION 06: ACCIDENTAL RELEASE MEASURES

Leak and Spill Procedure: Procedure for Clean Up: Sweep up or vacuum up and place in an appropriate closed container. Avoid raising dust. Isolate spill and stop leak where safe. If the material has been mixed with water or any other liquid, then dike area to contain spill. Dilute spill with large amounts of water and neutralize with dilute acid. Use vacuum truck to pick up neutralized material for proper disposal. Flush area with water to remove trace residue.
Personal Precautionary Measures: Wear appropriate protective equipment.
Environmental Precautionary Measures: Prevent from entering sewers, waterways or low areas.

SECTION 07: HANDLING AND STORAGE

Handling Procedures and Storage Requirements

Handling: Avoid dust generation and provide for room ventilation during handling. Avoid breathing vapors, mist, fume or dust. Avoid contact with eyes, skin and clothing. Keep the containers closed when not in use.
SPECIAL PRECAUTIONS FOR DILUTING CAUSTIC SODA:
1. ALWAYS add caustic soda to water with constant agitation. NEVER add water to the caustic soda.
2. The water should be lukewarm (80 - 100F). NEVER start with hot or cold water.
The addition of caustic soda to liquid will cause a rise in temperature. If caustic soda becomes concentrated in one area, is added too rapidly, or is added to hot or cold liquid, a rapid temperature increase can result in DANGEROUS mists, boiling or spattering which can cause an immediate VIOLENT ERUPTION. Avoid contact with organic materials and concentrated acids- may cause violent reactions. Caustic soda reacts with magnesium, aluminum, zinc (galvanized), tin, chromium, brass and bronze, generating hydrogen which is explosive. Caustic soda may react with various sugars to generate carbon monoxide. Hazardous carbon monoxide gas can form upon contact with food and beverage products in enclosed vessels and can cause death. Containers, even those that have been emptied, will retain product residue and vapour and should be handled as if they were full until they have been cleaned. Wash thoroughly after handling.
Storage: Store in a dry, well ventilated area, separate from acids, peroxides, metals, easily ignitable materials and other incompatibles. Protect against moisture, water and physical damage. Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen can be generated.

SECTION 08: PERSONAL PROTECTIVE EQUIPMENT / EXPOSURE CONTROLS

GLOVES/TYPE:	Appropriate chemical resistant gloves should be worn. Nitrile gloves. Neoprene gloves. Rubber gloves.
RESPIRATOR/TYPE:	If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.
EYE/TYPE:	Chemical goggles; also wear a face shield if splashing hazard exists.
OTHER/TYPE:	Ensure that eyewash stations and safety showers are proximal to the work-station location.
ENGINEERING CONTROL	Provide local exhaust to meet TLV requirements if making solutions or grinding up and mist or dust is generated. Ventilation facilities should be corrosion resistant. Localized ventilation should be used to control dust levels.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIE

PHYSICAL STATE/APPEARANCE:	Solid		
ODOUR:	Odorless	**ODOUR THRESHOLD:**	N. Av.
VAPOUR PRESSURE (mm Hg @ 20C):	N. Av.	**VAPOUR DENSITY (Air=1):**	N. Av.
EVAPORATION RATE (Ether = 1):	N. Av.	**SPECIFIC GRAVITY:**	2.13@20 C
BOILING POINT (C):	1388 (F)	**FREEZING POINT (C)**	318 (F)
Ph (% SOLUTION):	0.01 moles/litre - pH 12	**% VOLATILE (WT):**	N. Av.
SOLUBILITY IN WATER (% W/W)	N. Av.		

SECTION 10: STABILITY AND REACTIVITY

CHEMICALLY STABLE? Stable

IF NO, UNDER WHICH CONDITIONS?

INCOMPATIBILITY WITH OTHER SUBTANCES

IF YES, WITH WHICH ONES: Tin. Aluminum. Zinc. Leather. Wool. Acids. Organic halogen compounds or organic nitro compounds. Magnesium metal. Brass. Bronze. Carbon monoxide gas may be produced on contact with reducing sugars. Water can cause violent reaction.

SPECIAL REACTIVITY AND UNDER WHAT CONDITIONS

HAZARDOUS DECOMPOSITION PRODUCTS: None anticipated

SECTION 11: TOXICOLOGICAL INFORMATION

EXPOSURE LIMIT OF MATERIAL

LC 50 OF MATERIAL, SPECIES AND ROUTE

LD 50 OF MATERIAL, SPECIES AND ROUTE

CARCINOGENICITY OF MATERIAL

REPRODUCTIVE EFFECTS:

IRRITANCY OF MATERIAL

SENSITIZING CAPABILITY OF MATERIAL

SYNERGISTIC MATERIALS

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:

SECTION 14: TRANSPORT INFORMATION

TDG CLASSIFICATION Class 8, CAUSTIC SODA SOLIDS

UN NUMBER: 1823

PACKING GROUP: II

Special Provisions for Transport

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION E

E- CORROSIVE MATERIAL

SECTION 16: OTHER INFORMATION

ABBREVIATIONS USED: N.Av. = Not Available

N.App. / N.Ap. = Not Applicable

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SOURCES: Supplier MSDS

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MATERIAL SAFETY DATA SHEET.

SECTION (1) PRODUCT IDENTIFICATION AND USE:

PRODUCT NAME: BAR COR CWS-55.

PRODUCT USE: CLOSED SYSTEM WATER TREATMENT.

WHMIS CLASSIFICATION: D2b.

SUPPLIERS NAME: PACE CHEMICALS LTD.
8321 WILLARD STREET,
BURNABY, B.C. V3N 2X3.

TELEPHONE: (604) 520-6211
FAX: (604) 521-5927

EMERGENCY PHONE,(Canutec): (613) 996-6666.

SECTION (2) HAZARDOUS INGREDIENTS:

Sodium Nitrite: 10-30%w/w CAS # 7632-00-0
LD50: (Oral,Rat): 85 mg/kg
LC50: (Rat, 4 Hrs) 1.45 mg/l

Sodium Borate: 3-7%w/w CAS # 7775-19-1
LD50: (Oral, Rabbit): 2330 mg/kg
LD50: (Dermal, Rabbit): >10000 mg/kg
LC50: No data available.

Sodium Mercaptobenzothiazole:
1-5%w/w CAS # 149-30-4
LD50: No data available.
LC50: No data available.

SECTION (3) PHYSICAL DATA:

Physical state:	Liquid.
Appearance:	Clear pale Yellow.
Odour:	Almost Odourless.
Odour threshold,(ppm):	No data available.
Vapour pressure,(mm Hg)	No data available.
Vapour density,(Air=1):	No data available.
Evaporation rate,(Butyl Acetate=1):	<1
Boiling point:	100°C Approx.
Freezing point:	No data available.
pH,(½ % soln):	9.6
Specific Gravity:	1.15
Water/oil distribution coefficient:	No data available.

SECTION (4) FIRE & EXPLOSION DATA:

Flammability: Yes ( ) No (X)
If yes under what conditions?
Means of extinction: As for surrounding fire.
Flash point & method: None. (tcc)
Flammability limits,(v/v in air): Upper: Not applicable.
Lower: Not applicable.
Auto ignition temperature,(°C): None known.
Hazardous combustion products: None.
Explosion data: Sensitivity to impact: None known.
Sensitivity to static discharge: None known.

SECTION (5) REACTIVITY DATA:

Chemical stability: No ( ) Yes (X)
If no, under what conditions?
Incompatibility with other substances: No ( ) Yes (X)
If yes, which ones? Acids.
Reactivity data: Stable (X) Unstable ( )
If unstable, Under which conditions?
Hazardous decomposition products: Oxides of Sulphur, Carbon & Nitrogen may be liberated on thermal decomposition. Acids may liberate oxides of nitrogen & Sulphur compounds.

SECTION (6) TOXICOLOGICAL PROPERTIES:

Route of entry: Skin contact (X) Skin absorption ( )
Eye contact (X) Inhalation (X) Ingestion (X)
Effects of acute exposure to product:

SKIN CONTACT: May cause irritation on prolonged contact.

EYE CONTACT: Irritant.

INHALATION: Mist may be irritating to the respiratory tract.

INGESTION: May cause irritation and nausea.

Effects of chronic exposure to product: No data available.
Exposure limits: No data available.
Irritancy of product: May be irritating to all parts of the body.
Sensitization to product: No data available.
Synergistic products: No data available.
Teratogenicity: No data available.
Reproductive toxicity: No data available.
Mutagenicity: Sodium nitrite has caused metagenetic effects in laboratory animals studies.
Carcinogenicity: The ingredients of this product are not considered to be carcinogens by the National Toxicity Program, the International Agency for Research on Cancer or the Occupational Safety and Health Administration.

SECTION (7) PREVENTIVE MEASURES:

Gloves: PVC or Nitrile Rubber.
Respirator: Not usually required.
Eye protection: Chemical Goggles or Face Shield recommended.
Footwear: No special requirements.
Clothing: Impervious clothing (Rubber, PVC) recommended.
Other: Eye wash station recommended.
Engineering controls: Normal ventilation is adequate.
Leak & spill procedure: Stop leak. Pick up spilled material with inert absorbent (Floor-Dry) & place in disposable container. Wash down floor.
Waste disposal procedure: Dispose of in accordance with local municipal regulations.
Handling procedure & equipment: No special requirements.
Storage requirements: Store between 0° & 40°C. Keep container closed when not in use.
SPECIAL SHIPPING INSTRUCTIONS: NONE.

SECTION (8) FIRST AID MEASURES:

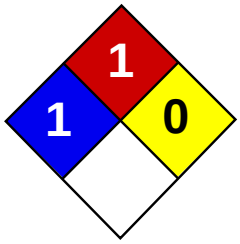
SKIN CONTACT: Wash well with plenty of soap and water. If irritation develops contact a physician.
EYE CONTACT: Immediately wash with plenty of running water, lifting eyelids occasionally. Contact a physician at once.
INHALATION: Remove to fresh air. Contact a physician at once.
INGESTION: If awake, Give plenty of water to drink & induce vomiting. Consult physician at once.

SECTION (9) PREPARATION DATA:

The information supplied in this data sheet is derived from sources believed to be reliable, however PACE CHEMICALS LTD offers no warranty, written or implied, as to the accuracy of its contents. We advise recipients to confirm in advance of need that the information is current, suitable and applicable to their requirements.

Prepared by : Technical Services
Telephone number : (604) 520-6211
Preparation date : October 14, 2014
Product number : 30055





Health	1
Fire	1
Reactivity	0
Personal Protection	C

Material Safety Data Sheet
Dowtherm SR1 MSDS

Section 1: Chemical Product and Company Identification

Product Name: Dowtherm SR1

Catalog Codes: SLD4267

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Ethylene glycol; Water; Potassium phosphate dibasic

CI#: Not available.

Synonym: Dowtherm* SR-1 Heat Transfer Fluid; Dowtherm* SR-1

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
Ethylene glycol	107-21-1	>95
Water	7732-18-5	<3
Potassium phosphate dibasic	7758-11-4	<3

Toxicological Data on Ingredients: Ethylene glycol: ORAL (LD50): Acute: 4700 mg/kg [Rat]. 5500 mg/kg [Mouse]. 6610 mg/kg [Guinea pig]. VAPOR (LC50): Acute: >200 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH [Ethylene glycol]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Ethylene glycol]. Non-mutagenic for bacteria and/or yeast. [Ethylene glycol]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs

damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

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.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get 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:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation: Not available.

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:
Medical Conditions Aggravated by Exposure: Persons with pre-existiing kidney, respiratory, eye, or neurological problems might be more sensitive to Ethylene Glycol. Notes to Physician: 1. Support vital functions, correct for dehydration and shock, and manage fluid balance. 2. The currently recommended medical management of Ethylene Glycol poisoning includes elimination of Ethylene Glycol and metabolites. Elimination of Ethylene Glycol may be achieved by the following methods: a. Emptying the stomach by gastric lavage. It is useful if initiated within < 1 of ingestion. b. Correct metabolic acidosis with intravenous administration of sodium bicarbonate, adjusting the administration rate accoridng to repeated and frequent measurement of acid/base status. c. Administer ethanol (orally or by IV (intravenously)) or fomepizole (4-methylpyrazole or Antizol)) therapy by IV as an antidote to inhibit the ormation of toxic metabolites. d. If patients are diagnosed and treated early in the course with the above methods, hemodialysis may be avoided if fomepizole or ethanol therapy is effective and has corrected the metabolic acidosis, and no renal failure is present. However, once severe acidosis and renal failure occured, however, hemodialysis is necessary. It is effective in removing Ethylene Glycol and toxic metabolites, and correcting metabolic acidosis.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: The lowest known value is 398°C (748.4°F) (Ethylene glycol).

Flash Points: CLOSED CUP: 111°C (231.8°F). (Tagliabue.)

Flammable Limits: LOWER: 3.2% (Ethylene Glycol)

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

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, 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: Not available.

Special Remarks on Explosion Hazards:
Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. (Ethylene glycol)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Poisonous liquid. 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 acetic acid. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 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 gas/fumes/ vapor/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Ethylene glycol STEL: 120 (mg/m3) [Australia] TWA: 100 (mg/m3) from ACGIH (TLV) [United States] CEIL: 125 (mg/m3) from OSHA (PEL) [United States] CEIL: 50 (ppm) from OSHA (PEL) [United States] TWA: 52 STEL: 104 (mg/m3) [United Kingdom (UK)] Inhalation TWA: 10 (mg/m3) [United Kingdom (UK)] SKINConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Glycol like

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colored

pH (1% soln/water): Not available

Boiling Point: 163°C (325.4°F)

Melting Point: May start to solidify at -13°C (8.6°F) based on data for: Ethylene glycol.

Critical Temperature: Not available.

Specific Gravity: 1.1295 (Water = 1)

Vapor Pressure: 0.3 kPa (@ 20°C)

Vapor Density: >1 (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, acetone.

Solubility:
Soluble in cold water, hot water, acetone. Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Absorbs moisture from the air. Avoid contamination with materials with hydroxyl compounds. Also incompatible with aliphatic amines, isocyanates, chlorosulfonic acid, and oleum (Ethylene glycol)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): >8200 mg/kg [Rat]. Acute dermal toxicity (LD50): >2000 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH [Ethylene glycol]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Ethylene glycol]. Non-mutagenic for bacteria and/or yeast. [Ethylene glycol]. May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:

Lowest Published Toxic Dose/Conc: TDL [Man] - Route: oral; Dose: 15gm/kg Lethal Dose/Conc 50% Kill LD50 [Rabbit] - Route: dermal; Dose: 9530 ul/kg (Ethylene glycol)

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. No human data has been reported at this time. May affect genetic material (mutagenic) (Ethylene glycol)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 41000 mg/l 96 hours [Trout]. 46300 mg/l 48 hours [water flea]. 34250 mg/l 96 hours [bluegill fish]. 34250 mg/l 72 hours [Goldfish]. (Ethylene Glycol)

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: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: No products were found. California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: No products were found. Illinois toxic substances disclosure to employee act: Ethylene glycol Illinois chemical safety act: Ethylene glycol New York release reporting list: Ethylene glycol Rhode Island RTK hazardous substances: Ethylene glycol Pennsylvania RTK: Ethylene glycol Minnesota: Ethylene glycol Massachusetts RTK: Ethylene glycol Massachusetts spill list: Ethylene glycol New Jersey: Ethylene glycol Louisiana spill reporting: Ethylene glycol California Director's List of Hazardous Substances: Ethylene Glycol TSCA 8(b) inventory: Ethylene glycol; Water; Potassium phosphate dibasic TSCA 4(a) proposed test rules: Ethylene glycol SARA 313 toxic chemical notification and release reporting: Ethylene glycol 95.95% CERCLA: Hazardous substances.: Ethylene glycol: 5000 lbs. (2268 kg);

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

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R22- Harmful if swallowed. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

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

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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RoClean L211
SAFETY DATA SHEET

1. Company and Product Identification

1.1	Identification – Product Name:	**RoClean L211**
1.2	Other means of identification Synonym:	Organic Amine salt Mixture, none
1.3	Recommended Use Of The Chemical and Restrictions On Use:	Reverse osmosis membrane cleaner Use only as directed on the label.
1.4	Name, Address, And Telephone Number Of The Manufacturer, Or Other Responsible Party:	**AVISTA TECHNOLOGIES** 140 Bosstick Street San Marcos, CA 92069 (760) 744-0536
	Competent Person email address	klindsey@avistatech.com
1.5	24 Hour Emergency No.:	1-800-424-9300 (United States) 1-202-483-7616 (International Collect)

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY NSF INTERNATIONAL TO ANSI/NSF 60 AS STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE OFF-LINE IN REVERSE OSMOSIS SYSTEMS.

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: *This product is a clear, colorless to amber colored, corrosive solution with a light, disinfectant odor. Depending on the duration of contact, over-exposures can severely irritate the skin or eyes and respiratory system, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, oxides of nitrogen and sodium). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.*

Physical Hazards Summary	None
Potential Health Hazards Summary	Eye Irritant, Category 2A Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3 Skin sensitizer, Category 1
Potential Ecological Effects Summary	None

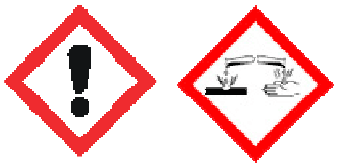
2.1 Classification Of Product

U.S. OSHA classification	Corrosive, Skin, eye irritant, sensitizer
Classification as per EC 1272/2008 (CLP/GHS)	Eye Irritant, Category 2A Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3 Skin sensitizer, Category 1 Xi Irritant
WHMIS classification	E, corrosive

Hazardous Materials Information System (HMIS) Rating

Health	**3**
Flammability	**0**
Physical Hazard	**0**
Protective Equipment	**D**

2.2 Label Elements OSHA/GHS

General Warnings	P101	If medical advice is needed, have product container or label at hand.
	P102	Keep out of reach of children.
	P103	Read label before use
	P403	Store in a well-ventilated place.
	P233	Keep container tightly closed
Signal Word	WARNING!	
Hazard statements	H319	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P305 + P351 + P338	
	H317	May cause an allergic skin reaction
	H 312	Harmful in contact with skin
	H332	Harmful if inhaled
	H314	Causes severe skin burns and eye damage
Precautionary statements	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P305	IF IN EYES: rinse extensively with large amounts of water
	P351	Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	F INGESTED or INHALED Immediately call a POISON CENTER or doctor/physician.
Hazard pictograms		

2.3 Unclassified Hazards None

2.4 Ingredients with unknown acute toxicity None

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical name CAS # EINECS #	% w/w	US OSHA	GHS/EU CLP	WHMIS
Chelate Agent Proprietary Proprietary	20 - 30	Irritant	Eye Irritant, Category 2A H319 P305 + P351 + P338	Class D2B: Toxic Material at > 1% 
Organic Amine Proprietary Proprietary	20 - 30	Corrosive, Combustible liquid	Skin sensitizer, Category 1 Acute toxicity, oral, Category 3 H317 Acute toxicity, dermal, Category 3	B3 Combustible E Corrosive
Glycol Wetting Agent Proprietary Proprietary	1 - 5	Low hazard	Not regulated	Not regulated
Chelate Agent 2 Proprietary Proprietary	1 - 5	Toxic	Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3	D2B Other toxic effects
Surfactant Proprietary Proprietary	1 - 5	Corrosive, Combustible liquid	Skin sensitizer, Category 1 Acute toxicity, oral, Category 3 Acute toxicity, oral, Category 3	B3 Combustible E Corrosive

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

4. FIRST-AID MEASURES

4.1 Description of Necessary Measures

Skin exposure: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

Eye exposure: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

Inhalation: If mist of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

Ingestion: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

4.2 Most Important Symptoms/Effects: Immediate: Inhalation exposure may cause coughing or sneezing. Symptoms of skin and eye contact may include redness and irritation. Ingestion may cause stomach pains, cramps, and gastritis.

Delayed: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Symptoms may include tingling, redness, and visible injury.

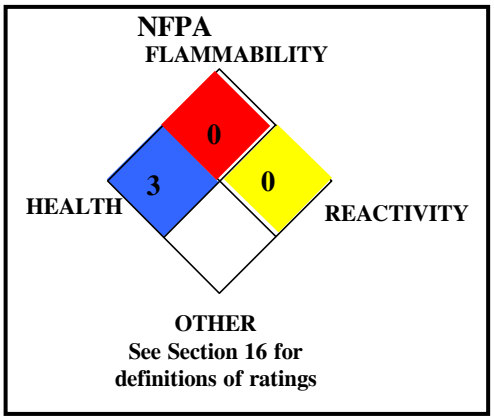
4.3 Indication Of Immediate Medical Attention And Special Treatment Needed, **TARGET ORGANS:** Acute: Skin, eyes, respiratory system. Chronic: Skin, eyes, respiratory system

If Necessary:

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

Flammable properties — Non-flammable aqueous solution



Flash Point °C: Not applicable.

Autoignition Temperature °C: Not applicable.

Flammable Limits (in air by volume, %):
Upper: Not applicable.
Lower: Not applicable.

5.1 Suitable And Unsuitable Extinguishing Media: This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water spray	YES	Carbon dioxide	YES
Foam	YES	Dry chemical	YES
Halon	YES	Other	YES

5.2 Specific Hazards Arising From Chemical: When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, and nitrogen oxides).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.

5.3 Special Protective Equipment And Precautions For Fire-Fighters: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people.

Protective equipment: For small releases (< 20 L), clean up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental releases (more than 20 L) should be Level C: triple-gloves (neoprene gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and full-face respirator with Amine and HEPA filter.

Emergency procedures: Monitoring must indicate that exposure levels are below those provided in Section 8 (Exposure Controls-Personal Protection) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained

Breathing Apparatus.

6.2 Methods and Materials for Containment and Cleaning Up

Vacuum or soak- up solids liquid for recovery/disposal. Neutralize residue with citric acid or other neutralizing agent for dilute amines. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residues in a suitable plastic container. Dispose of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate local standards (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

7.1 Precautions for Safe Handling

All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care.

As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating dust of this product. Remove contaminated clothing immediately.

During equipment maintenance follow practices indicated in Section 6 (Accidental Release Measures) to decontaminate equipment or clean-up small spills. Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate local standards.

7.2 Conditions For Safe Storage

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials. Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Incompatibilities: Strong acids, oxidizers

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 Control Parameters

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLVs		OSHA-PELs			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Chelate Agent	Proprietary	20 - 30	NE	NE	NE	NE	NE	NE
Organic Amine	Proprietary	20 - 30	7.5	15	8	15	30 ppm	NIOSH RELs: TWA = 8 STEL = 15 DFG MAKs: TWA = 5.1 PEAK = 2 MAK, 5 minutes, momentary value (Danger of cutaneous absorption) MAK Pregnancy Risk Group Classification: C
Glycol Wetting Agent	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Chelate Agent 2	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Surfactant	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).		Balance	None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

8.2 Appropriate Engineering Controls.

Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in this Section or as low as reasonably achievable. Ensure

eyewash/safety shower stations are available near areas where this product is used.

8.3 Personal Protective Equipment

Respiratory protection:	None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists or vapor. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the applicable local standards. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-face piece pressure/demand SCBA or a full-face piece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).
Eye protection:	Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. Splash goggles with a faceshield may be needed if splash hazards exist.
Hand protection:	Wear chemical impervious gloves (e.g., Solvex™, Neoprene).
Body protection:	If needed, use body protection appropriate for task (e.g., Tyvek suit, rubber apron) to protect from splashes and sprays.

9. PHYSICAL and CHEMICAL PROPERTIES

Appearance	This product is a clear, colorless to amber-colored liquid.		
Odor	Light disinfectant odor	Odor Threshold	NE
Freezing Point ^{o}C	< 0	pH (2% solution at 25^{o}C)	10.5 – 11.5
Initial Boiling Point ^{o}C	> 100	Boiling Point Range ^{o}C	N/A
Flammability	Non-flammable	Evaporation Rate (water = 1)	Similar to water
Vapor Density (air = 1)	N/A	Vapor Pressure mm Hg @ 20°C:	18 - 20
Solubility (in water)	Soluble	Relative density (water = 1)	1.07 ± 0.1
Viscosity	Similar to water	Oil-Water Partition Coefficient	N/A
Decomposition Temperature	NE		
How To Detect This Substance (Warning Properties):	Litmus paper will turn blue in contact with solutions of this solid.		

