

FACILITIES MANAGEMENT

Saunders Building

PO Box 1700 STN CSC Victoria BC V8W 2Y2 Canada

Title: 22-05537 Ian Stewart Complex Evaporative Condenser Replacement

Locations: Ian Stewart Complex – Arena Mechanical Room and Roof

Description: Facilities Management working closely together with Fraser Valley Refrigeration Ltd. and their sub trades will install a new rooftop evaporator condenser unit and related systems. The work will involve removing the ammonia in the system, the existing rooftop unit, crane lifts, temporary blocking of driveway to the back parking area, new steel work and the installation of new ammonia plant equipment. The work may be distracting from time to time during the execution of the contract. Please obey all safety signage and demarcation barriers.

Please note the ammonia in the system will be removed Thursday, June 15th and Friday, June 16th. Potentially ammonia alarms could intermittently ring, if there is an emergency condition, Alumni House and Athletic Building users will be contacted directly by Campus Security.

Time frame: Thursday, June 15, 2023 to August 8, 2023 approximately

FMGT contact: Gord Shirley, Project Manager

Email address: gshirley@uvic.ca

Phone: 250-213-3267





6/4/2021

Ammonia Release Emergency Procedures

University of Victoria

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Glossary of Terms / Acronyms

ATRS	Athletics & Recreation
BEC	Building Emergency Coordinator
CSEC	Campus Security
DDC	Direct Digital Control
Draeger	Hand – held Portable gas detector
FEC	Floor Emergency Coordinator
FMGT	Facilities Management
ISC	Ian Stewart Complex
OHSE	Occupational Health, Safety and Environment
Rampart	Rampart is the campus alarm monitoring system
SDS	Safety Data Sheet
SFD	Saanich Fire Department
SRT	Site Response Team
UC+M	University Communications & Marketing

UVic Ammonia Release Emergency Response Procedures

The Ian Stewart Complex (ISC) is equipped with an ice skating rink sustained by the operation of an ice plant containing approximately 90 kilograms of ammonia as the refrigerant. The majority of ammonia is contained in the receiver (90%) and evaporator (brine chiller) in the compressor room, located at the north end of the rink in Room 150A. Ammonia is also present in the lines leading to and from the evaporative condenser located on the roof of the compressor room.

Ammonia Plant Layout & Alarms

The ammonia plant consists of a *compressor room* (150a) which contains the pumps and piping associated with the ammonia chilling system, and an *electrical ante room* (150) which contains the electrical breaker panels and monitoring equipment. The compressor room and electrical ante room are monitored continuously for the presence of ammonia by a detection system that transmits alarms to Campus Security and the Electrical and Mechanical Shops in the event of a leak. Additional monitoring stations and alarms are also located at the north end of the rink adjacent to the Zamboni Room door, and on plant pressure relief valves located above the roof of the electrical ante room. Low level alarms are set at 25 ppm in all locations. A high level alarm located in the compressor room is set at 200 ppm. The alarm indicators, a combination of both audible and visual, have been set to activate as outlined in Table 1.

Table 1: Activation of Alarms

Location	Low Alarm (> 25 ppm)	High Alarm (>200 ppm)
Electrical Ante Room	<ul style="list-style-type: none"> Blue strobe light above exterior ante room door activates CSEC notified via Rampart* FMGT notified via DDC 	<ul style="list-style-type: none"> N/A
Compressor Room	<ul style="list-style-type: none"> Blue strobe light inside compressor room above door activates Compressor room exhaust ventilation fan starts automatically CSEC notifications via Rampart* FMGT notified via DDC Automatic shutdown of general building HVAC for ISC 	<ul style="list-style-type: none"> Red and blue strobe lights inside compressor room above door activate Panel and red strobe audible alarms activate Compressor room exhaust ventilation fan starts automatically Blue strobe lights in Alumni Wing activate CSEC notifications via Rampart* FMGT notified via DDC Automatic shutdown of general building HVAC for ISC
Ice Rink	<ul style="list-style-type: none"> Blue strobe light at back of rink activates CSEC notified via Rampart* FMGT notified via DDC 	<ul style="list-style-type: none"> N/A
Pressure Relief Valves	<ul style="list-style-type: none"> CSEC notified via Rampart* FMGT notified via DDC Blue strobe lights in Alumni Wing activate Automatic shutdown of general building HVAC for ISC 	<ul style="list-style-type: none"> N/A

*Rampart is the campus alarm monitoring system

Figures 1 through 8 provide images of the alarm panel located in the electrical ante room, the signage outside the Zamboni bay doors, at the rear of the rink and above the inside Zamboni room doors, and alert lights in the Alumni Wing.



Figure 1: Entrance to Electrical Room. Blue alarm light and warning located above door



Figure 2: Alarm display panel inside Electrical ante room

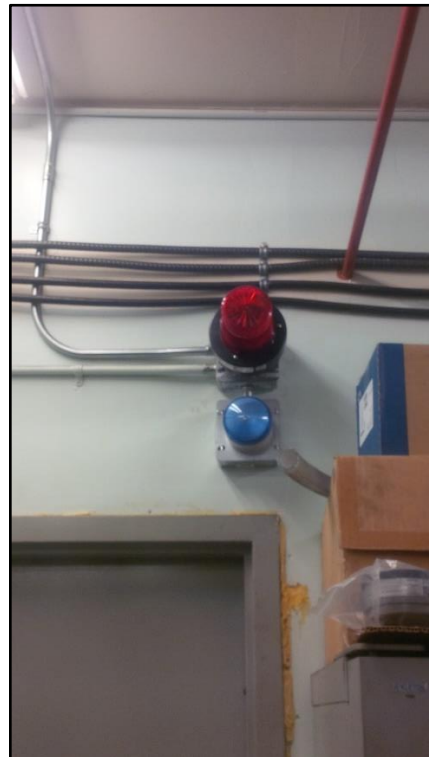


Figure 3: High (red) and low (blue) level alarm lights above compressor room door