10. STABILITY and REACTIVITY

10.1	Reactivity	Not considered reactive.
10.2	Chemical Stability	Stable
10.3	Possibility of hazardous reactions	Hazardous polymerization will not occur.
10.4	Conditions to avoid	Avoid mixing with incompatible materials.
10.5	Incompatible Materials	Strong acids, oxidizers
10.6	Hazardous Decomposition Products	Thermal decomposition of this product may generate nitrogen oxides, carbon monoxide and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Toxicity data for hazardous ingredients	Oral LD_{50} mg/kg	Dermal LD_{50} mg/kg	Inhalation LD_{50} mg/kg
Chelate Agent	LD_{50} (Intraperitoneal-Rat) 1548 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands	N/A	N/A
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye -Rabbit, adult) 1900 mg Standard Draize Test (Eye-Rabbit, adult) 100 mg/24 hours: Moderate irritation effects		
Organic Amine	LD_{50} (Oral-Rat) 1720 mg/kg LD_{50} (Oral-Mouse) 700 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: muscle contraction or spasticity;	LD_{50} (Subcutaneous-Rat) 1500 mg/kg LD_{50} (Skin-Rabbit) 1 mL/kg LD_{50} (Subcutaneous-Rat) 1500 mg/kg LD_{50} (Skin-Rabbit) 1 mL/kg	LC (Inhalation-Mouse) > 2420 mg/m^3/2 hours LC (Inhalation-Cat) > 2420 mg/m^3/2 hours TCLo (Inhalation-Rat) 66 ppm/24 hours/30 days-

	Lungs, Thorax, or Respiration: dyspnea LD_{50} (Oral-Rabbit) 1 gm/kg LD_{50} (Oral-Guinea Pig) 620 mg/kg LD_{50} (Intraperitoneal-Rat) 67 mg/kg LD_{50} (Intraperitoneal-Mouse) 50 mg/kg LD_{50} (Intravenous-Rat) 225 mg/kg: Behavioral: somnolence (general depressed activity), muscle contraction or spasticity; Lungs, Thorax, or Respiration: dyspnea LD_{50} (Intramuscular-Rat) 1750 mg/kg LDLo (Oral-Mammal-Species Unspecified) 1400 mg/kg TDLo (Oral-Rat) 115 gm/kg/90 days-continuous: Liver: changes in liver weight; Kidney, Ureter, Bladder: changes in bladder weight; Related to Chronic Data: death TDLo (Oral-Rat) 105 mg/kg/30 weeks-intermittent: Liver: liver function tests impaired, changes in liver weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death, Specific Developmental Abnormalities: musculoskeletal system TDLo (Oral-Rat) 4500 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: urogenital system	TDLo (Skin-Rat) 2250 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects	continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death TCLo (Inhalation-Rat) 400 mg/m^3/5 hours/26 weeks-intermittent: Lungs, Thorax, or Respiration: respiratory depression; Liver: liver function tests impaired; Kidney, Ureter, Bladder: proteinuria TCLo (Inhalation-Rat) 300 mg/m^3/5 hours/26 weeks-intermittent: Kidney, Ureter, Bladder: proteinuria, other changes in urine composition; Nutritional and Gross Metabolic: weight loss or decreased weight gain TCLo (Inhalation-Dog) 102 ppm/24 hours/30 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death TCLo (Inhalation-Guinea Pig) 75 ppm/24 hours/24 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death
	Open irritation test (skin-Rabbit) 505 mg: Moderate Standard Draize test (Skin-Rabbit) 250 µg: Severe	Cytogenetic analysis (Human-Lymphocyte) 100 µmol/L Sister chromatid exchange (Human-Lymphocyte) 1 mmol/L	
Glycol Wetting Agent	LD_{50} (Oral-Rat): 20 g/kg LD_{50} (Oral-Mouse) 22 g/kg LD_{50} (Oral-rabbit) 18500 mg/kg LD_{50} (Oral dog) 22 gm/kg LD_{50} (Oral-guinea pig) 18350 mg/kg LD_{50} (Oral-quail) > 2080 mg/kg TDLo (Oral-Child) 79 g/kg/56 weeks-intermittent: Central nervous system effects, BRN TDLo (Parenteral-Infant) 10 g/kg/3 days-continuous: Systemic effects LD_{50} (Intraperitoneal-Rat) 6660 mg/kg LD_{50} (Intraperitoneal-Mouse) 9718 mg/kg LD_{50} (Intravenous-Rat) 6423 mg/kg LD_{50} (Intravenous-Mouse) 6630	Skin-Human 500 mg/7 days Mild irritation effects Skin-Human 104 mg/3 days-intermittent Moderate irritation effects Skin-man: 10%/2 days LD_{50} (Skin-rabbit) 20800 mg/kg LD_{50} (Subcutaneous-Rat) 22,500 mg/kg LD_{50} (Subcutaneous-Mouse) 17,370 mg/kg LDLo (Subcutaneous-guinea pig) 15500 mg/kg	TCLo Inhalation-rat) 2180 mg/m^3/6 hours/90 days-intermittent: Behavioral: food intake (animal); Endocrine: changes in spleen weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases

	mg/kg LD_{50} (Intravenous-rabbit) 6500 mg/kg LD_{50} (Intravenous-dog) 26 gm/kg LDLo (Intravenous-chicken) 27 gm/kg: Vascular: other changes LD_{50} (Intramuscular-Rat) 14 g/kg TDLo (Intraperitoneal-Mouse) 100 mg/kg (15 days preg): Teratogenic effects TDLo (Intraperitoneal-Mouse) 100 mg/kg (11 days preg): Reproductive effects LDLo (Intramuscular-rabbit) 6300 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: coma; Lungs, Thorax, or Respiration: respiratory stimulation		
	Eye effects-Rabbit, adult 100 mg Mild irritation effects Eye effects-Rabbit, adult 500 mg/24 hours Mild irritation effects	DNA Inhibition (Mouse-Subcutaneous) 8000 mg/kg Cytogenetic Analysis (Subcutaneous-Mouse) 8000 mg/kg Cytogenetic Analysis (Hamster-fibroblast) 32 g/L	
Chelate Agent 2	N/A	N/A	N/A
Surfactant	N/A	N/A	N/A

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1	Ecotoxicity	LC_{50}, mg/L	EC_{50}, mg/L
	Organic amine		
	Aquatic	LC_{50} (goldfish) 24 hours = 190 mg/L (@ pH 10.1) LC_{50} (goldfish) 96 hours = 170 mg/l (@ pH 10.1) LC_{50} (goldfish) 24 hours = > 5,000 mg/L (@ pH 7) LC_{50} (goldfish) = > 5000 mg/L, 24 hours K_{OW} = -1.31 (est.) Biodegradation: Biological oxygen demand (BOD): 78%, 5 days; (theoretical) 0%, 5 days; 64%, 20 days. Persistence: Biodegrades at moderate rate. Aquatic Fate: If released to water, Organic amine should undergo biodegradation. The half-life in water is expected to be from a few days to weeks, depending on the acclimatization in the aquatic system. Atmospheric Fate: If released to the atmosphere, Organic amine is expected to exist entirely in the vapor phase. The primary mechanism of removal from the atmosphere would be by reaction with photochemically generated hydroxyl radicals, with an expected half-life of 4 hours. The complete solubility if Organic amine suggests that it will also be removed by precipitation.	EC_0 (*Pseudomonas putida* bacteria) 16 hours = 6,300 mg/L EC_0 (*Microcystis aeruginosa* algae) 8 days = 1.6 mg/L EC_0 (*Scenedesmus quadricauda* green algae) 7 days = 0.75 mg/L EC_0 (*Entosiphon sulcatum* protozoa) 72 hours = 300 mg/L EC_0 (*Uronema parduczi* Chatton-Lwoff protozoa) = 2,945 mg/L
	Terrestrial	If released to soil, Organic amine is expected to biodegrade fairly rapidly following acclimatization, with a half-life on the order of days to week. Organic amine will leach in soil to groundwater. Volatilization is not a significant fate process from the soil.	NE
	Glycol Wetting Agent		
		LC_{50} (*Lebistes reticulatus*, guppy) 48 hours > 10,000 mg/L LC_{50} (*Carassius auratus*) 24 hours = > 5,000 mg/L LC_{50} (*Salmo gairdneri*) 24 hours = 50,000 mg/L LC_{50} (*Pimephales promelas*) 96 hours = 54,900 mg/L	EC_{50} (*Photobacterium phosphoreum*, bacteria) 30 minutes = 26,800 mg/L TD (*Chlorella pyrenoidosa*, algae) = 92,000 mg/L EC_0 (*Daphnia magna*, crustacean) 48 hours = < 4,295 mg/L

		LC_{50} (Artemia salina) 24 hours = >10,000 mg/L LC_{100} (*Pimephales promelas*) 96 hours = 65,610 mg/L NOEC (*Pimephales promelas*) 96 hours < 47,829 mg/L fingerling trout: at 50,000 mg/l at 10°C: no mortality or apparent signs of stress were produced during a 25-hr exposure period (static bioassay) Log K_{ow} = -0.30-1.41 Biodegradation: Standard dilution BOD water, 5-day 64% theoretical biochemical oxygen demand, sewage inocula. Warburg respirometer, 40-day 78% theoretical biochemical oxygen demand, sewage inocula. Nutrient broth, 100% degradation in 4 days (aerobic conditions), 100% degradation in 4-9 days (anaerobic conditions), activated sludge, or digester sludge inocula, no significant degradation in sterile controls. Standard dilution BOD water, 5-day 2.2% theoretical biochemical oxygen demand, 10-day 56.7% theoretical biochemical oxygen demand, 50-day 80% theoretical biochemical oxygen demand, sewage inocula. Standard dilution BOD water, 5-day 62% theoretical biochemical oxygen demand, 20-day 79% theoretical biochemical oxygen demand, sewage inocula; synthetic seawater dilution, 5-day 55% theoretical biochemical oxygen demand, 20-day 83% theoretical biochemical oxygen demand, raw wastewater inocula. Sewage die-away, 74.5% theoretical biochemical oxygen demand in 5 days.	EC_{50} (*Daphnia magna*, crustacean) 48 hours = 34,400 mg/L EC_{100} (*Daphnia magna*, crustacean) 48 hours = 50,000 mg/L EC_{50} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L EC_{100} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L EC_{50} (*Nitocra spinipes*, crustacean) 96 hours = > 10,000 mg/L
	Chelate Agent		
		LC_{100} (*Cyprinus carpio*) 24 hours = 180 ppm/ at 25°C TLm (mosquito fish) 96 hours = 125 ppm/ (fresh water) TLm (bluegill) 48 hours = 99 mg/L/ (tap water) LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 486 mg/L LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 490-1030 mg/L (static bioassay) LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = > 500 mg/L LC_{50} (*Leuciscus Idus*) 96 hours = > 500 mg/L LC_{50} (Algae) 72 hours = 10-100 mg/L LC_{50} (*Daphnae*) 24 hours > 100 mg/L Biological Oxygen Demand = 20 mg O_2/g product, Chemical Oxygen Demand = 575 mg O_2/g product.	
12.2	Persistence and Degradability	The components of this product decompose in soil and water.	
12.3	Bioaccumulative Potential	This product is not expected to bioaccumulate	
12.4	Mobility in Soil	When spilled onto soil, this product will infiltrate downward, the rate being greater with lower concentration because of reduced viscosity.	
12.5	Other Adverse Ecological Effects	This product may be harmful to aquatic life if large volumes of it are released into an aquatic environment.	

13. DISPOSAL CONSIDERATIONS

Preparing Wastes of this Product for Disposal	Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with local regulations. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.
Disposal of Contaminated Packaging	Cleaned containers can be recycled or disposed of as non-contaminated waste, if authorized by your local authorities. Dispose of containers as required by local regulations.
U.S. EPA Waste Number	Not applicable as supplied.

14. TRANSPORT INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

14.1	UN Number	UN 2735
14.2	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
14.3	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
14.4	Packing Group	II
14.5	Marine Pollutant	Not applicable
	NA Emergency Response Guide Number (2012)	154
14.6	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Y3/D3
14.7	Special Transport Precautions	Not applicable
	National Motor Freight Classification	#70

International Air Transport Association

14.8	UN Number	UN 2735
	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
	Packing Group	II
	Packaging Instructions	850/854

International Maritime Organization

14.9	UN Number	UN 2735
	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
	Packing Group	II
	Marine Pollutant	Not applicable
	NA Emergency Response Guide Number (2012)	154
	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Y3/D3

15. SAFETY, HEALTH and ENVIRONMENTAL REGULATIONS SPECIFIC FOR THE PRODUCT

PROGRAM	Chelate	Organic amine	Glycol Wetting Agent	Chelate Agent 2	Octyl dimethylamine Oxide	
US EPA PROGRAMS						
Clean Air Act Hazardous Air Pollutants	NO	NO	NO	NO	NO	
Safe Drinking Water Act	NO	NO	NO	NO	NO	
RCRA F, K, P, U or D-lists	NO	NO	NO	NO	NO	
EPA Priority Pollutant	NO	NO	NO	NO	NO	
SARA 302 RQ	NO	NO	NO	NO	NO	
SARA 302 TPQ	NO	NO	NO	NO	NO	
SARA 313 LISTED	NO	NO	NO	NO	NO	
SARA CHEMICAL CATEGORIES						
SARA 311/312 ACUTE	NO	YES	NO	NO	NO	
SARA 311/312	NO	YES	NO	NO	NO	

CHRONIC						
SARA 311/312 FIRE	NO	NO	NO	NO	NO	
SARA 311/312 PRESSURE	NO	NO	NO	NO	NO	
SARA 311/312 REACTIVITY	NO	NO	NO	NO	NO	
EPA EXTREMELY HAZARDOUS SUBSTANCE	NO	NO	NO	NO	NO	
CALIFORNIA SAFE DRINKING WATER ACT (Proposition 65)						
This product does not contain any chemical listed on the California Safe Drinking Water Act list (Proposition 65)						
US OSHA PROGRAMS						
PEL	NO	8 mg/m^3	NO	NO	NO	
PSM	NO	NO	NO	NO	NO	
CHEMICAL SECURITY PROGRAMS						
DHS CFATS	NO	NO	NO	NO	NO	
CHEMICAL WEAPONS CONVENTION						
	NO	NO	NO	NO	NO	
US DRUG ENFORCEMENT ADMINISTRATION						
DEA Controlled Substances	NO	NO	NO	NO	NO	
CHEMICAL INVENTORY PROGRAMS						
WHMIS	NO	E	NO	NO	D2B	
DSL	YES	YES	YES	YES	YES	
NDSL	N/A	N/A	N/A	N/A	N/A	
REACH Pre-registered List	YES	YES	YES	NO	YES	
TSCA	YES	YES	YES	YES	YES	
European Inventory of Existing Commercial Chemical Substances (EINECS)	YES	YES	YES	YES	YES	
EU No-Longer Polymers List (NLP)	N/A	N/A	N/A	N/A	N/A	
EEC Classification Packaging, and Labeling of Dangerous Substances(Annex 1)	NO	Xi Harmful	NO	NO	Xi Harmful	
Philippines	YES	YES	YES	YES	YES	
Japan	YES	YES	YES	YES	YES	
Australia	YES	YES	YES	YES	YES	
Korea	YES	YES	YES	YES	YES	
China	YES	YES	YES	YES	YES	
New Zealand Inventory of Chemicals	YES	YES	YES	YES	YES	

16. OTHER INFORMATION

16.1	Original Preparation	Jan 5, 2009
16.2	Revision History	28 June 2013; GHS update
16.3	Prepared by	ADVANCED CHEMICAL SAFETY, Inc. PO Box 152329 San Diego, CA 92195 (858)-874-5577
16.4	Date of Printing	April 28, 2015

DEFINITIONS OF TERMS

16.5	A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:	
	Section 2	**GHS**: Global Harmonization System **OSHA:** U.S. Occupational Safety and Health Administration. **CLP**: Classification and Packaging **WHMIS**: Workplace Hazardous Materials Information System **STOT**: Specific Target Organ Toxicity
	Section 3	**CAS #:** Chemical Abstract Service index number **EINECS #:** European Chemical Substances Information System index number
	Section 5	**NFPA:** Nation Fire Protection Association **Health Hazard: 0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). **Flammability Hazard** **Reactivity Hazard:** Refer to definitions for "Hazardous Materials Identification System". **Flash Point**: Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL:** The lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL**: The highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.
	Section 8	**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH -** Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE (Not Established)** is made for reference.
	Section 11	**LD_{50}** : Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** : Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm:** Concentration expressed in parts of material per million parts of air or water; **mg/m^3** : Concentration expressed in weight of substance per volume of air; **mg/kg:** Quantity of material, by weight, administered to a test subject, based on their body weight in kg **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.
	Section 12	**LC_{50}:** The lowest concentration in water which kills 50% of the test subjects. **EC_{50}:** The Effect Concentration in water at which 50% of the test species if affected.
	Section 13	**US EPA Hazardous Waste Codes**: refer to 40 CFR 261.20
	Section 14	**DOT**: US Department of Transportation **IATA**: International Air Transport Association **IMO**: International Maritime Organization **MARPOL:** International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 **IBC Code** : Merchant Shipping Code
	Section 15	**RCRA**: US Resource Conservation and Recovery Act **SARA:** US Superfund Amendments and Reauthorization Act **PSM**: US OSHA Process Safety Management **CFATS:** US Department of Homeland Security Chemical Facility Anti-terrorism Standard **DSL:** Canadian Domestic Substances List **NDSL:** Canadian Non-Domestic Substances List **REACH**: European Registration, Evaluation, Authorization and Restriction of Chemicals list **TSCA:** US Toxic Substances Control Act

RoClean® L403
SAFETY DATA SHEET

1. Company and Product Identification

1.1	Identification – Product Name:	**RoClean® L403**
1.2	Other means of identification Synonym:	Organic / Inorganic acid mixture Mixture, none
1.3	Recommended Use of the Chemical and Restrictions on Use:	Reverse osmosis membrane cleaner Use only as directed on the label.
1.4	Name, Address, And Telephone Number of the Manufacturer, or Other Responsible Party: Competent Person email address	**AVISTA TECHNOLOGIES** 140 Bosstick Street San Marcos, CA 92069 (760) 744-0536 klindsey@avistatech.com
1.5	24 Hour Emergency No.:	1-800-424-9300 (United States) 1-703-527-3887 (International Collect)

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY NSF INTERNATIONAL TO ANSI/NSF 60 AS STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE OFF-LINE IN REVERSE OSMOSIS SYSTEMS.

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, colorless to amber liquid. Depending on the duration of contact, over-exposures can moderately to severely irritate the skin or eyes, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, phosphorous oxides, and sodium oxide). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

Physical Hazards Summary	None
Potential Health Hazards Summary	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2
Potential Ecological Effects Summary	The components of this product will decompose into other organic and inorganic compounds over time under normal environmental conditions

2.1 Classification of Product

U.S. OSHA classification	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2
Classification as per EC 1272/2008 (CLP/GHS)	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A

WHMIS classification	STOT repeated exposure category 2 Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2

Hazardous Materials Information System (HMIS) Rating	**Health** 2 **Flammability** 0 **Physical Hazard** 0 **Protective Equipment** C

2.2 Label Elements OSHA/GHS

General Warnings	P101	If medical advice is needed, have product container or label at hand.
	P102	Keep out of reach of children.
	P103	Read label before use
	P403	Store in a well-ventilated place.
	P233	Keep container tightly closed
Signal Word	WARNING!	
Hazard statements	H319	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	H 312	Harmful in contact with skin
	H332	Harmful if inhaled
	H314	Causes severe skin burns and eye damage
Precautionary statements	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P305	IF IN EYES: rinse extensively with large amounts of water
	P351	Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	IF INGESTED or INHALED Immediately call a POISON CENTER or doctor/physician.

Hazard pictograms



2.3 Unclassified Hazards None

2.4 Ingredients with unknown acute toxicity None

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical name **CAS #** **EINECS #**	**% w/w**	**US OSHA**	**GHS/EU CLP**	**WHMIS**
Inorganic phosphorous compound Proprietary Proprietary	25-35	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;

Chelate Proprietary Proprietary	25-35	Eye Irritant, Category 2A	Eye Irritant, Category 2A	Eye Irritant, Category 2A
Organic acid Proprietary Proprietary	10-20	Irritant, Category 2	Irritant, Category 2	Irritant, Category 2
Product	100	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2		

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

4. FIRST-AID MEASURES

4.1 Description of Necessary Measures

Skin exposure: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

Eye exposure: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

Inhalation: If mist of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

Ingestion: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

4.2 Most Important Symptoms/Effects: Immediate: Inhalation exposure may cause coughing or sneezing. Symptoms of skin and eye contact may include redness and irritation. Ingestion may cause stomach pains, cramps, and gastritis.

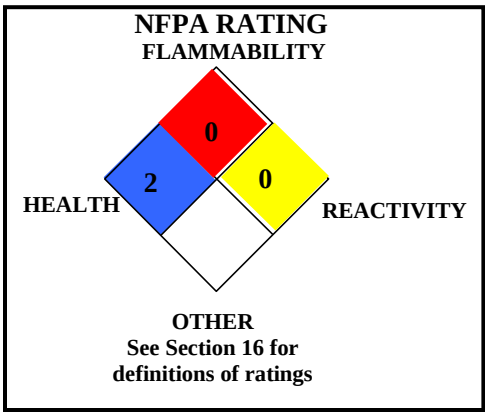
Delayed: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Symptoms may include tingling, redness, and visible injury.

4.3 Indication Of Immediate Medical Attention And Special Treatment Needed, If Necessary: **TARGET ORGANS:** Acute: Skin, eyes, respiratory system. Chronic: Skin, eyes, respiratory system

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and SDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

Flammable properties: Non-flammable aqueous solution



Auto ignition Temperature °C: Not applicable.

Flammable Limits (in air by volume, %):
Upper: Not applicable.
Lower: Not applicable.

5.1 Suitable And Unsuitable Extinguishing Media:

This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water spray	YES	Carbon dioxide	YES
Foam	YES	Dry chemical	YES
Halon	YES	Other	YES

5.2 Specific Hazards Arising From Chemical:

When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, phosphorous oxides, and nitrogen oxides).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.

5.3 Special Protective Equipment And Precautions For Fire-Fighters:

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people.

Protective equipment: For small releases (< 20 L), clean up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental releases (more than 20 L) should be Level C: triple-gloves (neoprene gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and full-face respirator with acid mist and HEPA filter.

Emergency procedures: Monitoring must indicate that exposure levels are below those provided in Section 8 (Exposure Controls-Personal Protection) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained Breathing Apparatus.

6.2 Methods and Materials for Containment and Cleaning Up

Vacuum or soak- up solids liquid for recovery/disposal. Neutralize residue with sodium bicarbonate or other neutralizing agent for dilute acids. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residues in a suitable plastic container. Dispose

of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate local standards (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

7.1 Precautions for Safe Handling

All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care.

As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating dust of this product. Remove contaminated clothing immediately.

During equipment maintenance follow practices indicated in Section 6 (Accidental Release Measures) to decontaminate equipment or clean-up small spills. Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate local standards.

7.2 Conditions For Safe Storage

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials. Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Incompatibilities: Strong bases, oxidizers, and water reactive materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 Control Parameters

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Inorganic phosphorous compound	Proprietary	25 - 35	1	3	1	3	1000	NIOSH REL: TWA = 1 STEL= 3
Chelate	Proprietary	25 - 35	NE	NE	NE	NE	NE	NE
Organic acid	Proprietary	10 - 20	NE	NE	NE	NE	NE	NE
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).		Balance	None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

8.2 Appropriate Engineering Controls.

Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in this Section or as low as reasonably practical. Ensure eyewash/safety shower stations are available near areas where this product is used.

8.3 Personal Protective Equipment

Respiratory protection: None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists or vapor. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the applicable local standards. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-face piece pressure/demand SCBA or a full-face piece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Eye protection: Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. Splash goggles with a faceshield may be needed if splash hazards exist.

Hand protection: Wear chemical impervious gloves (e.g., Solvex™, Neoprene).

Body protection: If needed, use body protection appropriate for task (e.g., Tyvek™ suit, rubber apron) to protect from splashes and sprays.

9. PHYSICAL and CHEMICAL PROPERTIES

Appearance	This product is a clear, colorless to amber liquid.		
Odor	Light disinfectant odor	Odor Threshold	NE
Freezing Point ºC	< 0	pH (2% solution)	2.5-3.5
Initial Boiling Point ºC	> 100	Boiling Point Range ºC	N/A
Flammability	Non-flammable	Evaporation Rate (water = 1)	Similar to water
Vapor Density (air = 1)	<1	Vapor Pressure mm Hg @ 20°C:	18 - 20
Solubility (in water)	Soluble	Relative density (water = 1)	1.3-1.4
Viscosity	Similar to water	Oil-Water Partition Coefficient	N/A
Decomposition Temperature	NE		
How To Detect This Substance (Warning Properties):	Litmus paper will turn red in contact with product.		

10. STABILITY and REACTIVITY

10.1	Reactivity	Not considered reactive.
10.2	Chemical Stability	Stable
10.3	Possibility of hazardous reactions	Hazardous polymerization will not occur.
10.4	Conditions to avoid	Avoid mixing with incompatible materials.
10.5	Incompatible Materials	Strong bases, oxidizers, and water reactive materials
10.6	Hazardous Decomposition Products	Thermal decomposition of this product may generate nitrogen oxides, carbon monoxide, phosphorous oxides, and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Toxicity data for hazardous ingredients	Oral LD_{50} mg/kg	Dermal LD_{50} mg/kg	Inhalation LD_{50} mg/kg
Inorganic phosphorous compound	LD_{50} (oral, rat) = 1759 mg/kg	LD_{50} (dermal, rabbit) = 3149mg/kg	N/A
	Standard Draize Test (Skin-Rabbit, adult) 595 mg/24 hours: Severe irritation effects Standard Draize Test (Eye effects-Rabbit, adult) 119 mg: Severe irritation effects TDLo (Oral-Man) 1286 mL/kg LDLo (Unreported-Man) 220 mg/kg		
Chelate	LD_{50} (Intraperitoneal-Rat) 1548 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands	N/A	N/A
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye -Rabbit, adult) 1900 mg Standard Draize Test (Eye-Rabbit, adult) 100 mg/24 hours: Moderate irritation effects		
Organic acid	LD_{50} (Oral-Rat) 3 g/kg LD_{50} (Oral-Mouse) 5040 mg/kg LD_{50} (Intraperitoneal-Rat) 883 mg/kg LD_{50} (Intraperitoneal-Mouse) 903 mg/kg LD_{50} (Subcutaneous-Rat) 5500 mg/kg LD_{50} (Subcutaneous-Mouse) 2700 mg/kg LD_{50} (Intraperitoneal-Mouse LD50: 903 mg/kg LD_{50} (Intravenous-Rabbit, adult) 330 mg/kg LD_{50} (Intravenous-Mouse) 42 mg/kg	LD_{50} (dermal, rabbit) > 2000 mg/kg	N/A

	LDLo (Oral-Rabbit, adult) 7000 mg/kg		
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye-Rabbit, adult) 750 mg/24 hours: Severe irritation effects		

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1	Eco toxicity	LC_{50}, mg/L	EC_{50}, mg/L
	RoClean L403		
	Aquatic	*Daphnia magna* > 1000 Fat Head Minnow > 1000	NE
	Terrestrial	NE	NE
12.2	Persistence and Degradability	The components of this product decompose in soil and water.	
12.3	Bio accumulative Potential	This product is not expected to bio accumulate	
12.4	Mobility in Soil	When spilled onto soil, this product will infiltrate downward, the rate being greater with lower concentration because of reduced viscosity.	
12.5	Other Adverse Ecological Effects	This product may be harmful to aquatic life if large volumes of it are released into an aquatic environment.	

13. DISPOSAL CONSIDERATIONS

Preparing Wastes of this Product for Disposal	Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with local regulations. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.
Disposal of Contaminated Packaging	Cleaned containers can be recycled or disposed of as non-contaminated waste, if authorized by your local authorities. Dispose of containers as required by local regulations.
U.S. EPA Waste Number	Not applicable as supplied.

14. TRANSPORT INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

14.1	UN Number	Not regulated
14.2	UN Proper Shipping Name	Not regulated
14.3	Transport Hazard Class(es)	Not regulated
	Transport label(s) required	Not regulated
14.4	Packing Group	Not regulated
14.5	Marine Pollutant	Not regulated
	NA Emergency Response Guide Number (2012)	Not regulated
14.6	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Not regulated
14.7	Special Transport Precautions	Not regulated
	National Motor Freight Classification	#70

International Air Transport Association

14.8	UN Number	Not regulated
	UN Proper Shipping Name	Not regulated
	Transport Hazard Class(es)	Not regulated

	Transport label(s) required	Not regulated
	Packing Group	Not regulated
	Packaging Instructions	Not regulated

International Maritime Organization

14.9	UN Number	Not regulated
	UN Proper Shipping Name	Not regulated
	Transport Hazard Class(es)	Not regulated
	Transport label(s) required	Not regulated
	Packing Group	Not regulated
	Marine Pollutant	Not regulated
	NA Emergency Response Guide Number (2012)	Not regulated
	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Not regulated

15. SAFETY, HEALTH and ENVIRONMENTAL REGULATIONS SPECIFIC FOR THE PRODUCT

PROGRAM	Inorganic Phosphorous Compound	Chelate	Organic Acid			
US EPA PROGRAMS						
Clean Air Act Hazardous Air Pollutants	NO	NO	NO			
Safe Drinking Water Act	NO	NO	NO			
RCRA F, K, P, U or D-lists	NO	NO	NO			
Epa Priority Pollutant	NO	NO	NO			
SARA 302 RQ	NO	NO	NO			
SARA 302 TPQ	NO	NO	NO			
SARA 313 LISTED	YES	NO	NO			
SARA CHEMICAL CATEGORIES						
SARA 311/312 ACUTE	NO	NO	NO			
SARA 311/312 CHRONIC	NO	NO	NO			
SARA 311/312 FIRE	NO	NO	NO			
SARA 311/312 PRESSURE	NO	NO	NO			
SARA 311/312 REACTIVITY	NO	NO	NO			
EPA EXTREMELY HAZARDOUS SUBSTANCE	NO	NO	NO			
CALIFORNIA SAFE DRINKING WATER ACT (Proposition 65)						
This product does not contain any chemical listed on the California Safe Drinking Water Act list (Proposition 65)						
US OSHA PROGRAMS						
PEL	NO	NO	NO			
PSM	NO	NO	NO			
CHEMICAL SECURITY PROGRAMS						
DHS CFATS	NO	NO	NO			
CHEMICAL WEAPONS CONVENTION						
	NO	NO	NO			
US DRUG ENFORCEMENT ADMINISTRATION						
DEA Controlled Substances	NO	NO	NO			
CHEMICAL INVENTORY PROGRAMS						

WHMIS	NO	NO	NO			
DSL	YES	YES	YES			
REACH Pre-registered List	YES	YES	YES			
TSCA	YES	YES	YES			
European Inventory of Existing Commercial Chemical Substances (EINECS)	YES	YES	YES			
EU No-Longer Polymers List (NLP)	N/A	N/A	N/A			
EEC Classification Packaging, and Labeling of Dangerous Substances (Annex 1)	Corrosive	NO	NO			
Philippines	YES	YES	YES			
Japan	YES	YES	YES			
Australia	YES	YES	YES			
Korea	YES	YES	YES			
China	YES	YES	YES			
New Zealand Inventory of Chemicals	YES	YES	YES			

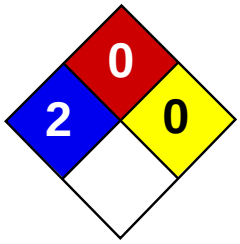
16. OTHER INFORMATION

16.1	Original Preparation	July 2, 1999
16.2	Revision History	February 19, 2004, 28 June 2013; GHS update 24 May, 2016, 7 October, 2016 Content corrections; 23 Aug 2016, information update, format changes
16.3	Prepared by	ADVANCED CHEMICAL SAFETY, Inc. PO Box 152329 San Diego, CA 92195 (858)-874-5577
16.4	Date of Printing	January 29, 2018

DEFINITIONS OF TERMS

16.5	A large number of abbreviations and acronyms appear on a SDS. Some of these which are commonly used include the following:	
	Section 2	**GHS**: Global Harmonization System **OSHA:** U.S. Occupational Safety and Health Administration. **CLP**: Classification and Packaging **WHMIS**: Workplace Hazardous Materials Information System **STOT**: Specific Target Organ Toxicity
	Section 3	**CAS #:** Chemical Abstract Service index number **EINECS #:** European Chemical Substances Information System index number
	Section 5	**NFPA:** Nation Fire Protection Association **Health Hazard: 0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). **Flammability Hazard** **Reactivity Hazard:** Refer to definitions for "Hazardous Materials Identification System". **Flash Point**: Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL:** The lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL**: The highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.
	Section 8	**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE (Not Established)** is made for reference.
	Section 11	**LD_{50}** : Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** : Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm:** Concentration expressed in parts of material per million parts of air or water; **mg/m^3** : Concentration expressed in weight of substance per volume of air; **mg/kg:** Quantity of material, by weight, administered to a test subject, based on their body weight in kg **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.
	Section 12	**LC_{50}:** The lowest concentration in water which kills 50% of the test subjects. **EC_{50}:** The Effect Concentration in water at which 50% of the test species if affected.
	Section 13	**US EPA Hazardous Waste Codes**: refer to 40 CFR 261.20
	Section 14	**DOT**: US Department of Transportation **IATA**: International Air Transport Association **IMO**: International Maritime Organization **MARPOL:** International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 **IBC Code** : Merchant Shipping Code
	Section 15	**RCRA**: US Resource Conservation and Recovery Act **SARA:** US Superfund Amendments and Reauthorization Act **PSM**: US OSHA Process Safety Management **CFATS:** US Department of Homeland Security Chemical Facility Anti-terrorism Standard **DSL:** Canadian Domestic Substances List **NDSL:** Canadian Non-Domestic Substances List **REACH**: European Registration, Evaluation, Authorization and Restriction of Chemicals list **TSCA:** US Toxic Substances Control Act





Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Sodium metabisulfite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium metabisulfite

Catalog Codes: SLS3025

CAS#: 7681-57-4

RTECS: VZ2000000

TSCA: TSCA 8(b) inventory: Sodium metabisulfite

CI#: Not available.

Synonym: Disodium disulfite; Disodium pyrosulfite; Sodium Pyrosulfite; Sodium Metabisulphite

Chemical Name: Pyrosulfurous acid, disodium salt

Chemical Formula: Na2S2O5

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
Sodium metabisulfite	7681-57-4	100

Toxicological Data on Ingredients: Sodium metabisulfite: ORAL (LD50): Acute: 1131 mg/kg [Rat]. DERMAL (LD50): Acute: >2000 mg/kg [Rat]. >1000 mg/kg [Guinea pig].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung irritant). CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs 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. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get 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:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

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: 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.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes of SOx, Na2O. Decomposes on heating to form sodium sulfate

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. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 locked up.. Do not ingest. Do not breathe dust. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive. Air Sensitive

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: Safety glasses. Lab coat. 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. 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: 5 (mg/m3) [United Kingdom (UK)] TWA: 5 (mg/m3) from ACGIH (TLV) [United States] TWA: 5 (mg/m3) from NIOSH [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid or Powdered solid.)

Odor: odor of sulfur dioxide

Taste: Not available.

Molecular Weight: 190.13 g/mole

Color: White to yellowish.

pH (1% soln/water): 4.3 [Acidic.]

Boiling Point: Not available.

Melting Point: Decomposition temperature: 150°C (302°F)

Critical Temperature: Not available.

Specific Gravity: 1.4 (Water = 1)

Vapor Pressure: Not applicable.

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, hot water. Freely soluble in glycerol. Slightly soluble in alcohol. Moderately soluble in ethanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat, moisture, air, dust generation.

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Moisture sensitive Air sensitive. It slowly oxidizes to sodium sulfate upon exposure to air and moisture. Incompatible with sodium nitrite

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1131 mg/kg [Rat]. Acute dermal toxicity (LD50): >1000 mg/kg [Guinea pig].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: upper respiratory tract, skin, eyes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic) based on animal test data. May cause adverse reproductive effects based on animal test data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: May cause eye irritaiton. Inhalation: May cause respiratory tract irritation with coughing and wheezing. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation irritation with abdominal pain, nausea, vomiting, diarrhea, violent colic, and possible gastri hemorrhaging. May affect behavior/central nervous system and cause central nervous system depression/seizures. It may also affect the cardiovasular system (hypotension, tachycardia, cardiovascular collapse), Ingestion of sulfite compounds may cause a severe allergic reaction (anaphylactoid symptoms) in sensitive individuals and some asthmatics. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause allergic dermatitis. Ingestion: Prolonged or repeated ingestion may affect the liver, urinary system, and metabolism (weight loss). Future exposures may also cause asthma like allergy with coughing, shortness of breath, wheezing and/or chest tightness. Inhalation: Prolonged or repeated inhalation may irritate the lungs, may cause bronchitis to develop with cough, phlegm and/or shortness of breath.

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:
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 (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Sodium metabisulfite Illinois toxic substances disclosure to employee act: Sodium metabisulfite Rhode Island RTK hazardous substances: Sodium metabisulfite Pennsylvania RTK: Sodium metabisulfite Minnesota: Sodium metabisulfite Massachusetts RTK: Sodium metabisulfite New Jersey: Sodium metabisulfite California Director's List of Hazardous Substances: Sodium metabisulfite TSCA 8(b) inventory: Sodium metabisulfite TSCA 4(a) ITC priority list: Sodium metabisulfite TSCA 8(a) PAIR: Sodium metabisulfite TSCA 8(d) H and S data reporting: Sodium metabisulfite: effective: 1/26/94; sunset: 6/30/98

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

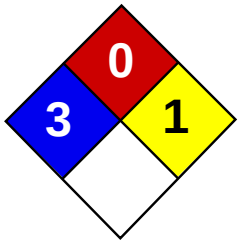
Other Special Considerations: Not available.

Created: 10/11/2005 12:35 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Sulfamic acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfamic acid

Catalog Codes: SLS2068, SLS3490

CAS#: 5329-14-6

RTECS: WO5950000

TSCA: TSCA 8(b) inventory: Sulfamic acid

CI#: Not available.

Synonym: Amidosulfonic acid

Chemical Name: Not available.

Chemical Formula: NH2SO3H

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
Sulfamic acid	5329-14-6	100

Toxicological Data on Ingredients: Sulfamic acid: ORAL (LD50): Acute: 3160 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). Hazardous in case of skin contact (permeator). 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:
Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). Hazardous in case of skin contact (permeator). 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 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. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

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:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : 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. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

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:
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. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate.

Section 7: Handling and Storage

Precautions:
Keep container dry. 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

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

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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 97.09 g/mole

Color: Not available.

pH (1% soln/water): 1 [Acidic.]

Boiling Point: Not available.

Melting Point: Decomposes. (205°C or 401°F)

Critical Temperature: Not available.

Specific Gravity: 2.15 (Water = 1)

Vapor Pressure: Not applicable.

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: 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: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3160 mg/kg [Rat].

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive solid.

Identification: : Sulfamic acid : UN2967 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sulfamic acid

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

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R35- Causes severe burns. R43- May cause sensitization by skin contact.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection: j

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

Health: 3

Flammability: 0

Reactivity: 1

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.

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Last Updated: 05/21/2013 12:00 PM

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RoClean L211
SAFETY DATA SHEET

1. Company and Product Identification

1.1	Identification – Product Name:	**RoClean L211**
1.2	Other means of identification Synonym:	Organic Amine salt Mixture, none
1.3	Recommended Use Of The Chemical and Restrictions On Use:	Reverse osmosis membrane cleaner Use only as directed on the label.
1.4	Name, Address, And Telephone Number Of The Manufacturer, Or Other Responsible Party:	**AVISTA TECHNOLOGIES** 140 Bosstick Street San Marcos, CA 92069 (760) 744-0536
	Competent Person email address	klindsey@avistatech.com
1.5	24 Hour Emergency No.:	1-800-424-9300 (United States) 1-202-483-7616 (International Collect)

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY NSF INTERNATIONAL TO ANSI/NSF 60 AS STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE OFF-LINE IN REVERSE OSMOSIS SYSTEMS.

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: *This product is a clear, colorless to amber colored, corrosive solution with a light, disinfectant odor. Depending on the duration of contact, over-exposures can severely irritate the skin or eyes and respiratory system, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, oxides of nitrogen and sodium). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.*

Physical Hazards Summary	None
Potential Health Hazards Summary	Eye Irritant, Category 2A Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3 Skin sensitizer, Category 1
Potential Ecological Effects Summary	None

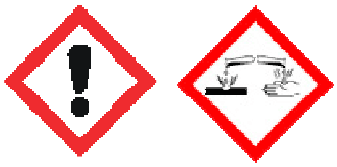
2.1 Classification Of Product

U.S. OSHA classification	Corrosive, Skin, eye irritant, sensitizer
Classification as per EC 1272/2008 (CLP/GHS)	Eye Irritant, Category 2A Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3 Skin sensitizer, Category 1 Xi Irritant
WHMIS classification	E, corrosive

Hazardous Materials Information System (HMIS) Rating

Health	**3**
Flammability	**0**
Physical Hazard	**0**
Protective Equipment	**D**

2.2 Label Elements OSHA/GHS

General Warnings	P101	If medical advice is needed, have product container or label at hand.
	P102	Keep out of reach of children.
	P103	Read label before use
	P403	Store in a well-ventilated place.
	P233	Keep container tightly closed
Signal Word	WARNING!	
Hazard statements	H319	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P305 + P351 + P338	
	H317	May cause an allergic skin reaction
	H 312	Harmful in contact with skin
	H332	Harmful if inhaled
	H314	Causes severe skin burns and eye damage
Precautionary statements	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P305	IF IN EYES: rinse extensively with large amounts of water
	P351	Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	F INGESTED or INHALED Immediately call a POISON CENTER or doctor/physician.
Hazard pictograms		

2.3 Unclassified Hazards None

2.4 Ingredients with unknown acute toxicity None

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical name CAS # EINECS #	% w/w	US OSHA	GHS/EU CLP	WHMIS
Chelate Agent Proprietary Proprietary	20 - 30	Irritant	Eye Irritant, Category 2A H319 P305 + P351 + P338	Class D2B: Toxic Material at > 1% 
Organic Amine Proprietary Proprietary	20 - 30	Corrosive, Combustible liquid	Skin sensitizer, Category 1 Acute toxicity, oral, Category 3 H317 Acute toxicity, dermal, Category 3	B3 Combustible E Corrosive
Glycol Wetting Agent Proprietary Proprietary	1 - 5	Low hazard	Not regulated	Not regulated
Chelate Agent 2 Proprietary Proprietary	1 - 5	Toxic	Acute toxicity, oral, Category 3 Acute toxicity, dermal, Category 3	D2B Other toxic effects
Surfactant Proprietary Proprietary	1 - 5	Corrosive, Combustible liquid	Skin sensitizer, Category 1 Acute toxicity, oral, Category 3 Acute toxicity, oral, Category 3	B3 Combustible E Corrosive

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

4. FIRST-AID MEASURES

4.1 Description of Necessary Measures

Skin exposure: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

Eye exposure: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

Inhalation: If mist of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

Ingestion: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

4.2 Most Important Symptoms/Effects: Immediate: Inhalation exposure may cause coughing or sneezing. Symptoms of skin and eye contact may include redness and irritation. Ingestion may cause stomach pains, cramps, and gastritis.

Delayed: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Symptoms may include tingling, redness, and visible injury.

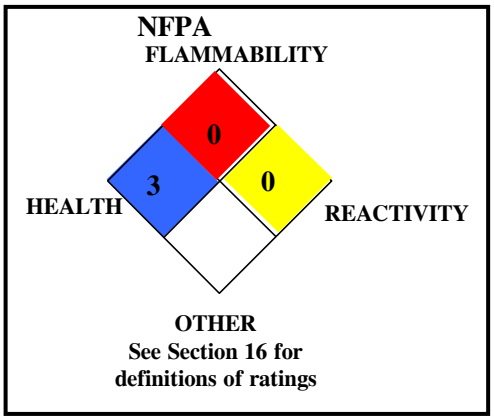
4.3 Indication Of Immediate Medical Attention And Special Treatment Needed, **TARGET ORGANS:** Acute: Skin, eyes, respiratory system. Chronic: Skin, eyes, respiratory system

If Necessary:

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

Flammable properties — Non-flammable aqueous solution



Flash Point °C: Not applicable.

Autoignition Temperature °C: Not applicable.

Flammable Limits (in air by volume, %):
Upper: Not applicable.
Lower: Not applicable.

5.1 Suitable And Unsuitable Extinguishing Media: This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water spray	YES	Carbon dioxide	YES
Foam	YES	Dry chemical	YES
Halon	YES	Other	YES

5.2 Specific Hazards Arising From Chemical: When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, and nitrogen oxides).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.

5.3 Special Protective Equipment And Precautions For Fire-Fighters: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people.

Protective equipment: For small releases (< 20 L), clean up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental releases (more than 20 L) should be Level C: triple-gloves (neoprene gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and full-face respirator with Amine and HEPA filter.

Emergency procedures: Monitoring must indicate that exposure levels are below those provided in Section 8 (Exposure Controls-Personal Protection) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained

Breathing Apparatus.

6.2 Methods and Materials for Containment and Cleaning Up

Vacuum or soak- up solids liquid for recovery/disposal. Neutralize residue with citric acid or other neutralizing agent for dilute amines. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residues in a suitable plastic container. Dispose of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate local standards (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

7.1 Precautions for Safe Handling

All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care.

As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating dust of this product. Remove contaminated clothing immediately.

During equipment maintenance follow practices indicated in Section 6 (Accidental Release Measures) to decontaminate equipment or clean-up small spills. Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate local standards.

7.2 Conditions For Safe Storage

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials. Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Incompatibilities: Strong acids, oxidizers

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 Control Parameters

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLVs		OSHA-PELs			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Chelate Agent	Proprietary	20 - 30	NE	NE	NE	NE	NE	NE
Organic Amine	Proprietary	20 - 30	7.5	15	8	15	30 ppm	NIOSH RELs: TWA = 8 STEL = 15 DFG MAKs: TWA = 5.1 PEAK = 2 MAK, 5 minutes, momentary value (Danger of cutaneous absorption) MAK Pregnancy Risk Group Classification: C
Glycol Wetting Agent	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Chelate Agent 2	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Surfactant	Proprietary	1 - 5	NE	NE	NE	NE	NE	NE
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).		Balance	None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

8.2 Appropriate Engineering Controls.

Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in this Section or as low as reasonably achievable. Ensure

eyewash/safety shower stations are available near areas where this product is used.

8.3 Personal Protective Equipment

Respiratory protection:	None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists or vapor. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the applicable local standards. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-face piece pressure/demand SCBA or a full-face piece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).
Eye protection:	Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. Splash goggles with a faceshield may be needed if splash hazards exist.
Hand protection:	Wear chemical impervious gloves (e.g., Solvex™, Neoprene).
Body protection:	If needed, use body protection appropriate for task (e.g., Tyvek suit, rubber apron) to protect from splashes and sprays.

9. PHYSICAL and CHEMICAL PROPERTIES

Appearance	This product is a clear, colorless to amber-colored liquid.		
Odor	Light disinfectant odor	Odor Threshold	NE
Freezing Point ^{o}C	< 0	pH (2% solution at 25^{o}C)	10.5 – 11.5
Initial Boiling Point ^{o}C	> 100	Boiling Point Range ^{o}C	N/A
Flammability	Non-flammable	Evaporation Rate (water = 1)	Similar to water
Vapor Density (air = 1)	N/A	Vapor Pressure mm Hg @ 20°C:	18 - 20
Solubility (in water)	Soluble	Relative density (water = 1)	1.07 ± 0.1
Viscosity	Similar to water	Oil-Water Partition Coefficient	N/A
Decomposition Temperature	NE		
How To Detect This Substance (Warning Properties):	Litmus paper will turn blue in contact with solutions of this solid.		

10. STABILITY and REACTIVITY

10.1	Reactivity	Not considered reactive.
10.2	Chemical Stability	Stable
10.3	Possibility of hazardous reactions	Hazardous polymerization will not occur.
10.4	Conditions to avoid	Avoid mixing with incompatible materials.
10.5	Incompatible Materials	Strong acids, oxidizers
10.6	Hazardous Decomposition Products	Thermal decomposition of this product may generate nitrogen oxides, carbon monoxide and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Toxicity data for hazardous ingredients	Oral LD_{50} mg/kg	Dermal LD_{50} mg/kg	Inhalation LD_{50} mg/kg
Chelate Agent	LD_{50} (Intraperitoneal-Rat) 1548 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands	N/A	N/A
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye -Rabbit, adult) 1900 mg Standard Draize Test (Eye-Rabbit, adult) 100 mg/24 hours: Moderate irritation effects		
Organic Amine	LD_{50} (Oral-Rat) 1720 mg/kg LD_{50} (Oral-Mouse) 700 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: muscle contraction or spasticity;	LD_{50} (Subcutaneous-Rat) 1500 mg/kg LD_{50} (Skin-Rabbit) 1 mL/kg LD_{50} (Subcutaneous-Rat) 1500 mg/kg LD_{50} (Skin-Rabbit) 1 mL/kg	LC (Inhalation-Mouse) > 2420 mg/m^3/2 hours LC (Inhalation-Cat) > 2420 mg/m^3/2 hours TCLo (Inhalation-Rat) 66 ppm/24 hours/30 days-

	Lungs, Thorax, or Respiration: dyspnea LD_{50} (Oral-Rabbit) 1 gm/kg LD_{50} (Oral-Guinea Pig) 620 mg/kg LD_{50} (Intraperitoneal-Rat) 67 mg/kg LD_{50} (Intraperitoneal-Mouse) 50 mg/kg LD_{50} (Intravenous-Rat) 225 mg/kg: Behavioral: somnolence (general depressed activity), muscle contraction or spasticity; Lungs, Thorax, or Respiration: dyspnea LD_{50} (Intramuscular-Rat) 1750 mg/kg LDLo (Oral-Mammal-Species Unspecified) 1400 mg/kg TDLo (Oral-Rat) 115 gm/kg/90 days-continuous: Liver: changes in liver weight; Kidney, Ureter, Bladder: changes in bladder weight; Related to Chronic Data: death TDLo (Oral-Rat) 105 mg/kg/30 weeks-intermittent: Liver: liver function tests impaired, changes in liver weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death, Specific Developmental Abnormalities: musculoskeletal system TDLo (Oral-Rat) 4500 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: urogenital system	TDLo (Skin-Rat) 2250 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects	continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death TCLo (Inhalation-Rat) 400 mg/m^3/5 hours/26 weeks-intermittent: Lungs, Thorax, or Respiration: respiratory depression; Liver: liver function tests impaired; Kidney, Ureter, Bladder: proteinuria TCLo (Inhalation-Rat) 300 mg/m^3/5 hours/26 weeks-intermittent: Kidney, Ureter, Bladder: proteinuria, other changes in urine composition; Nutritional and Gross Metabolic: weight loss or decreased weight gain TCLo (Inhalation-Dog) 102 ppm/24 hours/30 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death TCLo (Inhalation-Guinea Pig) 75 ppm/24 hours/24 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death
	Open irritation test (skin-Rabbit) 505 mg: Moderate Standard Draize test (Skin-Rabbit) 250 µg: Severe	Cytogenetic analysis (Human-Lymphocyte) 100 µmol/L Sister chromatid exchange (Human-Lymphocyte) 1 mmol/L	
Glycol Wetting Agent	LD_{50} (Oral-Rat): 20 g/kg LD_{50} (Oral-Mouse) 22 g/kg LD_{50} (Oral-rabbit) 18500 mg/kg LD_{50} (Oral dog) 22 gm/kg LD_{50} (Oral-guinea pig) 18350 mg/kg LD_{50} (Oral-quail) > 2080 mg/kg TDLo (Oral-Child) 79 g/kg/56 weeks-intermittent: Central nervous system effects, BRN TDLo (Parenteral-Infant) 10 g/kg/3 days-continuous: Systemic effects LD_{50} (Intraperitoneal-Rat) 6660 mg/kg LD_{50} (Intraperitoneal-Mouse) 9718 mg/kg LD_{50} (Intravenous-Rat) 6423 mg/kg LD_{50} (Intravenous-Mouse) 6630	Skin-Human 500 mg/7 days Mild irritation effects Skin-Human 104 mg/3 days-intermittent Moderate irritation effects Skin-man: 10%/2 days LD_{50} (Skin-rabbit) 20800 mg/kg LD_{50} (Subcutaneous-Rat) 22,500 mg/kg LD_{50} (Subcutaneous-Mouse) 17,370 mg/kg LDLo (Subcutaneous-guinea pig) 15500 mg/kg	TCLo Inhalation-rat) 2180 mg/m^3/6 hours/90 days-intermittent: Behavioral: food intake (animal); Endocrine: changes in spleen weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases

	mg/kg LD_{50} (Intravenous-rabbit) 6500 mg/kg LD_{50} (Intravenous-dog) 26 gm/kg LDLo (Intravenous-chicken) 27 gm/kg: Vascular: other changes LD_{50} (Intramuscular-Rat) 14 g/kg TDLo (Intraperitoneal-Mouse) 100 mg/kg (15 days preg): Teratogenic effects TDLo (Intraperitoneal-Mouse) 100 mg/kg (11 days preg): Reproductive effects LDLo (Intramuscular-rabbit) 6300 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: coma; Lungs, Thorax, or Respiration: respiratory stimulation		
	Eye effects-Rabbit, adult 100 mg Mild irritation effects Eye effects-Rabbit, adult 500 mg/24 hours Mild irritation effects	DNA Inhibition (Mouse-Subcutaneous) 8000 mg/kg Cytogenetic Analysis (Subcutaneous-Mouse) 8000 mg/kg Cytogenetic Analysis (Hamster-fibroblast) 32 g/L	
Chelate Agent 2	N/A	N/A	N/A
Surfactant	N/A	N/A	N/A

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1	Ecotoxicity	LC_{50}, mg/L	EC_{50}, mg/L
	Organic amine		
	Aquatic	LC_{50} (goldfish) 24 hours = 190 mg/L (@ pH 10.1) LC_{50} (goldfish) 96 hours = 170 mg/l (@ pH 10.1) LC_{50} (goldfish) 24 hours = > 5,000 mg/L (@ pH 7) LC_{50} (goldfish) = > 5000 mg/L, 24 hours K_{OW} = -1.31 (est.) Biodegradation: Biological oxygen demand (BOD): 78%, 5 days; (theoretical) 0%, 5 days; 64%, 20 days. Persistence: Biodegrades at moderate rate. Aquatic Fate: If released to water, Organic amine should undergo biodegradation. The half-life in water is expected to be from a few days to weeks, depending on the acclimatization in the aquatic system. Atmospheric Fate: If released to the atmosphere, Organic amine is expected to exist entirely in the vapor phase. The primary mechanism of removal from the atmosphere would be by reaction with photochemically generated hydroxyl radicals, with an expected half-life of 4 hours. The complete solubility if Organic amine suggests that it will also be removed by precipitation.	EC_0 (*Pseudomonas putida* bacteria) 16 hours = 6,300 mg/L EC_0 (*Microcystis aeruginosa* algae) 8 days = 1.6 mg/L EC_0 (*Scenedesmus quadricauda* green algae) 7 days = 0.75 mg/L EC_0 (*Entosiphon sulcatum* protozoa) 72 hours = 300 mg/L EC_0 (*Uronema parduczi* Chatton-Lwoff protozoa) = 2,945 mg/L
	Terrestrial	If released to soil, Organic amine is expected to biodegrade fairly rapidly following acclimatization, with a half-life on the order of days to week. Organic amine will leach in soil to groundwater. Volatilization is not a significant fate process from the soil.	NE
	Glycol Wetting Agent		
		LC_{50} (*Lebistes reticulatus*, guppy) 48 hours > 10,000 mg/L LC_{50} (*Carassius auratus*) 24 hours = > 5,000 mg/L LC_{50} (*Salmo gairdneri*) 24 hours = 50,000 mg/L LC_{50} (*Pimephales promelas*) 96 hours = 54,900 mg/L	EC_{50} (*Photobacterium phosphoreum*, bacteria) 30 minutes = 26,800 mg/L TD (*Chlorella pyrenoidosa*, algae) = 92,000 mg/L EC_0 (*Daphnia magna*, crustacean) 48 hours = < 4,295 mg/L

		LC_{50} (Artemia salina) 24 hours = >10,000 mg/L LC_{100} (*Pimephales promelas*) 96 hours = 65,610 mg/L NOEC (*Pimephales promelas*) 96 hours < 47,829 mg/L fingerling trout: at 50,000 mg/l at 10°C: no mortality or apparent signs of stress were produced during a 25-hr exposure period (static bioassay) Log K_{ow} = -0.30-1.41 Biodegradation: Standard dilution BOD water, 5-day 64% theoretical biochemical oxygen demand, sewage inocula. Warburg respirometer, 40-day 78% theoretical biochemical oxygen demand, sewage inocula. Nutrient broth, 100% degradation in 4 days (aerobic conditions), 100% degradation in 4-9 days (anaerobic conditions), activated sludge, or digester sludge inocula, no significant degradation in sterile controls. Standard dilution BOD water, 5-day 2.2% theoretical biochemical oxygen demand, 10-day 56.7% theoretical biochemical oxygen demand, 50-day 80% theoretical biochemical oxygen demand, sewage inocula. Standard dilution BOD water, 5-day 62% theoretical biochemical oxygen demand, 20-day 79% theoretical biochemical oxygen demand, sewage inocula; synthetic seawater dilution, 5-day 55% theoretical biochemical oxygen demand, 20-day 83% theoretical biochemical oxygen demand, raw wastewater inocula. Sewage die-away, 74.5% theoretical biochemical oxygen demand in 5 days.	EC_{50} (*Daphnia magna*, crustacean) 48 hours = 34,400 mg/L EC_{100} (*Daphnia magna*, crustacean) 48 hours = 50,000 mg/L EC_{50} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L EC_{100} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L EC_{50} (*Nitocra spinipes*, crustacean) 96 hours = > 10,000 mg/L
	Chelate Agent		
		LC_{100} (*Cyprinus carpio*) 24 hours = 180 ppm/ at 25°C TLm (mosquito fish) 96 hours = 125 ppm/ (fresh water) TLm (bluegill) 48 hours = 99 mg/L/ (tap water) LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 486 mg/L LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 490-1030 mg/L (static bioassay) LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = > 500 mg/L LC_{50} (*Leuciscus Idus*) 96 hours = > 500 mg/L LC_{50} (Algae) 72 hours = 10-100 mg/L LC_{50} (*Daphnae*) 24 hours > 100 mg/L Biological Oxygen Demand = 20 mg O_2/g product, Chemical Oxygen Demand = 575 mg O_2/g product.	
12.2	Persistence and Degradability	The components of this product decompose in soil and water.	
12.3	Bioaccumulative Potential	This product is not expected to bioaccumulate	
12.4	Mobility in Soil	When spilled onto soil, this product will infiltrate downward, the rate being greater with lower concentration because of reduced viscosity.	
12.5	Other Adverse Ecological Effects	This product may be harmful to aquatic life if large volumes of it are released into an aquatic environment.	

13. DISPOSAL CONSIDERATIONS

Preparing Wastes of this Product for Disposal	Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with local regulations. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.
Disposal of Contaminated Packaging	Cleaned containers can be recycled or disposed of as non-contaminated waste, if authorized by your local authorities. Dispose of containers as required by local regulations.
U.S. EPA Waste Number	Not applicable as supplied.

14. TRANSPORT INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

14.1	UN Number	UN 2735
14.2	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
14.3	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
14.4	Packing Group	II
14.5	Marine Pollutant	Not applicable
	NA Emergency Response Guide Number (2012)	154
14.6	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Y3/D3
14.7	Special Transport Precautions	Not applicable
	National Motor Freight Classification	#70

International Air Transport Association

14.8	UN Number	UN 2735
	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
	Packing Group	II
	Packaging Instructions	850/854

International Maritime Organization

14.9	UN Number	UN 2735
	UN Proper Shipping Name	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
	Transport Hazard Class(es)	8 (Corrosive)
	Transport label(s) required	Corrosive Class 8
	Packing Group	II
	Marine Pollutant	Not applicable
	NA Emergency Response Guide Number (2012)	154
	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Y3/D3

15. SAFETY, HEALTH and ENVIRONMENTAL REGULATIONS SPECIFIC FOR THE PRODUCT

PROGRAM	Chelate	Organic amine	Glycol Wetting Agent	Chelate Agent 2	Octyl dimethylamine Oxide	
US EPA PROGRAMS						
Clean Air Act Hazardous Air Pollutants	NO	NO	NO	NO	NO	
Safe Drinking Water Act	NO	NO	NO	NO	NO	
RCRA F, K, P, U or D-lists	NO	NO	NO	NO	NO	
EPA Priority Pollutant	NO	NO	NO	NO	NO	
SARA 302 RQ	NO	NO	NO	NO	NO	
SARA 302 TPQ	NO	NO	NO	NO	NO	
SARA 313 LISTED	NO	NO	NO	NO	NO	
SARA CHEMICAL CATEGORIES						
SARA 311/312 ACUTE	NO	YES	NO	NO	NO	
SARA 311/312	NO	YES	NO	NO	NO	

CHRONIC						
SARA 311/312 FIRE	NO	NO	NO	NO	NO	
SARA 311/312 PRESSURE	NO	NO	NO	NO	NO	
SARA 311/312 REACTIVITY	NO	NO	NO	NO	NO	
EPA EXTREMELY HAZARDOUS SUBSTANCE	NO	NO	NO	NO	NO	
CALIFORNIA SAFE DRINKING WATER ACT (Proposition 65)						
This product does not contain any chemical listed on the California Safe Drinking Water Act list (Proposition 65)						
US OSHA PROGRAMS						
PEL	NO	8 mg/m^3	NO	NO	NO	
PSM	NO	NO	NO	NO	NO	
CHEMICAL SECURITY PROGRAMS						
DHS CFATS	NO	NO	NO	NO	NO	
CHEMICAL WEAPONS CONVENTION						
	NO	NO	NO	NO	NO	
US DRUG ENFORCEMENT ADMINISTRATION						
DEA Controlled Substances	NO	NO	NO	NO	NO	
CHEMICAL INVENTORY PROGRAMS						
WHMIS	NO	E	NO	NO	D2B	
DSL	YES	YES	YES	YES	YES	
NDSL	N/A	N/A	N/A	N/A	N/A	
REACH Pre-registered List	YES	YES	YES	NO	YES	
TSCA	YES	YES	YES	YES	YES	
European Inventory of Existing Commercial Chemical Substances (EINECS)	YES	YES	YES	YES	YES	
EU No-Longer Polymers List (NLP)	N/A	N/A	N/A	N/A	N/A	
EEC Classification Packaging, and Labeling of Dangerous Substances(Annex 1)	NO	Xi Harmful	NO	NO	Xi Harmful	
Philippines	YES	YES	YES	YES	YES	
Japan	YES	YES	YES	YES	YES	
Australia	YES	YES	YES	YES	YES	
Korea	YES	YES	YES	YES	YES	
China	YES	YES	YES	YES	YES	
New Zealand Inventory of Chemicals	YES	YES	YES	YES	YES	

16. OTHER INFORMATION

16.1	Original Preparation	Jan 5, 2009
16.2	Revision History	28 June 2013; GHS update
16.3	Prepared by	ADVANCED CHEMICAL SAFETY, Inc. PO Box 152329 San Diego, CA 92195 (858)-874-5577
16.4	Date of Printing	April 28, 2015

DEFINITIONS OF TERMS

16.5	A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:	
	Section 2	**GHS**: Global Harmonization System **OSHA:** U.S. Occupational Safety and Health Administration. **CLP**: Classification and Packaging **WHMIS**: Workplace Hazardous Materials Information System **STOT**: Specific Target Organ Toxicity
	Section 3	**CAS #:** Chemical Abstract Service index number **EINECS #:** European Chemical Substances Information System index number
	Section 5	**NFPA:** Nation Fire Protection Association **Health Hazard: 0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). **Flammability Hazard** **Reactivity Hazard:** Refer to definitions for "Hazardous Materials Identification System". **Flash Point**: Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL:** The lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL**: The highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.
	Section 8	**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH -** Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE (Not Established)** is made for reference.
	Section 11	**LD_{50}** : Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** : Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm:** Concentration expressed in parts of material per million parts of air or water; **mg/m^3** : Concentration expressed in weight of substance per volume of air; **mg/kg:** Quantity of material, by weight, administered to a test subject, based on their body weight in kg **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.
	Section 12	**LC_{50}:** The lowest concentration in water which kills 50% of the test subjects. **EC_{50}:** The Effect Concentration in water at which 50% of the test species if affected.
	Section 13	**US EPA Hazardous Waste Codes**: refer to 40 CFR 261.20
	Section 14	**DOT**: US Department of Transportation **IATA**: International Air Transport Association **IMO**: International Maritime Organization **MARPOL:** International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 **IBC Code** : Merchant Shipping Code
	Section 15	**RCRA**: US Resource Conservation and Recovery Act **SARA:** US Superfund Amendments and Reauthorization Act **PSM**: US OSHA Process Safety Management **CFATS:** US Department of Homeland Security Chemical Facility Anti-terrorism Standard **DSL:** Canadian Domestic Substances List **NDSL:** Canadian Non-Domestic Substances List **REACH**: European Registration, Evaluation, Authorization and Restriction of Chemicals list **TSCA:** US Toxic Substances Control Act

RoClean® L403
SAFETY DATA SHEET

1. Company and Product Identification

1.1	Identification – Product Name:	**RoClean® L403**
1.2	Other means of identification Synonym:	Organic / Inorganic acid mixture Mixture, none
1.3	Recommended Use of the Chemical and Restrictions on Use:	Reverse osmosis membrane cleaner Use only as directed on the label.
1.4	Name, Address, And Telephone Number of the Manufacturer, or Other Responsible Party: Competent Person email address	**AVISTA TECHNOLOGIES** 140 Bosstick Street San Marcos, CA 92069 (760) 744-0536 klindsey@avistatech.com
1.5	24 Hour Emergency No.:	1-800-424-9300 (United States) 1-703-527-3887 (International Collect)

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY NSF INTERNATIONAL TO ANSI/NSF 60 AS STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE OFF-LINE IN REVERSE OSMOSIS SYSTEMS.

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, colorless to amber liquid. Depending on the duration of contact, over-exposures can moderately to severely irritate the skin or eyes, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, phosphorous oxides, and sodium oxide). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

Physical Hazards Summary	None
Potential Health Hazards Summary	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2
Potential Ecological Effects Summary	The components of this product will decompose into other organic and inorganic compounds over time under normal environmental conditions

2.1 Classification of Product

U.S. OSHA classification	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2
Classification as per EC 1272/2008 (CLP/GHS)	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A

WHMIS classification	STOT repeated exposure category 2 Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2

Hazardous Materials Information System (HMIS) Rating	**Health** 2 **Flammability** 0 **Physical Hazard** 0 **Protective Equipment** C

2.2 Label Elements OSHA/GHS

General Warnings	P101	If medical advice is needed, have product container or label at hand.
	P102	Keep out of reach of children.
	P103	Read label before use
	P403	Store in a well-ventilated place.
	P233	Keep container tightly closed
Signal Word	WARNING!	
Hazard statements	H319	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	H 312	Harmful in contact with skin
	H332	Harmful if inhaled
	H314	Causes severe skin burns and eye damage
Precautionary statements	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P305	IF IN EYES: rinse extensively with large amounts of water
	P351	Rinse cautiously with water for several minutes.
	P338	Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	IF INGESTED or INHALED Immediately call a POISON CENTER or doctor/physician.

Hazard pictograms



2.3 Unclassified Hazards None

2.4 Ingredients with unknown acute toxicity None

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical name **CAS #** **EINECS #**	**% w/w**	**US OSHA**	**GHS/EU CLP**	**WHMIS**
Inorganic phosphorous compound Proprietary Proprietary	25-35	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 B STOT repeated exposure category 2 Xn Harmful;

Chelate Proprietary Proprietary	25-35	Eye Irritant, Category 2A	Eye Irritant, Category 2A	Eye Irritant, Category 2A
Organic acid Proprietary Proprietary	10-20	Irritant, Category 2	Irritant, Category 2	Irritant, Category 2
Product	100	Acute Oral Toxicity, category 4 Skin irritation, category 2B Eye irritation category 2 A STOT repeated exposure category 2		

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

4. FIRST-AID MEASURES

4.1 Description of Necessary Measures

Skin exposure: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

Eye exposure: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

Inhalation: If mist of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

Ingestion: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

4.2 Most Important Symptoms/Effects: Immediate: Inhalation exposure may cause coughing or sneezing. Symptoms of skin and eye contact may include redness and irritation. Ingestion may cause stomach pains, cramps, and gastritis.

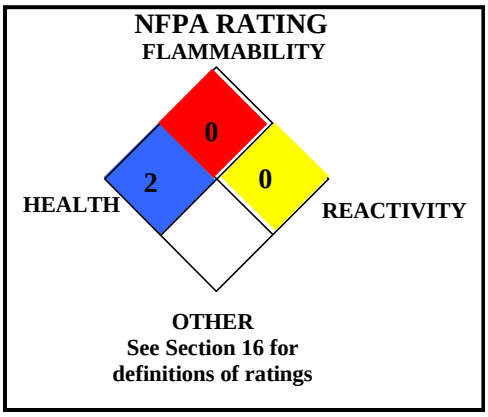
Delayed: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Symptoms may include tingling, redness, and visible injury.

4.3 Indication Of Immediate Medical Attention And Special Treatment Needed, If Necessary: **TARGET ORGANS:** Acute: Skin, eyes, respiratory system. Chronic: Skin, eyes, respiratory system

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and SDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

Flammable properties: Non-flammable aqueous solution



Auto ignition Temperature °C: Not applicable.

Flammable Limits (in air by volume, %):
Upper: Not applicable.
Lower: Not applicable.

5.1 Suitable And Unsuitable Extinguishing Media:

This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water spray	YES	Carbon dioxide	YES
Foam	YES	Dry chemical	YES
Halon	YES	Other	YES

5.2 Specific Hazards Arising From Chemical:

When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, phosphorous oxides, and nitrogen oxides).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.

5.3 Special Protective Equipment And Precautions For Fire-Fighters:

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people.

Protective equipment: For small releases (< 20 L), clean up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental releases (more than 20 L) should be Level C: triple-gloves (neoprene gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and full-face respirator with acid mist and HEPA filter.

Emergency procedures: Monitoring must indicate that exposure levels are below those provided in Section 8 (Exposure Controls-Personal Protection) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained Breathing Apparatus.

6.2 Methods and Materials for Containment and Cleaning Up

Vacuum or soak- up solids liquid for recovery/disposal. Neutralize residue with sodium bicarbonate or other neutralizing agent for dilute acids. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residues in a suitable plastic container. Dispose

of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate local standards (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

7.1 Precautions for Safe Handling

All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care.

As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating dust of this product. Remove contaminated clothing immediately.

During equipment maintenance follow practices indicated in Section 6 (Accidental Release Measures) to decontaminate equipment or clean-up small spills. Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate local standards.

7.2 Conditions For Safe Storage

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials. Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Incompatibilities: Strong bases, oxidizers, and water reactive materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 Control Parameters

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Inorganic phosphorous compound	Proprietary	25 - 35	1	3	1	3	1000	NIOSH REL: TWA = 1 STEL= 3
Chelate	Proprietary	25 - 35	NE	NE	NE	NE	NE	NE
Organic acid	Proprietary	10 - 20	NE	NE	NE	NE	NE	NE
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).		Balance	None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

8.2 Appropriate Engineering Controls.

Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in this Section or as low as reasonably practical. Ensure eyewash/safety shower stations are available near areas where this product is used.

8.3 Personal Protective Equipment

Respiratory protection: None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists or vapor. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the applicable local standards. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-face piece pressure/demand SCBA or a full-face piece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Eye protection: Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. Splash goggles with a faceshield may be needed if splash hazards exist.

Hand protection: Wear chemical impervious gloves (e.g., Solvex™, Neoprene).

Body protection: If needed, use body protection appropriate for task (e.g., Tyvek™ suit, rubber apron) to protect from splashes and sprays.

9. PHYSICAL and CHEMICAL PROPERTIES

Appearance	This product is a clear, colorless to amber liquid.		
Odor	Light disinfectant odor	Odor Threshold	NE
Freezing Point ºC	< 0	pH (2% solution)	2.5-3.5
Initial Boiling Point ºC	> 100	Boiling Point Range ºC	N/A
Flammability	Non-flammable	Evaporation Rate (water = 1)	Similar to water
Vapor Density (air = 1)	<1	Vapor Pressure mm Hg @ 20°C:	18 - 20
Solubility (in water)	Soluble	Relative density (water = 1)	1.3-1.4
Viscosity	Similar to water	Oil-Water Partition Coefficient	N/A
Decomposition Temperature	NE		
How To Detect This Substance (Warning Properties):	Litmus paper will turn red in contact with product.		

10. STABILITY and REACTIVITY

10.1	Reactivity	Not considered reactive.
10.2	Chemical Stability	Stable
10.3	Possibility of hazardous reactions	Hazardous polymerization will not occur.
10.4	Conditions to avoid	Avoid mixing with incompatible materials.
10.5	Incompatible Materials	Strong bases, oxidizers, and water reactive materials
10.6	Hazardous Decomposition Products	Thermal decomposition of this product may generate nitrogen oxides, carbon monoxide, phosphorous oxides, and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Toxicity data for hazardous ingredients	Oral LD_{50} mg/kg	Dermal LD_{50} mg/kg	Inhalation LD_{50} mg/kg
Inorganic phosphorous compound	LD_{50} (oral, rat) = 1759 mg/kg	LD_{50} (dermal, rabbit) = 3149mg/kg	N/A
	Standard Draize Test (Skin-Rabbit, adult) 595 mg/24 hours: Severe irritation effects Standard Draize Test (Eye effects-Rabbit, adult) 119 mg: Severe irritation effects TDLo (Oral-Man) 1286 mL/kg LDLo (Unreported-Man) 220 mg/kg		
Chelate	LD_{50} (Intraperitoneal-Rat) 1548 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands	N/A	N/A
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye -Rabbit, adult) 1900 mg Standard Draize Test (Eye-Rabbit, adult) 100 mg/24 hours: Moderate irritation effects		
Organic acid	LD_{50} (Oral-Rat) 3 g/kg LD_{50} (Oral-Mouse) 5040 mg/kg LD_{50} (Intraperitoneal-Rat) 883 mg/kg LD_{50} (Intraperitoneal-Mouse) 903 mg/kg LD_{50} (Subcutaneous-Rat) 5500 mg/kg LD_{50} (Subcutaneous-Mouse) 2700 mg/kg LD_{50} (Intraperitoneal-Mouse LD50: 903 mg/kg LD_{50} (Intravenous-Rabbit, adult) 330 mg/kg LD_{50} (Intravenous-Mouse) 42 mg/kg	LD_{50} (dermal, rabbit) > 2000 mg/kg	N/A

	LDLo (Oral-Rabbit, adult) 7000 mg/kg		
	Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects Standard Draize Test (Eye-Rabbit, adult) 750 mg/24 hours: Severe irritation effects		

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1	Eco toxicity	LC_{50}, mg/L	EC_{50}, mg/L
	RoClean L403		
	Aquatic	*Daphnia magna* > 1000 Fat Head Minnow > 1000	NE
	Terrestrial	NE	NE
12.2	Persistence and Degradability	The components of this product decompose in soil and water.	
12.3	Bio accumulative Potential	This product is not expected to bio accumulate	
12.4	Mobility in Soil	When spilled onto soil, this product will infiltrate downward, the rate being greater with lower concentration because of reduced viscosity.	
12.5	Other Adverse Ecological Effects	This product may be harmful to aquatic life if large volumes of it are released into an aquatic environment.	

13. DISPOSAL CONSIDERATIONS

Preparing Wastes of this Product for Disposal	Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with local regulations. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.
Disposal of Contaminated Packaging	Cleaned containers can be recycled or disposed of as non-contaminated waste, if authorized by your local authorities. Dispose of containers as required by local regulations.
U.S. EPA Waste Number	Not applicable as supplied.

14. TRANSPORT INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

14.1	UN Number	Not regulated
14.2	UN Proper Shipping Name	Not regulated
14.3	Transport Hazard Class(es)	Not regulated
	Transport label(s) required	Not regulated
14.4	Packing Group	Not regulated
14.5	Marine Pollutant	Not regulated
	NA Emergency Response Guide Number (2012)	Not regulated
14.6	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Not regulated
14.7	Special Transport Precautions	Not regulated
	National Motor Freight Classification	#70

International Air Transport Association

14.8	UN Number	Not regulated
	UN Proper Shipping Name	Not regulated
	Transport Hazard Class(es)	Not regulated

	Transport label(s) required	Not regulated
	Packing Group	Not regulated
	Packaging Instructions	Not regulated

International Maritime Organization

14.9	UN Number	Not regulated
	UN Proper Shipping Name	Not regulated
	Transport Hazard Class(es)	Not regulated
	Transport label(s) required	Not regulated
	Packing Group	Not regulated
	Marine Pollutant	Not regulated
	NA Emergency Response Guide Number (2012)	Not regulated
	Transport in Bulk (Annex II of MARPOL 73/78 and IBC Code)	Not regulated

15. SAFETY, HEALTH and ENVIRONMENTAL REGULATIONS SPECIFIC FOR THE PRODUCT

PROGRAM	Inorganic Phosphorous Compound	Chelate	Organic Acid			
US EPA PROGRAMS						
Clean Air Act Hazardous Air Pollutants	NO	NO	NO			
Safe Drinking Water Act	NO	NO	NO			
RCRA F, K, P, U or D-lists	NO	NO	NO			
Epa Priority Pollutant	NO	NO	NO			
SARA 302 RQ	NO	NO	NO			
SARA 302 TPQ	NO	NO	NO			
SARA 313 LISTED	YES	NO	NO			
SARA CHEMICAL CATEGORIES						
SARA 311/312 ACUTE	NO	NO	NO			
SARA 311/312 CHRONIC	NO	NO	NO			
SARA 311/312 FIRE	NO	NO	NO			
SARA 311/312 PRESSURE	NO	NO	NO			
SARA 311/312 REACTIVITY	NO	NO	NO			
EPA EXTREMELY HAZARDOUS SUBSTANCE	NO	NO	NO			
CALIFORNIA SAFE DRINKING WATER ACT (Proposition 65)						
This product does not contain any chemical listed on the California Safe Drinking Water Act list (Proposition 65)						
US OSHA PROGRAMS						
PEL	NO	NO	NO			
PSM	NO	NO	NO			
CHEMICAL SECURITY PROGRAMS						
DHS CFATS	NO	NO	NO			
CHEMICAL WEAPONS CONVENTION						
	NO	NO	NO			
US DRUG ENFORCEMENT ADMINISTRATION						
DEA Controlled Substances	NO	NO	NO			
CHEMICAL INVENTORY PROGRAMS						

WHMIS	NO	NO	NO			
DSL	YES	YES	YES			
REACH Pre-registered List	YES	YES	YES			
TSCA	YES	YES	YES			
European Inventory of Existing Commercial Chemical Substances (EINECS)	YES	YES	YES			
EU No-Longer Polymers List (NLP)	N/A	N/A	N/A			
EEC Classification Packaging, and Labeling of Dangerous Substances (Annex 1)	Corrosive	NO	NO			
Philippines	YES	YES	YES			
Japan	YES	YES	YES			
Australia	YES	YES	YES			
Korea	YES	YES	YES			
China	YES	YES	YES			
New Zealand Inventory of Chemicals	YES	YES	YES			

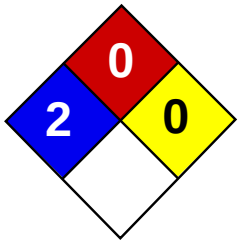
16. OTHER INFORMATION

16.1	Original Preparation	July 2, 1999
16.2	Revision History	February 19, 2004, 28 June 2013; GHS update 24 May, 2016, 7 October, 2016 Content corrections; 23 Aug 2016, information update, format changes
16.3	Prepared by	ADVANCED CHEMICAL SAFETY, Inc. PO Box 152329 San Diego, CA 92195 (858)-874-5577
16.4	Date of Printing	January 29, 2018

DEFINITIONS OF TERMS

16.5	A large number of abbreviations and acronyms appear on a SDS. Some of these which are commonly used include the following:	
	Section 2	**GHS**: Global Harmonization System **OSHA:** U.S. Occupational Safety and Health Administration. **CLP**: Classification and Packaging **WHMIS**: Workplace Hazardous Materials Information System **STOT**: Specific Target Organ Toxicity
	Section 3	**CAS #:** Chemical Abstract Service index number **EINECS #:** European Chemical Substances Information System index number
	Section 5	**NFPA:** Nation Fire Protection Association **Health Hazard: 0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). **Flammability Hazard** **Reactivity Hazard:** Refer to definitions for "Hazardous Materials Identification System". **Flash Point**: Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL:** The lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL**: The highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.
	Section 8	**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE (Not Established)** is made for reference.
	Section 11	**LD_{50}** : Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** : Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm:** Concentration expressed in parts of material per million parts of air or water; **mg/m^3** : Concentration expressed in weight of substance per volume of air; **mg/kg:** Quantity of material, by weight, administered to a test subject, based on their body weight in kg **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.
	Section 12	**LC_{50}:** The lowest concentration in water which kills 50% of the test subjects. **EC_{50}:** The Effect Concentration in water at which 50% of the test species if affected.
	Section 13	**US EPA Hazardous Waste Codes**: refer to 40 CFR 261.20
	Section 14	**DOT**: US Department of Transportation **IATA**: International Air Transport Association **IMO**: International Maritime Organization **MARPOL:** International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 **IBC Code** : Merchant Shipping Code
	Section 15	**RCRA**: US Resource Conservation and Recovery Act **SARA:** US Superfund Amendments and Reauthorization Act **PSM**: US OSHA Process Safety Management **CFATS:** US Department of Homeland Security Chemical Facility Anti-terrorism Standard **DSL:** Canadian Domestic Substances List **NDSL:** Canadian Non-Domestic Substances List **REACH**: European Registration, Evaluation, Authorization and Restriction of Chemicals list **TSCA:** US Toxic Substances Control Act





Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Sodium metabisulfite MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium metabisulfite

Catalog Codes: SLS3025

CAS#: 7681-57-4

RTECS: VZ2000000

TSCA: TSCA 8(b) inventory: Sodium metabisulfite

CI#: Not available.

Synonym: Disodium disulfite; Disodium pyrosulfite; Sodium Pyrosulfite; Sodium Metabisulphite

Chemical Name: Pyrosulfurous acid, disodium salt

Chemical Formula: Na2S2O5

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
Sodium metabisulfite	7681-57-4	100

Toxicological Data on Ingredients: Sodium metabisulfite: ORAL (LD50): Acute: 1131 mg/kg [Rat]. DERMAL (LD50): Acute: >2000 mg/kg [Rat]. >1000 mg/kg [Guinea pig].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung irritant). CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs 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. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get 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:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

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: 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.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes of SOx, Na2O. Decomposes on heating to form sodium sulfate

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. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 locked up.. Do not ingest. Do not breathe dust. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive. Air Sensitive

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: Safety glasses. Lab coat. 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. 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: 5 (mg/m3) [United Kingdom (UK)] TWA: 5 (mg/m3) from ACGIH (TLV) [United States] TWA: 5 (mg/m3) from NIOSH [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid or Powdered solid.)

Odor: odor of sulfur dioxide

Taste: Not available.

Molecular Weight: 190.13 g/mole

Color: White to yellowish.

pH (1% soln/water): 4.3 [Acidic.]

Boiling Point: Not available.

Melting Point: Decomposition temperature: 150°C (302°F)

Critical Temperature: Not available.

Specific Gravity: 1.4 (Water = 1)

Vapor Pressure: Not applicable.

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, hot water. Freely soluble in glycerol. Slightly soluble in alcohol. Moderately soluble in ethanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat, moisture, air, dust generation.

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Moisture sensitive Air sensitive. It slowly oxidizes to sodium sulfate upon exposure to air and moisture. Incompatible with sodium nitrite

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1131 mg/kg [Rat]. Acute dermal toxicity (LD50): >1000 mg/kg [Guinea pig].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: upper respiratory tract, skin, eyes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic) based on animal test data. May cause adverse reproductive effects based on animal test data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: May cause eye irritaiton. Inhalation: May cause respiratory tract irritation with coughing and wheezing. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation irritation with abdominal pain, nausea, vomiting, diarrhea, violent colic, and possible gastri hemorrhaging. May affect behavior/central nervous system and cause central nervous system depression/seizures. It may also affect the cardiovasular system (hypotension, tachycardia, cardiovascular collapse), Ingestion of sulfite compounds may cause a severe allergic reaction (anaphylactoid symptoms) in sensitive individuals and some asthmatics. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause allergic dermatitis. Ingestion: Prolonged or repeated ingestion may affect the liver, urinary system, and metabolism (weight loss). Future exposures may also cause asthma like allergy with coughing, shortness of breath, wheezing and/or chest tightness. Inhalation: Prolonged or repeated inhalation may irritate the lungs, may cause bronchitis to develop with cough, phlegm and/or shortness of breath.

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:
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 (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Sodium metabisulfite Illinois toxic substances disclosure to employee act: Sodium metabisulfite Rhode Island RTK hazardous substances: Sodium metabisulfite Pennsylvania RTK: Sodium metabisulfite Minnesota: Sodium metabisulfite Massachusetts RTK: Sodium metabisulfite New Jersey: Sodium metabisulfite California Director's List of Hazardous Substances: Sodium metabisulfite TSCA 8(b) inventory: Sodium metabisulfite TSCA 4(a) ITC priority list: Sodium metabisulfite TSCA 8(a) PAIR: Sodium metabisulfite TSCA 8(d) H and S data reporting: Sodium metabisulfite: effective: 1/26/94; sunset: 6/30/98

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

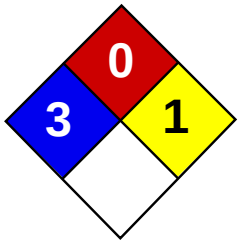
Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Sulfamic acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfamic acid

Catalog Codes: SLS2068, SLS3490

CAS#: 5329-14-6

RTECS: WO5950000

TSCA: TSCA 8(b) inventory: Sulfamic acid

CI#: Not available.

Synonym: Amidosulfonic acid

Chemical Name: Not available.

Chemical Formula: NH2SO3H

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
Sulfamic acid	5329-14-6	100

Toxicological Data on Ingredients: Sulfamic acid: ORAL (LD50): Acute: 3160 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). Hazardous in case of skin contact (permeator). 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:
Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). Hazardous in case of skin contact (permeator). 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 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. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

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:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : 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. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

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:
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. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate.

Section 7: Handling and Storage

Precautions:
Keep container dry. 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

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

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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 97.09 g/mole

Color: Not available.

pH (1% soln/water): 1 [Acidic.]

Boiling Point: Not available.

Melting Point: Decomposes. (205°C or 401°F)

Critical Temperature: Not available.

Specific Gravity: 2.15 (Water = 1)

Vapor Pressure: Not applicable.

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: 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: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3160 mg/kg [Rat].

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive solid.

Identification: : Sulfamic acid : UN2967 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sulfamic acid

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

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R35- Causes severe burns. R43- May cause sensitization by skin contact.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection: j

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

Health: 3

Flammability: 0

Reactivity: 1

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 08:29 PM

Last Updated: 05/21/2013 12:00 PM

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Appendix F



Saltworks Technologies Inc.

SaltMaker Operating Manual

Revision 10

CONFIDENTIAL INFORMATION

www.saltworkstech.com

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1 Safety

This section highlights the safety considerations during installation, operation, and maintenance of a SaltMaker plant. Operating ranges and constraints are given and must be followed for reliable and safe operation.

1.1 Personal Protective Equipment (PPE)



Figure 1: PPE required

The following PPE are required for operation of the SaltMaker:

- CSA approved safety boots.
- Safety glasses for eye protection.
- Long sleeves and pants for skin coverage.
- Appropriate gloves for skin protection.
- Hardhat and full face shield when appropriate (e.g. chemical handling).
- Hearing protection inside balance of plant containers when appropriate (e.g. working near air compressors or tank pneumatic vibrators – note that the vibrators are optional).
- Respirators when appropriate (e.g. chemical handling).
- Hardhat when appropriate (e.g. construction work)

1.2 General Safety

- Identify hazards and take proper steps to reduce or eliminate them before commencing work.
- Know and correctly use PPE for Plant operation.
- Know evacuation routes and keep them clear of all objects.
- Know the locations of Plant Emergency Stop buttons.
- Know the locations of Plant Safety Data Sheets (SDS) and ensure SDS is up to date.
- Know how and where to isolate sources of energy, such as electrical, thermal, compressed air etc.
- Know the locations of safety equipment (fire extinguisher, eye wash station).
- Establish a list of emergency contacts that is easily accessible by operators. (e.g. plant manager, fire, police).
- Understand potential physical and chemical hazards associated with plant operation.
- Ensure tools and equipment are in good working condition before use.
- Watch for slips, trips and elevation hazards.
- Prior to getting to task, stop and think about the safety of you and your co-workers.
- Follow site specific safety regulation and consult with safety authority if required.

1.3 Hazards and Awareness

A hazard review with a qualified individual should be conducted before operations. Personnel should complete risk assessments prior to commencing operation of the SaltMaker. Operators should pay particular attention to the water source and hazards it may pose when water is concentrated or stored in open-top tanks. If a new water source is being operated, a qualified chemist or engineer should be consulted. Lock-out procedures shall be followed. SaltMaker specific hazards and precautions are summarized below.

- Tripping hazards (structure/piping across floor). Uneven floors.
- Slippery surfaces – clean spills and keep floor dry.
- Splashing (skin/eye protection) – exercise care when filling tanks.
- Low ceiling/pipe height – take care when moving in passageways and moving around equipment.
- Voltage/current (disconnect & lockout before servicing) – ask a qualified electrician to perform work on electrical systems.
- High temperature water and steam: take extra precaution when in the vicinity of heat sources and hot water.
- Pressurized piping: confirm isolation and bleed down system prior to work on any pressure system. Only qualified personnel are to open, and work on pressure systems.
- Process Chemicals - check site SDS for before use; process fluid in the SaltMaker is being concentrated and hazards may be amplified.
- Compressed air & high pressure liquids – take caution when connecting, purging, and disconnecting lines, regularly inspect hoses and fittings for leaks or wear.
- Noise - hearing protection is required near air compressor or other noisy equipment
- Ergonomics - provide adequate task lighting, kneeling pads as necessary.
- Working at height per site specific regulation (e.g. Wear fall protection above 10 ft)

1.4 Emergency Stop

Multiple emergency stops (E-stops) are located around the plant for an immediate shut-down if operators notice conditions that place operators and other personnel in danger (ex. smoke, burst pipes etc). Pressing the E-stop will initiate a stop to all motors and processes. Once stopped, the SaltMaker will cool down and process fluid will likely crystallize inside the plant. If the hazard is removed, release the E-stop and initiate a normal shutdown flush. The normal shutdown sequence flushes the plant of process fluid and ensures that internal crystallization does not occur.

If an E-stop is pressed and the plant cools for greater than 20 minutes, there is a very high likelihood that after an emergency stop, operators will face:

- Damaged pump seals
- Salt crust formation and clogged pipework

These risks can be mitigated by completing a “pre-startup flush” prior to starting up. This can be activated in the “Overview” tab. Refer to *Appendix K: Salt Crust Prevention and Instructions* and *Appendix AJ: Shutdown Guide* for more details.

1.5 Operating Ranges and Constraints

For the safety of the operator and protection of equipment, all inlet water must be within operating range of the SaltMaker.

- Operating pressure 100-150 kPa / [15psi]
- Max operating pressure 700 kPa / [100psi]
- Max operating temperature 90 °C / [194 °F]
- Max/min heat source temperature 120 °C/60 °C [248 °F/140 °F]
- Air loop pressure < 15 kPa [2.2 psi]
- Compressed air system built in, 150 psi
- Outside temperatures -40 °C to +40 °C / [-40 °F to 104 °F]

Inlet Specifications

- Inlet suspended solids < 1 mm (basket strainer)
- Inlet total dissolved solids (TDS) *No limit
- pH: 2 < pH < 11
- Organics *No limit
- Hydrocarbons *No limit
- Chlorides *No limit

Feed water must be chemically compatible with wetted parts: CPVC, PVC, solvent glue joints, polypropylene (PP), polyethylene (PE), fiber reinforced plastic (FRP), noryl, and titanium.

The equipment within the SaltMaker is not explosion proof rated, therefore flammable fluids and vapors should not be treated in this system.

The SaltMaker heat recovery module (radiator) uses titanium heat exchangers to transfer heat between air and brine. Titanium heat exchangers have excellent corrosion resistance to concentrated brine. However, titanium is not immune to all types of corrosion. Ensure compatibility of the process brine and titanium before operating the SaltMaker. Contact Saltworks if unsure.

All personnel must be familiar with this manual and the Manufacturers Data Registry (MDR) before operating or maintaining the SaltMaker. The MDR contains piping and instrumentation diagrams (P&ID), electrical schematics, operating and maintenance manuals, datasheets and other useful documentation. Original manufacturer's documentation is included in the MDR. Operators must be familiar and skilled with water pumps and piping systems.

Inappropriate SaltMaker operation or maintenance will void Saltworks' warranty.

2 Process Understanding

This section outlines a high-level process overview of the SaltMaker, followed by operating procedures. General maintenance and troubleshooting procedures are found in the appendices.

2.1 SaltMaker Process Overview

The SaltMaker plant is based on a humidification-dehumidification (HDH) cycle to produce condensed water and concentrated brine/solid salt. To increase energy efficiency and production, the SaltMaker uses a multiple effect humidification concept. Moderate grade heat (80° to 100°C) is used to evaporate and condense water in an air stream in successive effects. The latent heat of condensation is recycled as it is downgraded, with each effect operating at 10-15°C lower than the previous effect. Each effect is operated in series. Within these effects there are multiple sets, which operate in parallel. See illustration below:

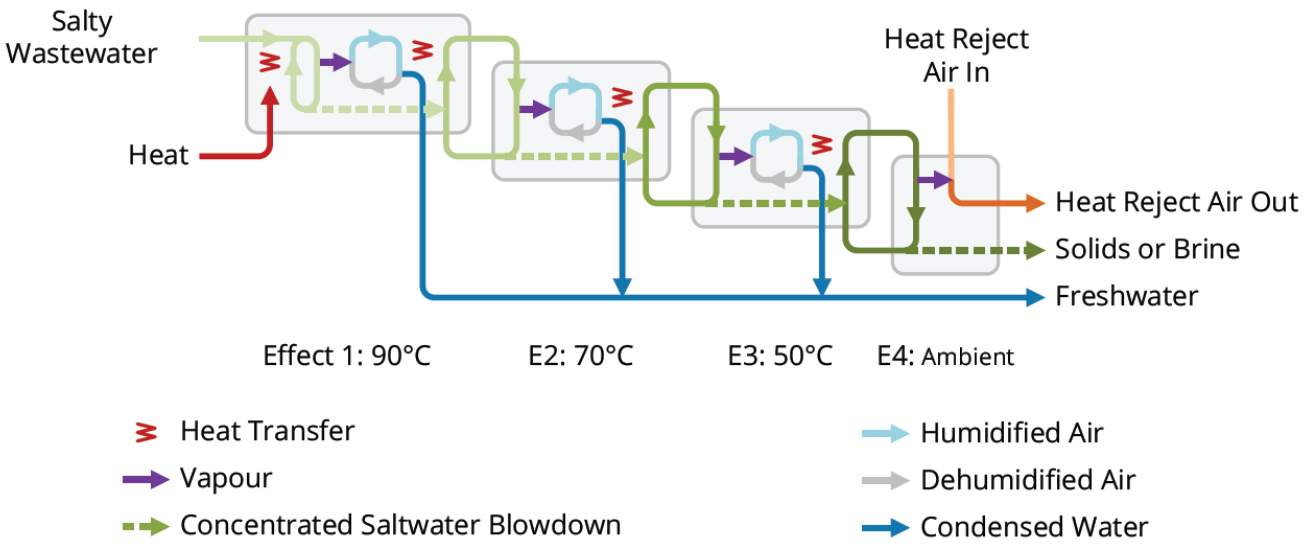


Figure 2: Simplified SaltMaker Process

A simplified process diagram shows how saltwater feed is transferred from effect 1 to subsequent effects. Note that the diagram describes a four effect SaltMaker with the first three effects being closed air loop and the fourth effect open to atmosphere. Depending on the model, there may be four or five effects in a SaltMaker with the final effect being open to atmosphere or closed air loop system for zero air emissions. Further note that the plant is normally configured such that effect 1, 4, 5 concentrate the saltwater, and then blow down process fluid to effects 2 and 3 for crystallization. Please refer to your plants' specific design PFD for details.

2.2 Humidification – Dehumidification Cycle

The SaltMaker concentration process involves concentrating feed water through a humidification – dehumidification (HDH) process. This is a low temperature process, which enables use of fiberglass reinforced plastic (FRP) for plant module construction, and CPVC and PVC for the pipe work system.

Each effect operates at a lower temperature than the previous effect. All except the final effect operate in closed loop configuration at higher temperatures to increase plant capacity while the final effect operates in open. Air can hold more moisture per unit volume at higher temperatures. The SaltMaker capacity will increase when effect 1 is ran at a higher temperature. Ideally the plant will operate at its maximum E1 temperature of 90°C to maximize capacity.

The final effect operates at near wet bulb temperature (lowest temperature of all effects) in an open-air loop configuration. For emission concerns, there is an option to run the final effect in closed-air loop.

2.3 SaltMaker Effects

The SaltMaker can be composed of four or five effects. In the first effect of both a four and five Effect SaltMaker, the process water is heated by an external thermal source. Process water in successive effects is heated by latent heat of condensation in the heat recovery module of the previous effect. This process allows the SaltMaker to use the recycled heat four or five times to drive evaporation. The final effect operates at the lowest temperature.

2.4 Brine or Solids Extraction System

The SaltMaker can be designed to produce a concentrated brine or solids for discharge. If the brine extraction option is selected, brine from the most concentrated effects, typically effect 2 and 3, is discharged out of the plant either continuously or in batches. If the solid extraction option is selected, a salt bagging system filters out solids from a high solids content brine, which allows for solids for disposal.

2.5 Freshwater System

The freshwater system collects SaltMaker condensed water and delivers it to either the self-cleaning system or discharges it from the SaltMaker plant for re-use, further treatment of volatiles such as ammonia, or disposal. Types of wash are described below. Optional systems for further treatment of SaltMaker condensed water is described in section 3.2.

2.6 Self-Cleaning System

The self-cleaning system is critical for SaltMaker maintenance and operation. It aids in salt crust removal on equipment and ensures longevity of the plant. Periodically flushing each effect with lower salinity water (condensed water or raw feed) removes salt crust build up, reduces maintenance and keeps wetted parts of equipment operating smoothly. Described below are the different types of SaltMaker washes. CIP and wash frequency varies with water chemistry, operator should develop and follow an effective CIP and wash regime that aims to prevent irreversible scaling while minimizing brine dilution and capacity hit.

2.6.1 CIP (Clean-in-place)

CIP is a thorough wash that flushes an entire effect. Depending on the water chemistry and type of scale, CIP could be basic, acidic, or neutral pH, or use of any other chemicals (dependent on what is scale is present). Once a CIP is initiated on an effect (automatically or manually), the effect brine is sent to the effect hold tank. The effect is filled with the selected CIP fluid, which is circulated in a closed loop for a user-set duration to clean the pumps, piping, sensors, and modules. After the CIP is completed, CIP fluid is sent back to the CIP tank for re-use, unless the CIP fluid is above a certain conductivity that is considered "spent" and no longer has enough cleaning power, in which case it is processed by the system. Otherwise, the effect is re-filled from either effect hold, system hold, or raw feed, depending on which effect it is, and resumes normal operation.

2.6.2 Pump Seal Flush

The pump seal flush is a short wash that sends a slug of raw feed or condensed water to the pump seal. It is always initiated when an effect pump is starting up or shutting down. It can also be initiated by timer or manually for a user-set duration during normal operation. This helps to prevent salt crystals from accumulating near the pump seals and are crucial for long term reliability of the SaltMaker. Pump seals are wear and tear/consumable parts but salt crystal accumulation wears out the pump seals faster and causes premature failure of the pump.

2.6.3 Level Sensor Wash

The level sensor wash is a short wash that sends a slug of raw feed or condensed water to the wetted surface of a level sensor that is located on a high salinity tank. It can also be initiated by timer or manually for a user-set duration during normal operation. This helps remove solids build up at the wetted surface of the sensor and prevents false tank level measurement.

2.6.4 Radiator Wash

The radiator wash cleans the outside surface of the titanium radiators in heat recovery modules by spraying condensed water. It can be initiated by timer or manually for a user-set duration. It helps to wash off deposit that may be carried over by the circulating air.

2.6.5 Superflush

Superflush is an extended and thorough wash that requires the plant to be offline; therefore, it generally lasts a few days. All effects send the brine to the system hold tank and get refilled with condensed water from the clean reserve tank. The effects circulate the condensed water at the normal operating temperature. Any condensed water produced is recycled back to the system. At the end of the superflush, the plant returns to normal operation while the spent superflush water remains in the system to be treated at the same time. It is highly recommended to perform Superflush periodically. Frequency will depend on water chemistry and plant operations.

2.6.6 Shutdown and Start-up Wash

Shutdown washes should be performed before plant shut down to remove concentrated brine from the SaltMaker pipework to prevent potential salt crystallization and clogging in valves, pumps, or pipework. The shutdown wash sequence is automated. Before shutting down the SaltMaker, confirm the appropriate SHUTDOWN WASH MODE is selected for each effect, and the system will perform the proper washes before shutting down. See Section 5.7 Shutdown for description of the different types of shutdown wash.

Before commencing SaltMaker operation after an emergency stop or alarm trip with no shutdown wash, the operator should perform a start-up flush. This wash cycle will aid in removing any crystallized salts resulting from concentrated brine remaining in the system. This is important to protect equipment (e.g. pumps, valves, pipe work) and to ensure SaltMaker reliability. The pre start-up flush is manually initiated by selecting "FLUSH NOW" under the "Overview" plant start-up settings tab on the HMI.

2.7 P&ID and Tagging System

Depending on contract agreement, the plant may be tagged in Saltworks' tagging system or in accordance with customer provided tagging scheme. Please refer to the plant owner's tagging specification for description of non-Saltworks tagging scheme.

Saltworks tags include the component name, component size, drawing number, SaltMaker effect number, and a sequential number. For complete listing, refer to the legend page of your P&ID.

3 SaltMaker Construction

This section describes the major physical components of the SaltMaker system.

3.1 SaltMaker System

The SaltMaker is designed for full modularity; everything from individual subsystems to plant packaging is modular. Modularity offers the following benefits:

- Rapid site dispatch, simple site installation, and flexibility for future plant capacity expansion by adding additional "blocks".
- Transport and installation using readily available trailers and cranes.
- Each module is mass produced and quality assured for repeatable production.
- Modules slide in and out for easy installation, cleaning, and replacement. (see Figure 7: Module Removal by Forklift)
- Modules can be cleaned by "power washing" and then reinstalled.



Figure 3: Repeatable Mass Produced Evaporation Modules



Figure 4: Fan Modules



Figure 5: Heat Recovery Modules (Radiator)



Figure 6: Assembled Modules



Figure 7: Module Removal by Forklift

Future expansion can be achieved with the addition of side-by-side SaltMaker sub-systems. A SaltMaker consists of the following core elements:

A. Two or three lower level 40’ Balance of Plant (BOP) open concept containers
B. Four or five upper level 20’ effects, with two said effects placed on one lower BOP Container
C. Four or five piping cages, one on top of each upper level 20’ effect
D. Work platforms between and beside each BOP container, allowing for maintenance access to effects.

The above core elements are shown in the figure below. Developing larger plants or expanding an existing plant requires additional elements, modules, and containers. For larger plants, some ancillary services may be shared. For example, larger air compressors and hot water heaters may be installed in place of multiple smaller units.



Figure 8: SaltMaker Isometric View: 2 x 40’ BOP & 4 x 20’ Effects + Work Platforms

3.1.1 Open concept Containers

Each main floor container houses Balance of Plant (BOP) systems. These systems include saltwater inlet, heat recovery, freshwater, hot wash, electrical, controls, and air distribution.

3.1.2 Frames

Four or five 20’ frames are placed on top of each container. Their purpose is to provide structure and support for standard evaporation, heat recovery, and fan modules.

3.1.3 Effects

Each SaltMaker effect is made up of repeated units which slide in and out of the ISO container structure for ease of site construction and service.

3.1.3.1 Evaporation Module

Heated water enters the top of the module and moves through the packing. Some of the water evaporates as air passes through the packing, concentrating the brine solution.

3.1.3.2 Heat Recovery Module

Water vapor condenses on the heat recovery heat exchanger, producing freshwater. The condensing water vapor transfers latent heat of condensation to the heat exchanger surface, which warms the brine solution of the subsequent effect.

3.1.3.3 Fan Module

The fans move air around the humidified air loop. There is one fan module per closed air loop effect. There are two fan modules per open air loop effect.

3.1.3.4 Blowers

Blowers may be installed in lieu of fan modules in some plants. They are installed at fan ducts for closed air loop effects. For open effects, blowers are installed at fan duct inlets and/or outlets.

3.1.3.5 Fan Duct

The fan duct connects end modules together for humidified air to flow through. The final effect is normally open to atmosphere and does not include an air duct. Instead, air is driven in parallel by two fan modules and flows through two ducts.



Figure 9: SaltMaker Effect



Figure 10: Site Installation



Figure 11: Evaporation Module



Figure 12: Heat Recovery Module



Figure 13: Fan Module

3.1.4 SaltMaker Tanks

The SaltMaker are made with fiber-reinforced plastic (FRP), polyethylene or polypropylene. Tanks holding high salinity water are usually cone bottom tanks to prevent sedimentation while clean water tanks are usually flat-bottomed. Each tank has a level indicator attached for easy level identification. The tanks include a variety of drains and process instrument attachments per your P&ID.

3.1.5 Tank Pneumatic Vibrators (optional)

Tank pneumatic vibrators are used to agitate and keep saturated fluids from coagulating in the brine tank to prevent clogging of pumps, pipes and valves. Tank pneumatic vibrators are triggered by operator-set timers. Pneumatic vibrator function is readily confirmed by noise. If vibrator failure is suspected, the vibrators should be removed and replaced. The problematic units can be sent to Saltworks for rebuild.

3.1.6 Solids Management System (optional)

The solid management system consists of a series of tanks, pumps, and solid extraction skids that enable solid content in the brine to settle and be extracted. Effect hold tanks receive brine from an effect when the brine has reached a certain conductivity or density indicating it is time for a solid extraction. The brine remains in the effect hold for a user-set settling time. After settling, the bottom portion of the brine where solids have settled is sent to the solids extraction skid or discharged out of the plant as slurry, and the top clarified portion will be returned to the effects to be further concentrated.

If you plant includes solids extractions skids, they work by pumping solid-dense slurries into water-permeable bags. The brine entrained in the solids is drained, collected and sent back to the effect tanks, leaving solids behind in the bag. Once the bag is full per the automatic weight measurement system, the bag is moved by a forklift to a dewatering basin for further drying, as seen in Figure 14: Removing a Bag from Solid Extraction Skid by Forklift. Solids extractions are automatically triggered by the control program based on timer and/or conductivity and/or density.



Figure 14: Removing a Bag from Solid Extraction Skid by Forklift

3.1.7 Pump Skids & Pipework

The SaltMaker uses various types of pumps depending on the function and fluid, and are usually mounted on a pump skid that includes the pipe work and instrument necessary to connect to other parts of the plant.

Centrifugal pumps are used to circulate brine in each effect, they come with variable frequency drives that provide controlled start-up and shut-down of the plant. The electrical draw of the VFD pump is monitored for indication of system fouling. Diaphragm pumps are used to handle high solids fluids and may be electrically or pneumatically powered. They could also be operated at variable speed if installed with a VFD or an air regulator.

The SaltMaker effect pipework is constructed from schedule 80 CPVC. CPVC can operate reliably up to 90°C at low pressures. Depending on the project, there are options that effects and ancillary systems operating at lower temperature may be constructed from schedule 80 PVC pipe. PVC can operate reliably at up to 60°C.

3.1.8 Thermal Source

The thermal source system provides the heat energy the SaltMaker requires for treatment of brine solutions. The main components of this system are titanium heat exchangers used to transfer heat from the thermal source (90°C to 120°C) to effect 1 brine. The effect 1 heat exchangers are supplied with a hot fluid provided by external means (usually hot water or glycol). The hot fluid provides the energy required for evaporation of brine in the 1st effect. The maximum temperature of effect 1 brine is 90 °C. This heat is recycled to the subsequent effects through the heat recovery modules.

3.1.9 Electrical and Control System

The electrical system provides the required power for pumps, fans, and controls. The control system consists of an industrial Programmable Logic Controller (PLC), Input and Output (I/O) modules and networking hardware, and the human machine interface (HMI). See figure below for an overview of the electrical and control system.

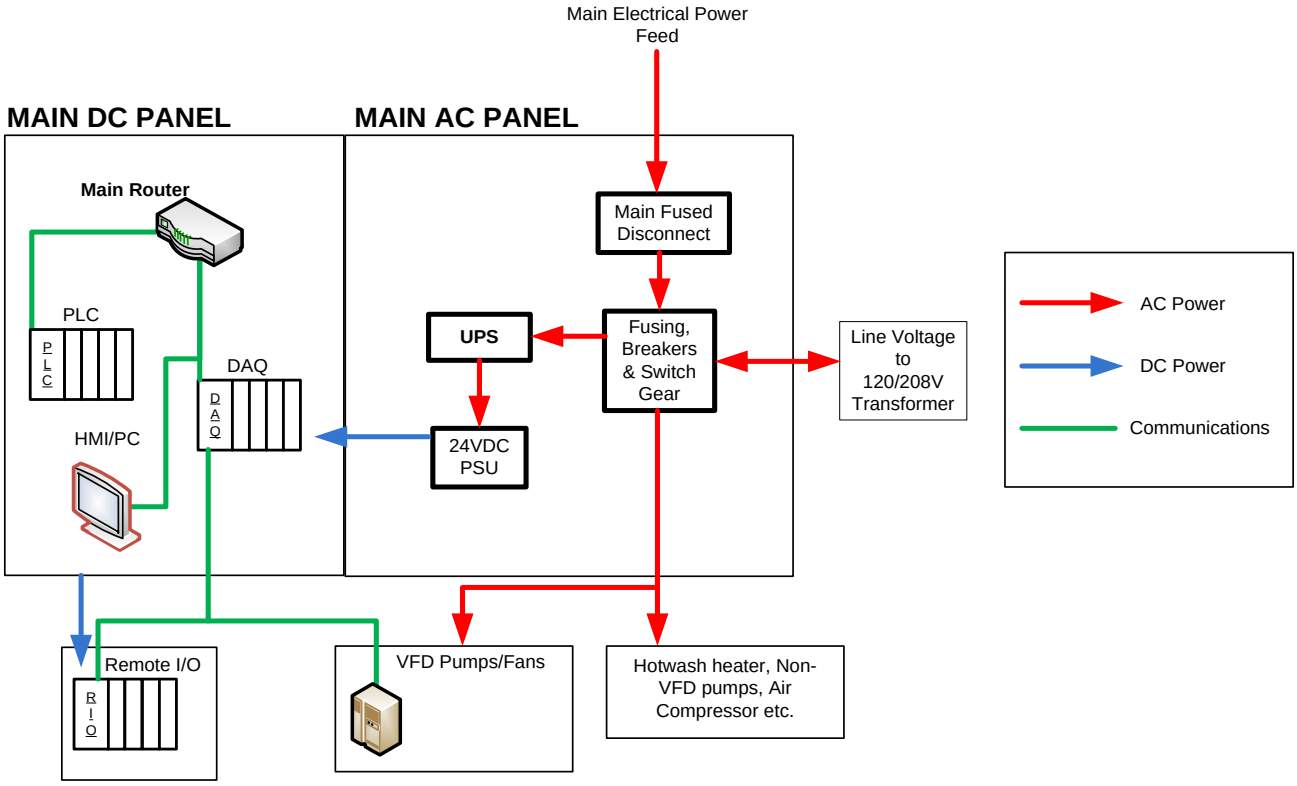


Figure 15: Electrical & Control System Architecture

3.1.9.1 Main AC Panel

The Main AC Control Panel is located in the electrical section in one of the BOP containers, and supplies AC three-phase power to Satellite AC Effect panels as well as BOP level equipment. This panel houses power distribution hardware and circuit protection devices for the freshwater system pumps, air compressor and other equipment. The main AC control panel also houses redundant low voltage DC power supplies for instrumentation and control, as well as an uninterruptable power supply to protect sensitive equipment. The uninterruptable power supply has approximately 90 minutes (depending on project requirement) of backup power for control power only. When backup power runs low, the unit will initiate a proper shutdown on the HMI PC. The figure below shows the AC panel and the main disconnect for the SaltMaker plant.

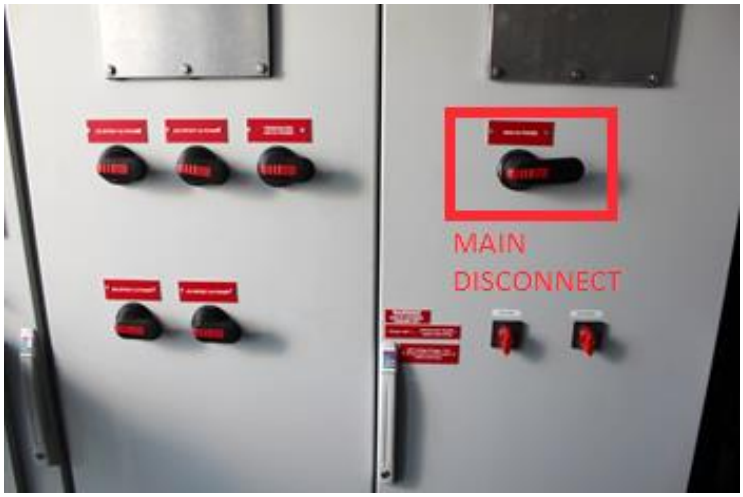


Figure 16: Main AC Panel

3.1.9.2 AC Step down Transformer

The transformer on the other side of the AC panel converts high voltage (480V or higher) VAC into 120V/240V for controls, instrumentation and container infrastructure power. This includes lights, ventilation fans, and receptacle power. Do not place any objects on the transformer – it will get hot and could cause serious damage.

3.1.9.3 Satellite AC Effect Panels

The Satellite AC effect Panels house variable frequency drives that control motors for the process pumps and fans. The panels obtain power from the Main AC Panel. Variable frequency drives allow the control system to adjust the speed of AC motors that drive pumps. The drives can also monitor torque, current, and pump load. This data gives operators information about process conditions such as the degree of scaling or fouling inside pumps and pipes.



Figure 17: AC VFD Pump Panel

3.1.9.4 DC Control Panel and Satellites

The Main DC panel and satellite DC panels house the instrumentation and control gear. The main DC panel (located beside the main AC Panel) houses the main PLC that controls all plant functions.

The PLC handles logic and controls the plant operation based on user inputs from the HMI and sensor feedback from the process. I/O modules on the PLC are connected to sensor signals. Remote I/O units are installed inside Satellite DC Control Panels to gather all instrument data and convert the data to an Ethernet signal to send to the main PLC. This enables modular expansion while minimizing cable runs and risk of cable damage.

3.1.9.5 Compressed Air & Air Satellite Panels

The compressed air system is an important component of the SaltMaker. The system provides air to

- Control actuated valves to direct fluid flow, which is critical for start-up, shut down, and cleaning cycles.
- Energize pneumatic vibrators (optional) to prevent salt bridging in brine tanks.
- Energize air operated diaphragm pumps for fluid transfer and solid extraction (refer to P&ID for specific SaltMaker systems).

The compressed air system includes the air compressor, particle and coalescent filters, air dryer and pneumatic lines to valves and valve banks. Filtered air is provided to air satellite panels that house solenoid valve banks. When initiated, these solenoid valve banks provide air to the solenoid valves that power the pneumatic equipment, turning them on or off.

3.1.9.6 Instrumentation and Automation

The SaltMaker system uses a variety of sensors and automation hardware to achieve reliable plant operation. Sensors include temperature, pressure, flow, level, conductivity, pH, density, weight, overflow detection (optional), main power current and air flow. Saltworks uses standardized 4-20 mA analogue sensor outputs to minimize signal loss. 4-20mA signals are read by input/output (I/O) modules on the PLC or Remote I/O units.

The SaltMaker uses the following types of instruments:

Pressure:

These sensors are used to measure pressure in pipe (i.e. pump discharge, evap nozzle inlet). Trends in pressure readings can help the operator identify pipe scaling/plugging. It can also be used to identify pump problems.

These pressure sensors use piezo-resistive measuring cells (similar to a strain gauge) to measure pressure being applied on the sensor connector. A built-in transmitter amplifies this signal and converts it into 4-20mA to communicate with PLC modules.

Level:

These sensors are used to measure the level on SaltMaker tanks. Different types of sensors are used depending on the fluid and process conditions.

> ***Pressure:*** these sensors use piezo-resistive measure cells that are calibrated at high resolution to measure level changes in tanks. They are mounted near the bottom of the tank. Because they measure hydrostatic pressure, they are affected by density changes of the fluid.
>
> ***Ultrasonic:*** these sensors send ultrasonic sound pulses and measure the time it takes for the pulses to reflect and bounce back from the process medium below and return to the sensor. This is translated into a level measurement. These sensors are mounted on top of the tank and do not come into direct contact with process fluids.
>
> ***Radar:*** these sensors send radar pulses and measure the time it takes for the pulses to reflect and bounce back from the process medium below and return to the sensor. This is translated into a level measurement. These sensors are mounted on top of the tank and do not come into direct contact with process fluids. In general, radar has performance and reliability advantages over ultrasonic. Suitability of radar vs. ultrasonic sensors depend on actual tank conditions and is outside the scope of this manual.

Level sensor feedback allows for automated level control by filling and transfer of water in process tanks. The system is vital to continuous operations of the SaltMaker. Proper SaltMaker operations produce a unique saw-tooth pattern on main effect tank levels, with a slow decrease in tank level due to evaporation and a fast increase in levels due to transfer of process fluids into the tank. Automated level warnings help operators locate issues before they become serious enough to interrupt operations.

Conductivity:

These sensors are used to measure conductivity of water, which is proportional to the ionic or salt concentration of the water. The SaltMaker deploys two different types of conductivity sensors:

> ***Contacting conductivity sensors:*** These sensors employ a potentiometric method. Two or four electrodes are submersed in the sample fluid. The sample fluid completes the electrical circuit. An alternating current is applied on the electrodes and the voltage potential is measured. This voltage potential is proportional to the conductivity of the fluid. Saltworks uses this type of sensor to measure conductivity range from 0-5mS.
>
> ***Inductive conductivity sensors:*** Two coils are wound inside the ring-shaped sensor. One coil drives a magnetic field with a known voltage and induces a current on the second coil. This current is proportional to the conductivity of the measured fluid. This type of sensor is suitable for measuring conductivity in the 5-1000mS range.

Conductivity sensor signals help operators monitor concentration of process water in different effects. By tracking an increase in concentration of brine over time, these sensors ensure that the SaltMaker is functioning normally.

pH:

These sensors contain a potentiometric cell made of pH-sensitive electrodes. Voltage is measured across the electrodes and the signal is amplified and processed into a 4-20mA signal. PH sensors help monitor condition of treated and untreated water. They are also used in optional acid and base dosing systems to monitor and control pH to adjust solubility of the process water to different salts.

Temperature:

These sensors measure the temperature of the process streams in the SaltMaker. The SaltMaker uses resistive RTDs (resistance temperature detectors) which are sensors that change in resistance due to a change in temperature. This signal is amplified and processed into a 4-20mA signal with a transmitter.

Temperature differences between the effects provide the main driving force for the humidification-dehumidification (HDH) process. Abnormal temperature differences would indicate problems with heat transfer between one effect and the other. These sensors help operators track temperature across all the effects to confirm normal operation.

Flow:

These sensors measure and totalizes flow through a pipe. In the SaltMaker, electromagnetic flow meters are used. These in-line sensor measures induced voltage generated by a conductive fluid as it flows through a pipe and converts the data into a flow rate. Flow sensors are usually located at plant inlet and discharge lines and provides valuable data for evaluating plant capacity and performance.

Density:

The SaltMaker uses direct insertion type of density meter that contains vibration tines, piezo-electric cells, and temperature sensors. As density of the fluid changes, vibration frequency of the vibration tines changes, which is detected by the piezo-electric cells. The transmitter continuously calculates a temperature compensated

density based on the vibration frequency. Density meters are used to determine when sufficient settling time has occurred in the tank and when is it time to start or stop sending slurry to the solids extraction skid.

Air Flow:

Air Flow mass meter measure SCFM of air flow through a pipe. It measures flow by maintaining one probe warmer than the other, calculates mass velocity from the amount of heat conducted away by the flowing gas, and then calculates the flow on the basis of pipe area. Air flow mass meters helps detect air leaks, and when connects to a pipe that supplies an air diaphragm pump, helps indicate when there's pluggage (no air mass flow) or when the tank is empty (high air mass flow).

Weight:

Load cells are located on the solids extraction skids to measure mass of the salt bag. Base on the mass, the controls program can determine if a bag is full or available, allowing automated solids extraction.

Main Power Current:

Current sensor measures electrical current in main power line.

Overflow Detection (Optional) :

Capacitor type sensor detects water overflow from tank or burst rupture disc as a switch to warn operator.

3.2 System Options

3.2.1 Gas Fired Thermal Power Package

Saltworks can provide pre-packaged gas fired water heater packages as the thermal source, while some clients elect to provide their own waste heat or low pressure steam. Please review your project Design Basis, or P&ID for details. Operation of Saltworks gas fired water heater package is outside the scope of this Operating Manual. Documentation for this Thermal Power package will be provided in the MDR if this option is employed on site.

3.2.2 Post Treatment RO

A reverse osmosis (RO) system may be incorporated downstream of the SaltMaker for further polishing of the produced SaltMaker condensed water. For example, the RO system is used in the removal of ammonia which may have "evaporated over" into the condensed water. Detailed RO operating procedures can be found in the *Post Treatment RO O&M Manual* in the MDR.

3.2.3 Acid, Base Dosing Systems

Depending on process water chemistry, an acid or base dosing system may be integrated into the SaltMaker processes. Acid dosing can be employed to reduce scale formation (e.g. carbonates) or to preferentially keep some compounds dissolved in the brine (e.g. ammonia) by adjusting the pH of the brine between pH 3 – 5. Similarly, base dosing can also be employed to keep compounds dissolved (e.g. hydrogen sulfide) by adjusting brine pH between pH 9 – 10.

The acid/base dosing system consists of dosing hardware as well as pH probes installed on the process water line that continuously measure pH. Should the solution pH fluctuate above or below the operator set point, acid or base solution will be dispensed to the appropriate tank by a metering or diaphragm pump. Operating procedures on acid and base dosing systems can be found in *Appendix I: Acid & Base Dosing System O&M*.

3.2.4 Antifoam Dosing System

Depending on process water chemistry, brine foaming may occur as the process water is concentrated. Foam may overflow from the tank, leading to a containment breach. To keep foaming under control, an anti-foam chemical can be added to the brine tanks. The antifoam system consists of dosing hardware and timer based dosing controls. When antifoam dosing is initiated, compressed air is used to open valves and to power the dosing pump for chemical dispensing into the specific tank. Procedure on how to configure the antifoam dosing system can be found in *Appendix J: Antifoam Dosing System O&M.*

3.2.5 Antiscalant Dosing System

Antiscalant are added to the concentrated brine to inhibit formation of calcium scaling on SaltMaker wetted parts. Contact Saltworks for recommended antiscalant dosing frequency and quantity. The operator would add antiscalant once every X hours for Y dosing rate per project water chemistry.

If an automated antiscalant dosing system is selected with your plant, it consists of dosing hardware and dosing controls that dispenses antiscalant solution into the appropriate tank or pipeline for a user-set amount of time or volume per set dosing rate.

3.2.6 Biocide Dosing System

The biofilm treatment system is used to keep biological growth in the heat recovery modules and basins under control. The system includes a treatment solution holding tank, an air-powered pump, air-actuated valves, and a set of nozzles to spray heat recovery modules. This treatment system distributes a disinfectant mixture to kill micro-organisms and keep slime from forming on heat exchanger surfaces and in collection basins. Details on Biofilm Treatment System can be found in *Appendix L: Biocide Dosing System O&M.*

3.2.7 Solids Extraction Skids

Solids extraction skids consists of water-permeate bags over a large basin, with necessary pumps, valves, and instruments built in. These solids filtering system works by gravity draining high solids brine in large bags. The bags are removable by forklift when they are full to a drying area for further drying then disposal. Brine that passes thought the bags onto the basin is sent back to the SaltMaker to be further concentrated.

4 Operating the HMI

The SaltMaker is controlled by a programmable logic controller (PLC). This PLC communicates to an industrial PC through the plant's network. The industrial PC acts as the human-machine interface (HMI), and allows operators to monitor operating conditions in real time, adjust set-points, and investigate alarms.

All operators should first familiarize themselves with the specific HMI for their plant and the associated process and instrumentation diagrams (P&ID). Without controlling the plant, navigate the control screens and locate all key process devices such as pumps, fans, and actuated ball valves both on the HMI and physically in the plant. The operator must read and understand *Appendix D: SaltMaker Control Philosophy* before starting SaltMaker operations.

The HMI is primarily divided into two sections: controls and indicators. The left side of the HMI houses two levels of controls: plant level ("Main Mode"; upper left) and subsystem level ("Settings"; lower left). The right side of the of the HMI houses indicators that displays the visual depiction of the subsystems and their associated valves, tanks, pumps and other relevant equipment. The emergency stop button ("E-STOP") is located inside the "Main Mode" section in the upper left corner of the HMI. Figure 18 below shows the HMI and the sections.

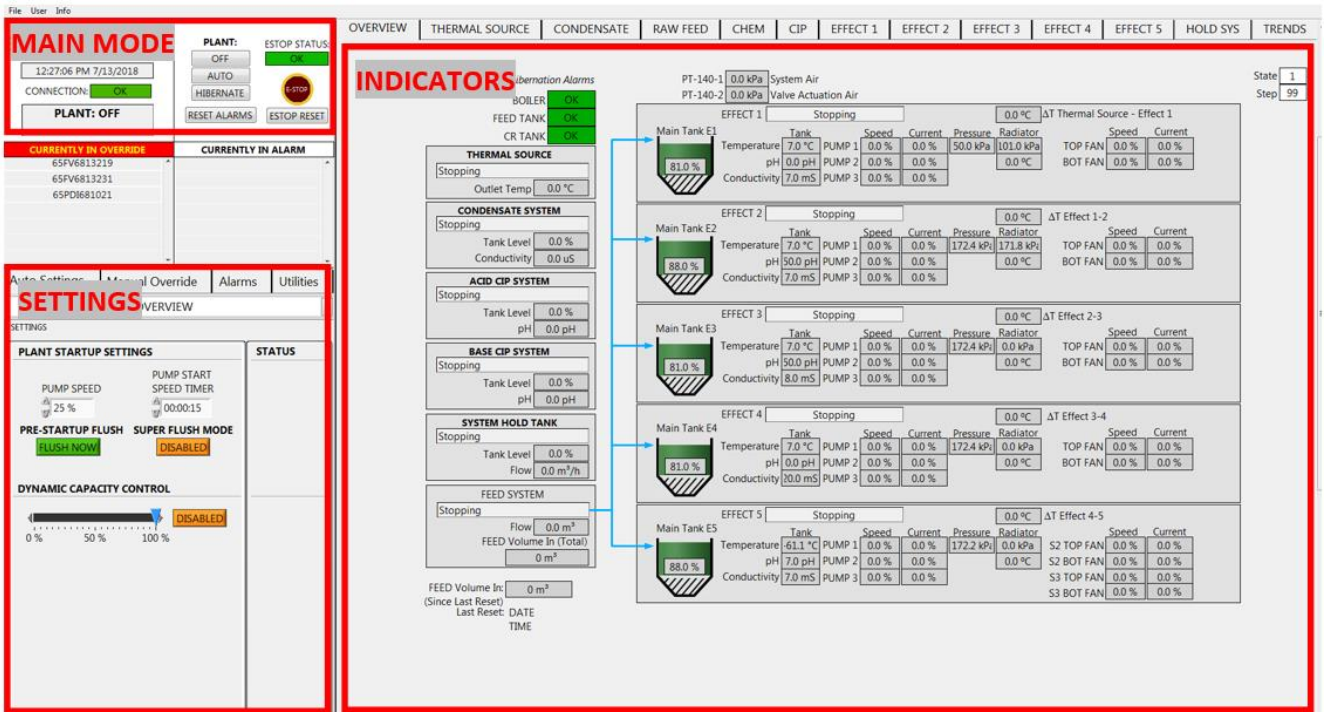


Figure 18: SaltMaker HMI[1]

[1] Numbers on this screenshot are not representative of process setpoints

The HMI has many subsystems within the plant that can be controlled independently, including:

- Overview
- Thermal Source
- Condensed Water System
- Feed System
- Chem Treatment (Optional)
  - Acid Dosing System
  - Base Dosing System
  - Antifoam Dosing System
  - Biocide Dosing System
  - Antiscalant Dosing System
- CIP system
- Effect Hold and System Hold
- Effect 1
- Effect 2
- Effect 3
- Effect 4
- Effect 5

Depending on the project, there could be other subsystems not listed above.

4.1 HMI: Pre-Start up

4.1.1 SaltMaker Operating Parameters

SaltMaker operating settings can be loaded from and/or saved to a file with a .sil extension. To save or load the SaltMaker settings go to “File” and select “Plant settings” to bring up the Plant Settings Datafile Path dialog box (see Figure 19 below). Select the proper parameter settings file (e.g. default.sil) using the folder button on the lower left, and click “Load” to load parameters from file, or click “Save” to save the current operating settings to the selected file.

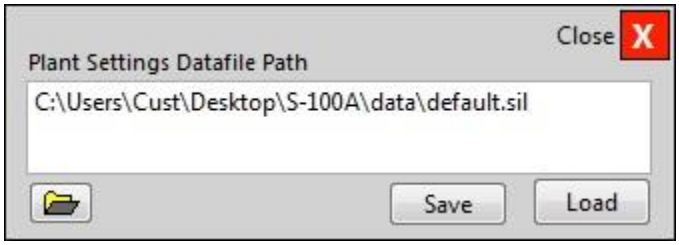


Figure 19: Save or Load Plant Settings

4.1.2 Datalogging

All data related to the SaltMaker is logged in a local file on the controls PC, and then copied to cloud storage for backup and access. Datalog settings are located under the Datalog tab, and allow the user to set the path to store the datalog files. See Figure 20 below.

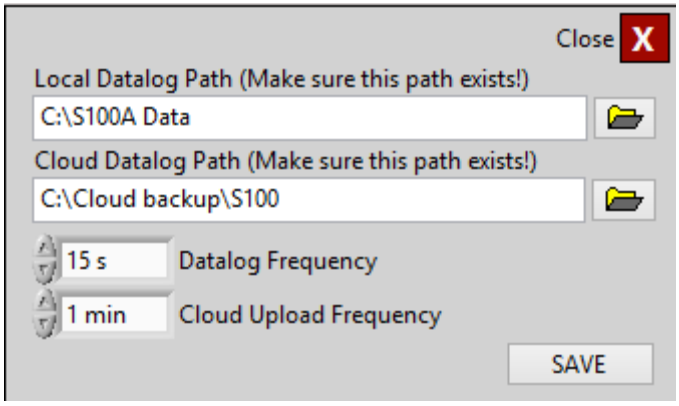


Figure 20: Data Log Settings*

4.1.3 User Settings

The HMI uses accounts and user profiles to assign different access levels for different users (three accounts and three user profiles are built into the HMI). More accounts and user profiles can be added as necessary.

The following list explains the three built-in users and their associated user profiles in the HMI:

Saltworks:

This is the account used by Saltworks engineers for taking full control of the HMI. It is assigned to the user profile “saltworks”, which grants access to all functions available in the HMI, including plant controls, alarm controls and user controls. This account should only be used by Saltworks personnel.

Admin:

This is the account assigned to administrators of the plant. This account is associated to the user profile “admin”. It also grants full access to all functions available in the HMI.

Default:

This is the account that the HMI runs on by default when launched. This account is associated to the “default” user profile, which grants access to plant settings and alarm settings, but has no access to user settings of the HMI.

Each account must be associated to an existing user profile. New Profile can be added or deleted and level accessibility to HMI function can be selected by Admin account. Please see Figure 21 below.

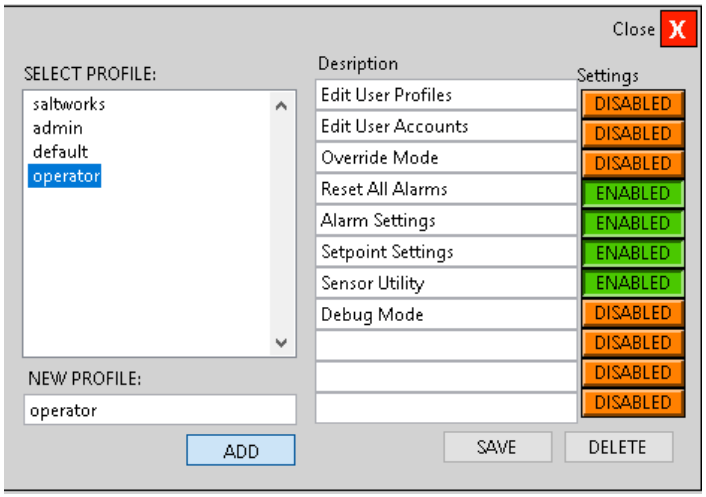


Figure 21: Editing User Profiles

4.2 HMI Operation

If all mechanical checks are completed and operating settings are correct, the user can change the plant mode (see Figure 22) from "OFF" to "AUTO". The SaltMaker system will start automatically based on operating settings.

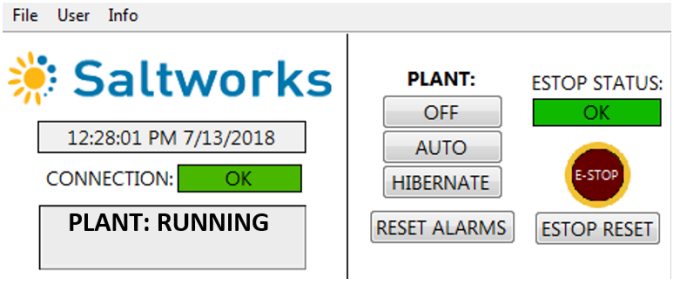


Figure 22: Selecting Plant Mode Operation

The operator can run the entire plant, as well as any sub-system, in manual or auto mode. The figure above shows the menu that lists all control modes available for Main Mode:

PLANT MODE: OFF

This mode triggers the shutdown of the plant by interrupting all ongoing processes, performing a shutdown wash and terminating all processes after the shutdown wash has been completed.

PLANT MODE: AUTO

This mode runs the plant based on the set points the operator has defined. The operating set points for the plant or sub-systems should be adjusted as required by local conditions before the plant is started in automatic mode. Note that selecting "AUTO" from PLANT MODE menu will initiate all sub-systems to "AUTO" mode.

PLANT MODE: HIBERNATE

This mode runs the main pumps with valves in default positions but without the fans and thermal source. Use this mode to reduce the risk of scaling when thermal source or other plant systems have been interrupted.

The operator has the option of manually overriding the control inputs. This is useful in identifying, isolating and fixing problems whether the plant is running or off. **EXTREME CAUTION MUST BE APPLIED AS INADVERTANT OPERATION MAY CAUSE DAMAGE**. This should only be performed with proper training and in depth understanding of the process and plant operation. Refer to *Appendix B: Detailed Troubleshooting and Maintenance Instructions* on how to use Override Mode to help troubleshoot process and pipework problems.

To operate a device in override mode:

1. From the display tabs, click on the device that is to be manually controlled. It will be highlighted by a red outline on the Manual Override tab as shown in Figure 23: Selecting Device to OverrideFigure 23Figure 23.

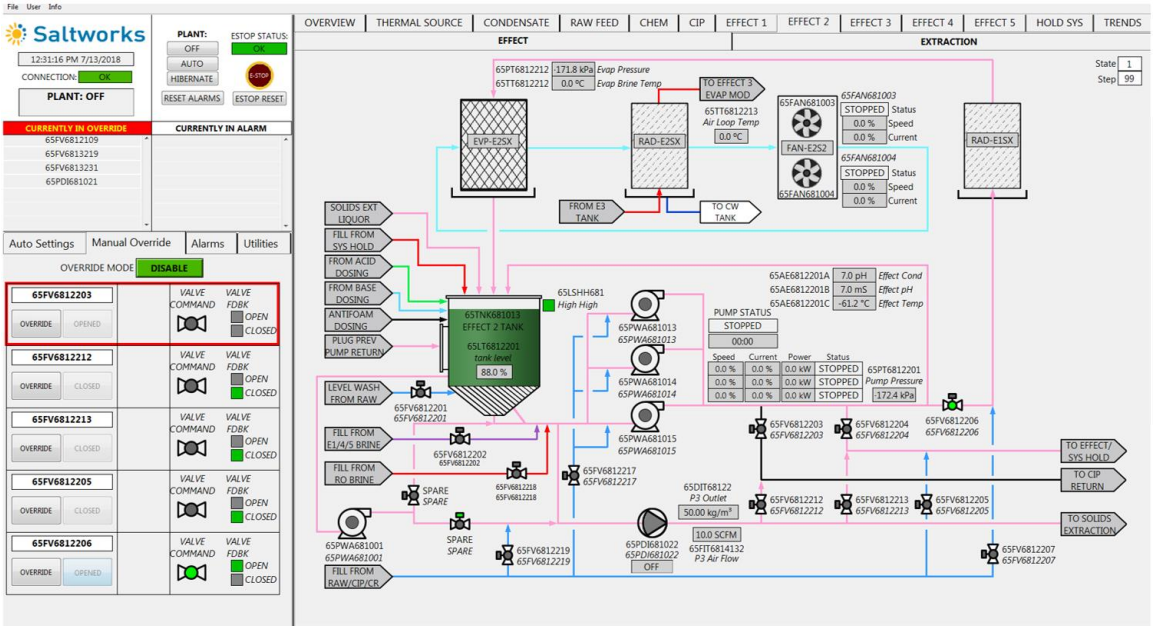


Figure 23: Selecting Device to Override

2. Clicking the OVERRIDE button to put the device into the override state and allow the operator to manually control the device, indicated by a blue box around the device. Above the Manual Override tab is the “Currently in Override” display that displays all devices currently in override. Figure 24 shows the “Currently in Override” display, as well as a valve in override state.

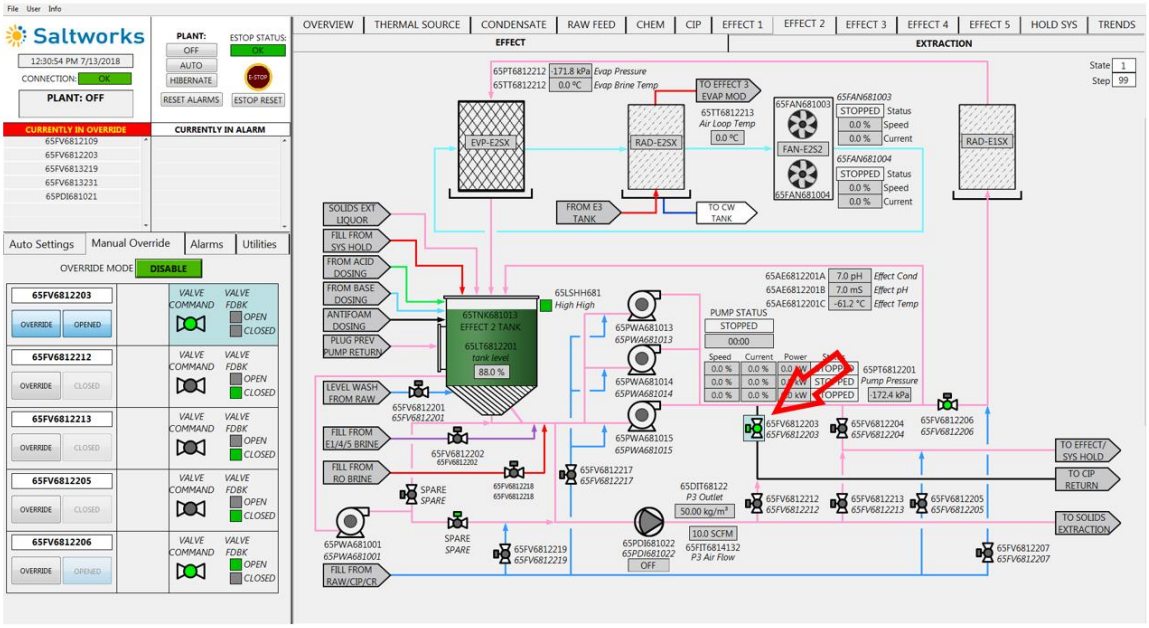


Figure 24: Overriding Selected Device

To release all override, click OVERRIDE MODE – DISABLE button. This will remove all overrides in the plant simultaneously. This button is shown in Figure 25.

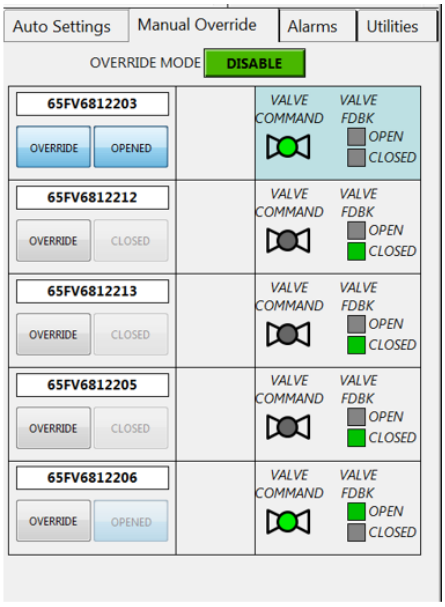


Figure 25: Removing all Overrides

4.3 Alarms on the HMI

The SaltMaker has alarms for each digital and analog input. An alarm status indicates a warning that an instrument reading is outside of a predefined threshold. Alarm status triggered by a low (L) or high (H)

threshold does not affect plant operation. Alarm status triggered by a low-low (LL) or high-high (HH) threshold will affect plant operation depending on the alarm action setting.

4.3.1 Currently in Alarm Display

The "Currently in Alarm" display shows the digital and/or analog inputs that are currently in alarm. When the alarm is triggered, this display blinks in red and automatically updates tripped alarm status in real time, as shown in Figure 26.

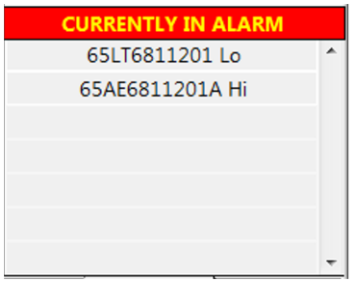


Figure 26: Currently in Alarms

4.3.2 Alarm History Display

The Alarm History display (on the main Alarms tab, Figure 27 shows the last 500 alarms triggered. An extensive list can be found in the data logging files.

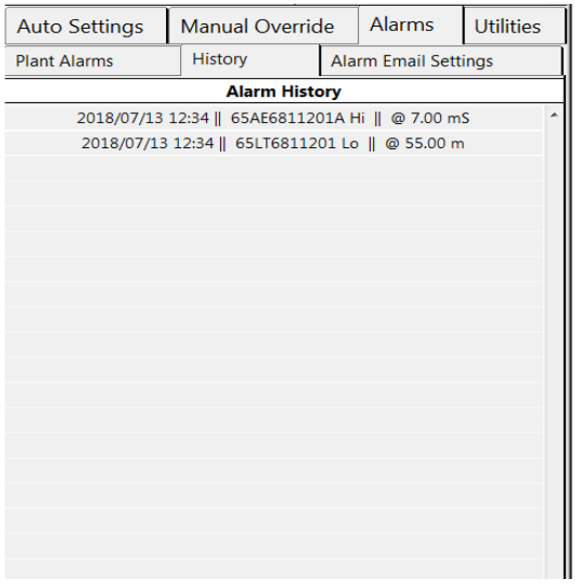


Figure 27: Main Alarms Tab[2]

[2] Numbers on this screenshot are not representative of process setpoints

4.3.3 Alarm Settings

Alarm Settings allow the user to select a specific digital or analog alarm to change its settings. Use the drop down filter to select the type of alarm to be adjusted. Select a specific alarm and change the set points in the control panel. Above the Alarm Settings are the alarm indicators that display the current status of the alarm, as well as the current value of the analog input if it is an analog alarm. See Figure 28.

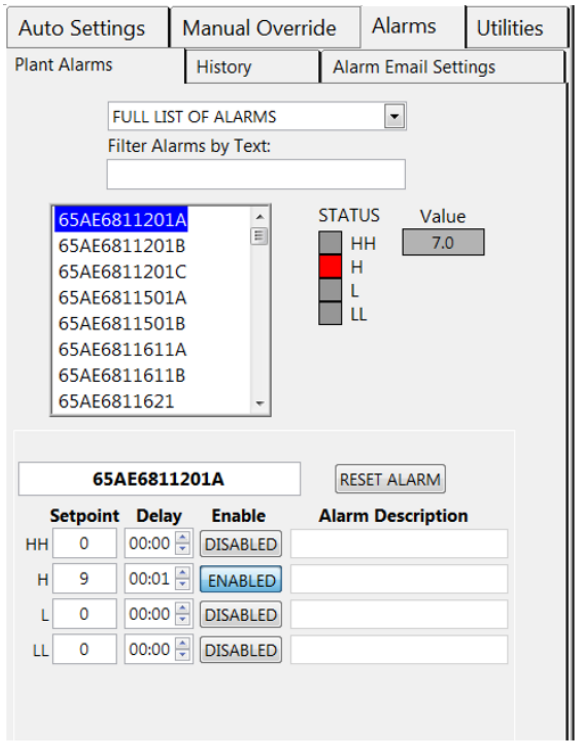


Figure 28: Alarm Settings

4.3.4 Alarm Email Forwarding

When an alarm is triggered, the HMI automatically sends an email with the alarm information to all recipients specified in the “To:” list. To add an additional recipient, type in the “Recipient” field a valid email address without extra characters such as spaces, tabs, or the enter key, and click ADD. Extra characters will not allow for alarm email forwarding. See Figure 29 below.

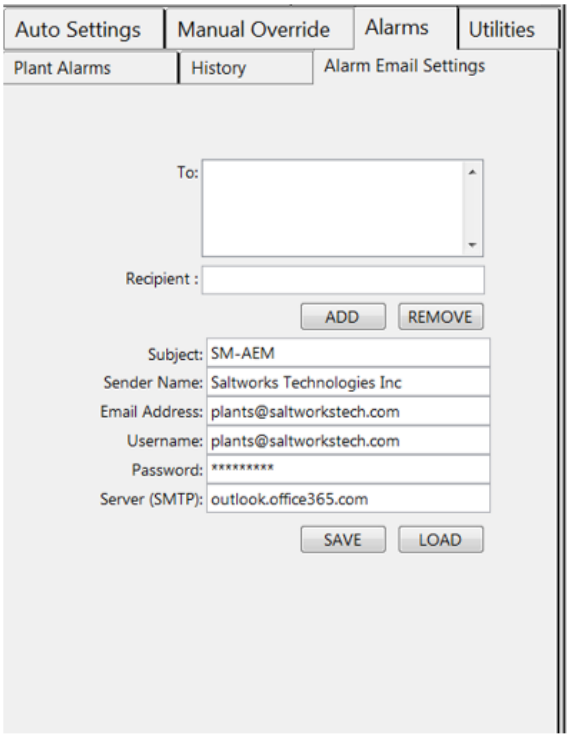


Figure 29: Alarm Email Settings[3]

4.3.5 Alarm Email Settings

The Alarm Email Settings are the email server settings that allow the program to send emails to the recipients.

4.3.6 System Reset

The user can reset all alarms that are no longer beyond alarm threshold by clicking and holding the Reset Alarms button for 2 seconds. See Figure 30.

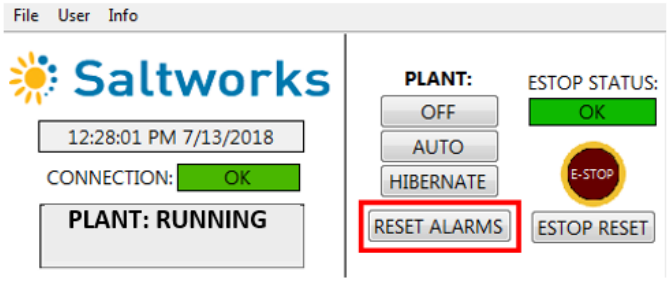


Figure 30: System Reset Alarms Button

[3] Numbers on this screenshot are not representative of process setpoints

4.3.7 HMI Emergency Stop

When an E-STOP has been triggered, the top banner of the HMI will flash with the different possible locations where the E-STOP was triggered. After the E-STOP is physically reset, the user can reset the plant by clicking E-STOP Reset under the System Reset tab.

5 Operating Procedures

5.1 Start-up Procedures

Make sure you are familiar with the previous section HMI operation. For details on HMI parameters and settings, see *Appendix D: SaltMaker Controls Philosophy.* Training videos are also available for viewing.

Before attempting to start the SaltMaker in Full Auto mode, individual systems should be calibrated and tested in Manual Mode. For electrical and controls troubleshooting refer to *Appendix C: Electrical & Controls Troubleshooting and Maintenance Guide*.

Checks before Start-up:

1. Ensure main power is connected and live. Confirm main disconnect is in the ON position. Confirm that subsystem disconnects are also in the ON position. The figure below shows disconnects in both ON

(vertical) and OFF (horizontal) positions. If any system is in the OFF position, do a visual check of related electrical energized equipment to make sure the system is safe to turn ON.



Figure 31: Main disconnect in ON Position

2. Confirm that the controls, including the PLC and HMI are powered.
3. Check that air compressor is ON and there is approximately 100 psi of pressure at the compressor. Also check the pressure sensor readings on each effect air box and make sure there is at least 80 psi.
4. Trace flow paths for the saltwater circuit, freshwater circuit, and salt extraction circuit to ensure all manual valves are in the correct position. Refer to *P&ID* for normal valve positions of saltwater system, freshwater system and salt extraction system.
5. Check and make sure there is adequate level on all effect tanks, plant feed tanks, and chemical tanks.
6. Prime all pumps by opening the plug on pump volute, or a priming valve on the pump discharge line (shown below) until water flows out. PUMPS CANNOT BE RUN DRY.

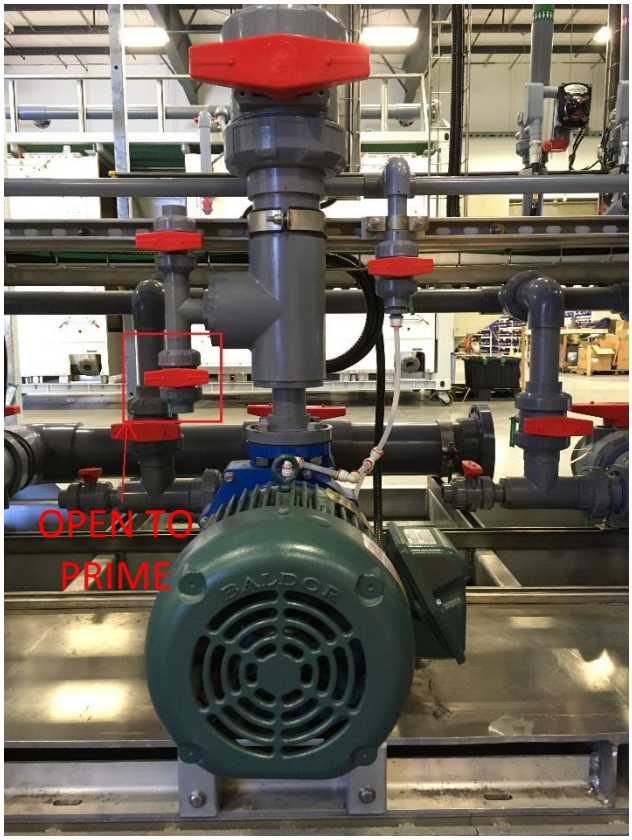


Figure 32: Open Valve to Prime Main Pumps

7. If the operator suspects that valves may be sticky due to scaling, actuate the valves in manual override to make sure they can move freely.
8. Check alarm states and confirm all alarms are clear. If there is an alarm, identify the cause. Resolve the condition before resetting the alarm on the screen.
9. If the system is recovering from an alarm or an e-stop state that prevents a shutdown wash sequence, the user needs to perform a “Pre-Startup Flush.” To perform the flush, check to make sure each Effect has the appropriate “Shutdown Wash Type” selected in the “Shutdown” Tab. Also make sure that the tank that the shutdown flush is drawing from has enough water. Fill this tank if needed. Then click on “Flush Now” button under the Pre-Startup Flush Controls in the Overview Tab.

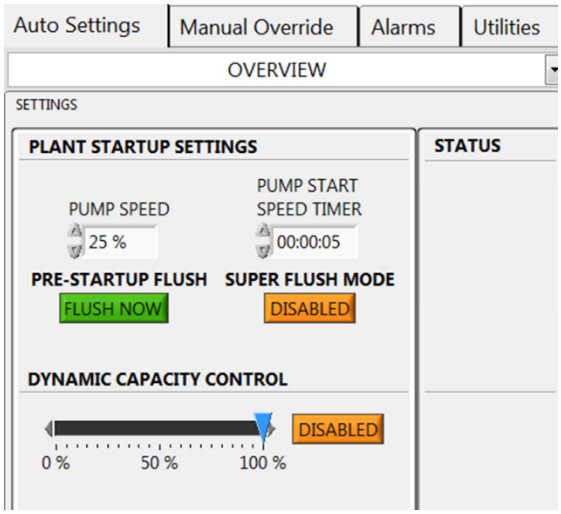


Figure 33: Activating a pre-startup flush on the SaltMaker

The plant should initiate a fast shutdown sequence using the shutdown wash fluid selected for each effect in order, following by a pump seal flush with a duration specifically for the Pre-Startup Flush. The plant is ready to start once the flush is completed.

When ready, select "Auto" in the Main Mode Select menu. The plant will initiate the start-up sequence. Pumps will turn on sequentially. During start-up there are two pump speeds that can be set by the operator: start up speed and running speed. Between each pump start up, there is a time delay to allow the tank levels to equalize and flow to reach steady state. Delays are also added between effect start-ups to make sure that levels in all tanks are at steady state before continuing to the subsequent effects. When starting each set, confirm that flow is adequate and pressure is within operating range. Once start-up is complete, do a walk-through and inspect for leaks, abnormal vibrations and noise. Keep track of identified problems.

5.2 Operating the SaltMaker

The SaltMaker is fully automated with intelligent controls that notify the user through warnings and alarms when the plant needs specific operator attention. The following checks should be performed before running the SaltMaker unattended for a couple of hours (e.g. running overnight). Daily checks are recommended to ensure increased uptime and early detection of problems. A full inspection and maintenance checklist is provided in *Appendix A: Inspection and Maintenance Schedule.*

5.2.1 Confirm the Following before Running Unattended

Process and Controls:

1. Check Settings: pump speed, fan speed, chemical dosing setpoints. Confirm that pressures as well as VFD currents are within normal operating range. If not, investigate for the cause.
2. Remove all over-rides, investigate and clear all alarms.

Plant Visual Inspection:

3. Check pressure gauges on all process pumps. Listen for abnormal noises and watch for leaks and other problems.
4. Confirm that there are enough chemical for overnight operation.
5. Check feed tank level and confirm that there are enough feed for overnight operation.
6. Visually inspect module interior by opening inspection ports. Before opening inspection ports, turn off the effect fans to reduce risk of exposure to any potentially hazardous volatile compounds.
7. Check pressure across bag filters. Clean filters if needed.

Site Specific and Optional Systems:

8. If RO pre-conditioner is installed, confirm that RO pre-conditioner cooling system are ON and pH control is functional, e.g. setting and chemical.
9. If RO treatment system installed:
   - Check differential pressure across bag and cartridge filters. Replace filters if needed.
   - Check that RO permeate flow rate is normal if it is running. Otherwise confirm flow through datalogs during the last run.
   - See *Post Treatment RO O&M Manual* in the MDR for more details.
10. Check thermal Source system:
    - Confirm thermal source water pressure at pump suction > 20 psi (add water if pressure is low)
    - Confirm fuel supply feed rate is within specs. e.g. Natural gas or Diesel.
    - See *Standard Water Heater Manual* in the MDR for more details.

5.2.2 Check Lists

Check lists consist of daily, weekly, monthly, yearly lists. They provide operators guideline to maintain the plant in spec as a minimum requirement. The check points are recommended for SaltMaker but is not limited to the check lists due to project specific check points. Operators' due diligence is required for reliable plant operation.

List below provides a high-level overview of critical or common check items. please refer to Appendix A for detail check lists.

5.2.2.1 Daily Checks

Process and Controls:

1. Check for any warnings or alarms and investigate as needed.
2. Identify and investigate if pressure, temperature, conductivity, or level readings are abnormal. A re-calibration may be needed (see weekly checks).
3. Confirm data logging functionality (DAQ / TDMS files).
4. Generate data plots and confirm correct graph pattern for:
   a. Each effect tank level vs. time
   b. Each effect brine and condensed water conductivity vs. time
   c. Each effect temperature vs. time
5. Calculate capacity using totalizer DAQ data.
6. Confirm the plant control is online (Internet connection and remote access is working).

Condensed Water System:

1. Measure condensed water quality. Confirm that conductivity readings from plant sensor match handheld readings.
2. Check for biological growth. Clean or dose biocide chemical as needed to keep growth under control.

Pumps:

1. Check pump discharge pressure from local pressure indicators on pump outlet.
2. Check pump flow rates.
3. Visually inspect pumps for leak.
4. Listen for irregular noise or vibrations from the pump. Pump seal flush may help with resolving vibration or noise issues.

Effect System:

1. Confirm sufficient feed water level in feed tanks.
2. Confirm that flow is adequate on effects and sets.
3. Visually inspect the evaporator module. If scaling is observed, perform CIP. NOTE: before opening inspection ports, turn off the effect fans to reduce risk of exposure to any potentially hazardous volatile compounds.
4. Check the fans and blowers for irregular noise and vibration.

Solids Management System (if applicable):

1. Confirm solids management system control settings: solids extraction set point and timers.
2. Confirm density meter is functioning (refer to section 2.2 in *Appendix AM: Tank Bottom Plug Prevention and Plug Removal*).
3. Visually confirm that salt is being removed from the system into a salt bag after a solids extraction.
4. Check salt extraction bin level, bag and drain line for plugging.
5. Visually inspect return pump for leaks and plugging. Listen for irregular noise and vibrations. Check pump air flow and whether the low air flow switch has been triggered (FSL).

Brine Extraction System (if applicable):

1. Visually inspect brine extraction pumps for leaks and plugging.
2. Check flowrate or pressure at discharge pipework.
3. Listen for irregular noise and vibrations.
4. Confirm flow.

5.2.2.2 Weekly Checks

The weekly check should be done by the operator every week regardless whether the SaltMaker is operating or offline.

List below provides a high-level overview of critical or common check items. please refer to Appendix A for detail check lists.

Air System

1. Check pressure on the air compressors and make sure the reading is steady at approximately 100 psi.
2. Check data trend on air pressure sensors to confirm that air supply is steady during operation.
3. Check whether any FSL sensors are triggered and that air mass flow transmitters (MFIT) are reading expected values.
4. Check that air moisture sensor is reading a sufficiently low value. If value is high, troubleshoot desiccant filter, and/or air moisture sensor. Ensure that air is flowing through backup desiccant dryers.
5. Check oil lubrication level on pneumatic vibrators if installed. Listen for irregular noise.

Sensor & Instrumentation

1. Confirm calibration of level transmitters (LT) against level indicators (LI) for tanks.
2. Confirm level transmitters are washed and cleaned.
3. Confirm calibration of temperature transmitters (TT) with temperature indicators (TI). Do this while the plant is operating, the pipes have sufficient flow, and perform a 1-point calibration on HMI if needed.
4. Confirm calibration of pressure transmitters (PT) against pressure indicators (PI) while the plant is in operation. Make a note on discrepancies and perform a 1-point calibration on HMI if needed.
5. Confirm calibration of conductivity meter (CIT) against TS value trend (must analyse sample TS value first). Make a note of discrepancies and perform 1-point calibration on HMI if needed.
6. Confirm calibration of density meter by manually measuring density of brine and comparing the readings. Perform calibration if needed per instructions in section 2.2.1 in *Appendix AM: Tank Bottom Plug Prevention and Plug Removal*.

Effects

1. Check and add lubrication to fan/motor bearings as required. Fans must be ran at 25% speed during grease application. Refer to *Appendix AP: Bearing Greasing Table* for greasing table/requirement.
2. Check the radiator for bacterial growth. Initiate a biofilm treatment cycle as needed to keep biological growth under control.

CIP

1. While operating, observe a full CIP. Check flow indicators, conductivity readings and pressure readings to confirm that CIP is effective.

To maintain reliable operation and longevity of the plant, periodic inspection and maintenance should be carried out as per maintenance listed in *Appendix B: Detailed Troubleshooting and Maintenance Instructions.*

5.3 SaltMaker Cleaning Cycles

Setting proper SaltMaker self-cleaning cycles is essential to continuous operation of the SaltMaker. The self-cleaning cycles are summarized in section 2.6. If salt crusting is encountered the systems, the operator can

manually initiate each wash sequence. To do so, select the effect on the HMI, and choose the "Washes" tab. You can then choose "Wash Now" for the following:

- CIP
- Pump Seal Flush
- Level Sensor Wash
- Radiator Wash

You can enable, disable, and change the timer and duration of each of the washes above for each effect. The following section describes the automated control sequence for each type of wash.

5.3.1 CIP

- Fans and heat to the effect turns off (eg. for Effect 3 CIP, Effect 2 and 3 fans turn off).
- Valve to Effect Hold Tank opens.
- Valve to radiators closes.
- Radiator is filled with condensed water from Clean Reserve Tank. If Clean Reserve Tank level is low, radiator is filled with CIP.
- Once effect tank is emptied to Effect Hold Tank, CIP fluid fills effect via radiator.
- Effect is circulated on CIP fluid with fans and heat on for a specified duration.
- Acid or base is dosed during CIP circulation if required.
- If conductivity of CIP reaches a certain limit, CIP stays in effect, is now considered brine, and normal operations resume. Otherwise, when wash finishes, valve to CIP tank opens to drain CIP fluid.
- Fans and heat turn off.
- Valve to radiators closes.
- Radiator is filled with condensed water from Clean Reserve Tank. If Clean Reserve Tank level is low, raw fills radiator from Plant Feed Tank.
- Effect is refilled with brine from System Hold Tank, brine from other effects or with raw. Normal operations resume.

5.3.2 Pump Seal Flush

- Initiated by auto wash settings and when an effect pump is starting up.
- Pump seal flush valve opens, and raw is pumped to seals for a set time.

5.3.3 Level Sensor Wash

- Valve from raw or condensed water to level sensor is opened.
- Raw or condensed water pump is ran for a set time to clean level sensor.
- Pump stops, and valves closes after the wash is complete.

5.3.4 Radiator Wash

- Condensed water is pumped to biocide spray system; thus, valve from condensed water tank opens, and condensed water pump turns on.

5.4 Effect Hold Transfer

- Initiated by timer or conductivity. Effect Hold Transfer sends brine to an effect hold tank and refill from lower concentration solution such as raw, to manage concentration gradient and/or clean the packing.
- Could be partial effect hold transfer where part of the tank is replaced or a full effect hold transfer where the entire tank is replaced.

5.5 Brine Discharge (Brine Extraction Pump Option)

- When the most concentrated effects go above the targeted concentration, brine extraction pumps will turn on to discharge concentrated brine out of the plant for disposal. If discharging to a tank, a level switch detects when the discharge tank is full and stops the brine extraction pumps. Operator is notified when the discharge tank is full.
- Operator must confirm brine flow to the discharge tank from each of the brine extraction pumps individually either using overrides, or checking the flowmeter. This ensures each brine extraction pumps are discharging as they should.
- If brine level is full or brine discharge tank is not available, the SaltMaker will keep operating until a high concentration warning level is reached. The thermal source will turn off to prevent further concentration of process fluid, while the effects and sets keep running to prevent the formation of salt crust in effect pipework. This process can be done by changing plant mode to hibernation.

5.6 Stop-Settle-Extract Option (optional)

- Stop-settle-extract occurs while brine is in Effect Hold Tank.
- When minimum settling duration and extraction start density are reached, a stop-settle-extract sequence occurs.
- After settling, the Effect Hold Tank bottom slurry is pumped to an available water-permeable bag.
- The slurry is de-watered leaving behind solids in the bag. The filtered brine is captured in a basin, which is re-introduced to the system.
- Once the bag is full per the automatic weight measurement system, the bag is moved by a forklift to a dewatering basin for further drying.
- After approximately 1-2 days the solids are generally dry enough to pass a paint-filter test (typical moisture content = ~10%) and are removed from the plant.
- After solids extraction, Effect Hold Tank brine is transferred to System Hold Tank.
- The most concentrated effects will often have the ability to remove solids directly without transferring to Effect Hold Tank, so that extractions can be performed more frequently.

5.7 Shutdown

Normal Shut Down

1. In each of the Effect Shutdown tabs, select the SHUTDOWN WASH MODE and TYPE, as well as duration (Figure 34: Enabling shutdown wash). Refer to *Appendix AJ: Shutdown Guide* for description of the different types of shutdown washes.

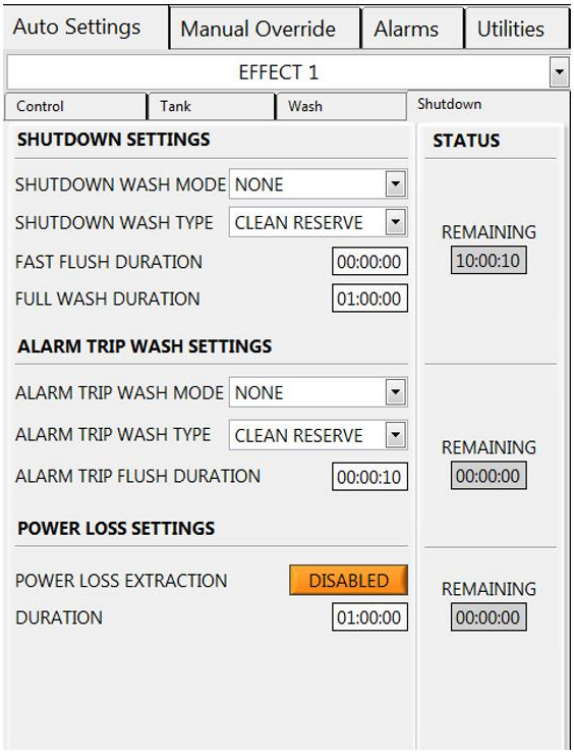


Figure 34: Enabling shutdown wash

2. Turn Plant Mode to OFF.
    a. This will turn off the systems and initiate the shutdown washes in the correct order.
    b. A shutdown wash is initiated. This will prevent salt solidification in the SaltMaker piping and pumps when the plant is down.

Emergency Shutdown or Power Lost

In the event of an emergency, the E-Stop button on the HMI or a physical E-Stop button on the control panel can be pressed.

- Once it is pressed, all systems will shut down immediately. No shutdown wash is initiated.
- To restart the plant, the operator needs to clear the emergency alarm and any other process alarms that may have been triggered during the emergency shutdown.
- After an emergency shutdown, the SaltMaker plant will require a “Pre-Start Up Flush” before starting again. This can be activated in the “Overview” selection tab under “Plant Start Up Settings”.
- An alternative would be to perform a full manual flush while power is down. See below.

5.8 Manual Flush Procedure

This flush is possible if a pressurized (30+ psi) fresh water supply is available. Before performing this wash, please ensure processed brine has been drained out of the system and back to tanks. When power is lost or E-stop is

engaged, air valves will go to their normal positions. This means that if an ABV in the P&ID is marked NO (normally open), it will be open. If an ABV in the P&ID is marked NC (normally closed) it will be closed.

The example below is used to illustrate a manual flush procedure. Please refer to your specific P&ID to confirm which valves to open and close. Instructions below will reference this specific P&ID.

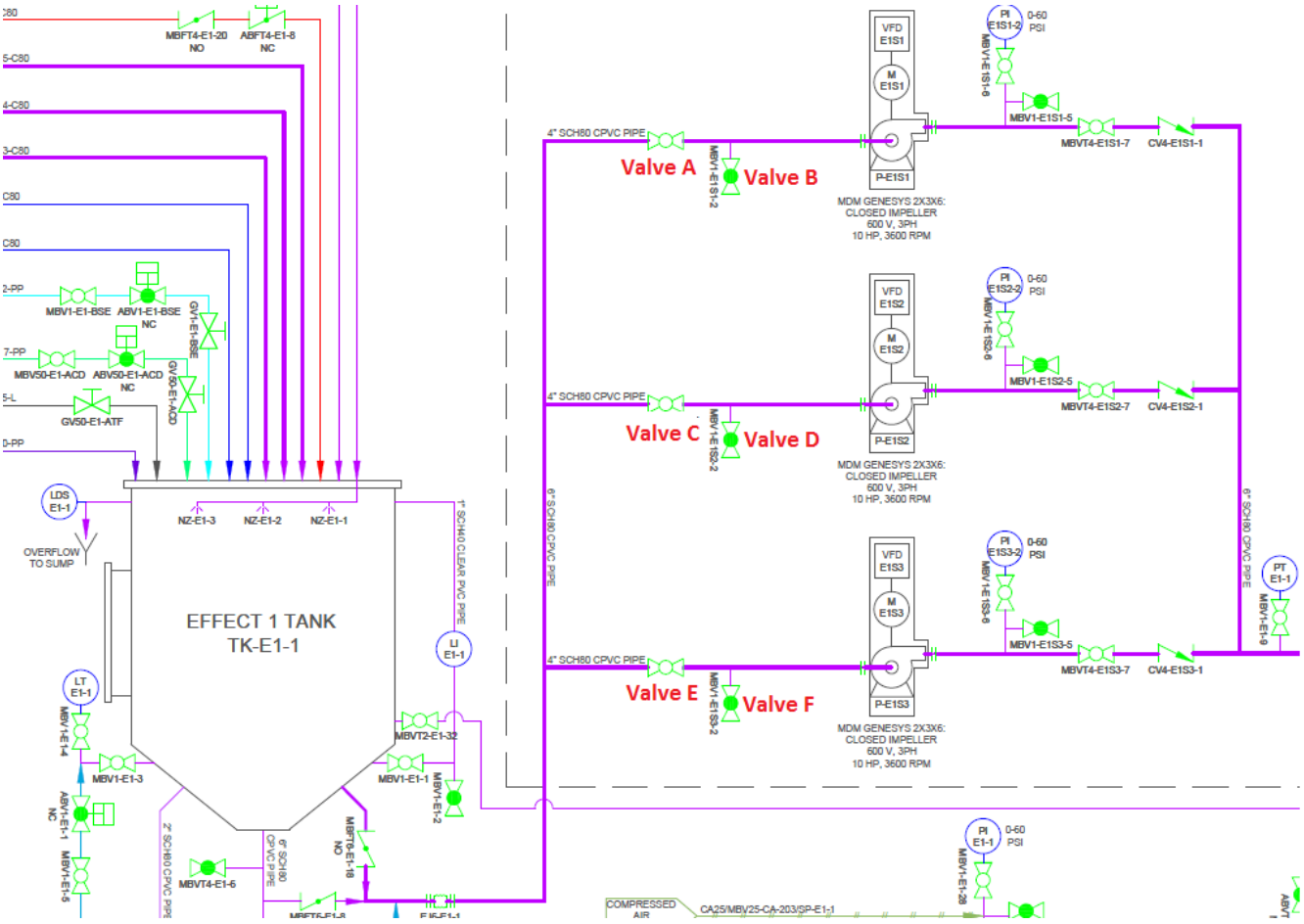


Figure 35: Manual flush P&ID example

1) Effect 1 Set 1 pipework flush.
   - Close Valve A to isolate Set 1.
   - Connect fresh water supply to Valve B.
   - Open Valve B.
   - Close Valve C (valve to Set 2 pump inlet), and Valve E (valve to Set 3 pump inlet).
   - Open fresh water supply and flush until fresh water returns to main tank. See Figure 36 below.
   - Close Valve B (fresh water supply) when flush is complete.

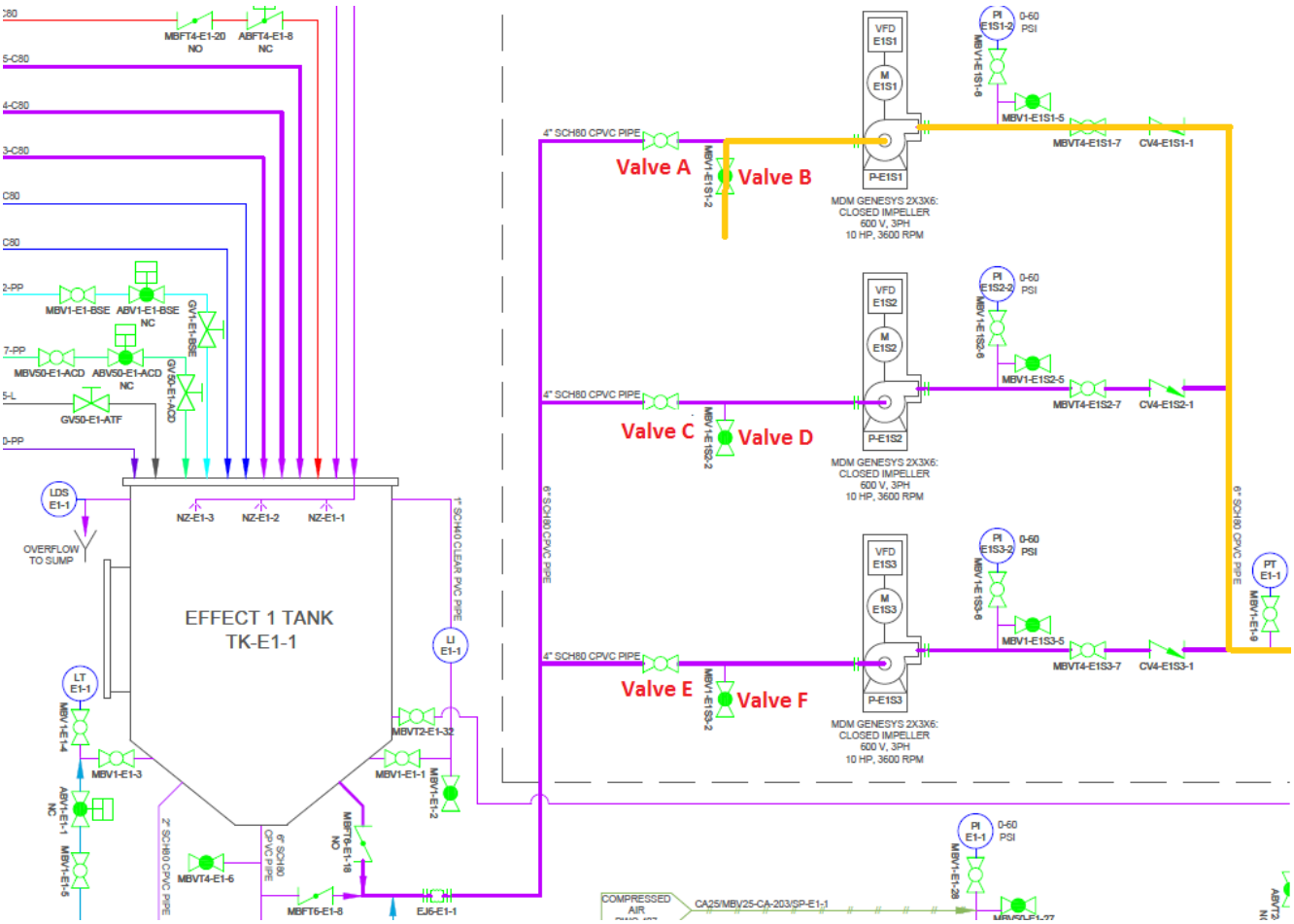


Figure 36: Flow Path for Manual Flush Effect 1 Set 1

2) Effect 1 Set 2 pipework flush.
   - Close Valve C to isolate Set 2.
   - Connect fresh water supply to Valve D.
   - Open Valve D.
   - Close Vale A (valve to Set 2 pump inlet), and Valve E (valve to Set 3 pump inlet).
   - Open fresh water supply and flush until fresh water returns to main tank.
   - Close Valve D (fresh water supply) when flush is complete.

3) Effect 1 Set 3 pipework flush.
   - Close Valve E to isolate Set 2.
   - Connect fresh water supply to Valve F.
   - Open Valve F.
   - Close Valve A (valve to Set 1 pump inlet), and Valve C (valve to Set 3 pump inlet).
   - Open fresh water supply and flush until fresh water returns to main tank.
   - Close Valve F (fresh water supply) when flush is complete.

Repeat the steps above for all effects.

5.9 Process Disruptions and Alarm Management

The SaltMaker monitors sensor readings to make sure they are in the normal operating range. If they are outside the range, the system notify the operator by issuing a warning. If the problem is serious enough, the system will then initiate alarm action, such as shut down, to help prevent equipment damage or to avoid an unsafe condition. Both warnings and alarms can be forwarded to e-mails or phone text messages.

Alarms are separated into two categories:

- Low (L) or High(H): no action, warning only
- Alarm Low (LL), or Alarm High (HH): depending on the alarm, there maybe be action that interrupts the process

All alarms have adjustable time delays and can be enabled individually. Alarms can be configured for each sensor, including, but not limited to, level, pressure, temperature, conductivity and pH. See section 4.3.3 on how to change alarm settings.

5.9.1 Air Pressure Alarms

The plant requires air to actuate valves to divert flow to different systems. When air pressure is low, the ability for valves to move fluid around is compromised.

Air Pressure Warning (L):

Shut off air vibrators (optional) and diaphragm pumps to conserve air or to protect air equipment.

Air Pressure Alarm Low (LL):

The system will shutdown without going through the flush sequence.

5.10 SaltMaker Maintenance

Please refer to:

Appendix A: *Inspection and Maintenance Schedule*

Appendix B: Detailed Troubleshooting and Maintenance Instructions

Appendix C: Detailed Electrical & Controls Troubleshooting and Maintenance

6 References

Additional documents, information and tools related to the SaltMaker are provided as appendices. Saltworks also has instructional videos available for viewing. Please refer to the MDR for access.

1 Check List

Please complete the following daily Plant Operation and Maintenance check list. This list is in addition to daily sampling/analysis and inspection/CIP/greasing schedule.

1.1 Daily Check List

No	System	Check Point	Yes/No	Note
1	Visual Check – Leaks	Walk around to check for leaks, especially: - pump seals - pump seal flush - ADPs and nearby high vibration connections		
2	Visual Check – Sound/vibration	Walk around to check for abnormal sound/vibration: - ADPs - Pumps - Fans		
3	Process/HMI	Check any alarm on HMI and investigate. If cause of alarm is relieved reset the alarm control on HMI.		
4	Process/HMI	Check overview tabs for any anomaly and investigate: - levels - pressures - temperatures - conductivity - pH - density - flow		
5	Process/HMI	Check setpoints are correct.		
6	Pump Air Diaphragm	Check ADP Air exhaust muffler icing. If muffler inside has icing issue please check compressed air system - air dryer. If icing is only outside from atmosphere moisture icing, please remove.		
7	Pump Air Diaphragm	Check pulsation dampener pressure. Adjust air pressure if necessary.		
8	Pump Air Diaphragm	Check pump flange bolts loosening and retighten per bolting torque spec on the pump if necessary.		
9	E1 HEX	Check E1 HEX flow rate and differential pressure across HEX. - Action: If flow rate is lower than rating, and DP is higher than normal, perform back flush and SSE/burst on E1 tank.		SM1 FIT1101: _____ m3/hr FIT1103: _____ m3/hr PT2101: _____ kPa PT2112: _____ kPa

No	System	Check Point	Yes/No	Note
		Secondary tool is checking inlet cone strainer. If cone strainer is clean suspect HEX plugging and perform manual backflush.		SM2 FIT5101: _____ m3/hr FIT5103: _____ m3/hr PT6101: _____ kPa PT6112: _____ kPa
10	Effect Module Evap Module	Evap Inlet nozzle pressure check and adjust effect set pump speed but do not exceed 98% of pump motor current. - Action: Investigate what Evap inlet nozzle pressure is low, i.e. pump functionality or HEX or Radiator plugging/scaling. Perform CIP as necessary		
11	Effect Module Air Seal	Check for air seal damage or leakage, and check inflatedness.		
12	Effect Module Fan Module	Check fan vibration and sound for any abnormal condition. - E1/2/3/4 fans - Action: If abnormal condition is observed, stop operating problematic fan and report/inspect.		
13	Effect Blowers	Check for any abnormal vibration or sound. - E4 blowers - E5 blowers - Action: If abnormal condition is observed, stop operating problematic fan and report/inspect.		
14	Basket Strainer	Inspect basket strainer and clean basket strainer if necessary: - Underground feed - Feed tanks outlet - Sump pump outlet		
15	Feed System HEX Cone Strainer	Check inline cone strainer at brine inlet of plant feed Heat Exchanger (HX). Check PI inlet and outlet and if pressure difference is 2 psi higher than normal value, clean strainer.		PT0401: _____ kPa PT0402: _____ kPa
16	Feed System Circulation Loop	Confirm feed circ pump functionality.		
17	Condensed Water	Check bag filter pressure and flowrate DAQ. Replace bags as needed. (20 or 25 micron)		
18	Compressed air - Air receiver vessel	Check air receiver drain is functioning.		

No	System	Check Point	Yes/No	Note
19	Compressed air	Check air compressor status and local alarms. Reset if needed or request air compressor tech for troubleshooting if issue persists.		
20	Compressed air	Check air pressure at local pressure gauge and compare to the reading of pressure transmitter on HMI, should be 100 PSI or 699 kPa		PI4007: _____ kPa PT4007: _____ kPa
21	Compressed air - Air Seal	Check air pressure at air seal manifold and make sure it is at 17 PSI or 117 kPa		SM1 PI4141: _____ SM2 PI4541: _____
22	Compressed air - Air Dryer	Check air dryer functionality and any local alarm on Desiccant dryer control panel.		
23	Boiler	Check Boiler control panels and ensure no fault or lock out. If there is fault or lock out investigate what is code and cause. i.e. low water cut off switch, low air pressure - reset		
24	All chemical dosing systems	Check any chemical leakage at pump suction, discharge and ABVs and feed container.		
25	All chemical dosing systems	Check chemical dosing pump functionality.		
26	RO Preconditioning system	Check RO preconditioning cooling radiator fan functionality		
27	pH Control System	Check pH sensor functionality by sampling. Measure pH of sample and compare HMI reading. If necessary, calibrate sensor. - Feed System - Effect 1/2/3/4/5 Tank - Acid CIP System - Base CIP System - Condensed Water System - Nitrite Destruction System - RO Preconditioning System - RO System		
28	Solid Extraction System	Check Solid Extract System functionality: - Salt bag draining - ADP pumping - Remove excess salt build up - Adjust extraction settings as needed - Remove any full salt bags and replace with new bag and bag liner		

No	System	Check Point	Yes/No	Note
29	Sump	Check sump functionality and make sure sump remain low level.		
30	Process	Check and perform any scheduled operation activity (i.e. ADP bolt torqueing, booster fan greasing, effect flow measurement, sample analysis, packing inspections)		