Figure 4: Alarm indicator light at back (north) end of rink



Figure 5: Alarm indicator light and warning sign over interior Zamboni room door



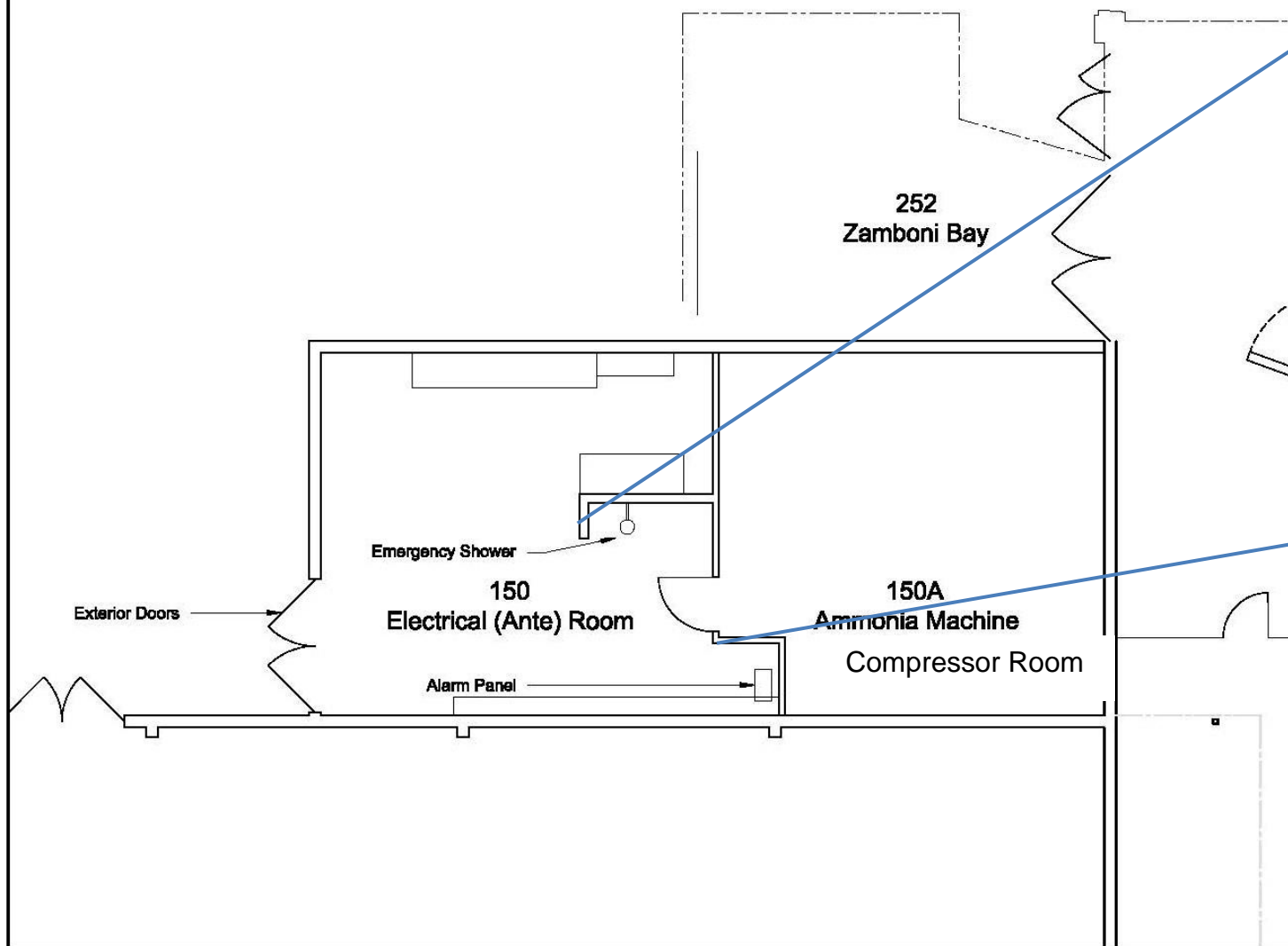
Figure 6 & 7: Alarm indicator lights at Alumni Wing; Ground floor North (left) and South (right) entrances



Figure 8: Alarm indicator light upper floor stairwell

Figure 9 - Ammonia Plant Floor Plan

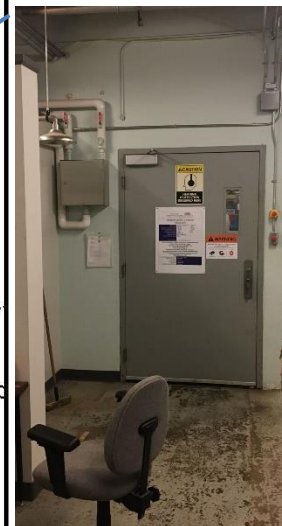
Floor plan of the ammonia plant and its areas as referenced in the remainder of this document.



**University
of Victoria**

Facilities Management

Notes:



Title:

**Ammonia Plant
Ian Stewart Complex**

Date: **12 June 2018**

Scale: **1:100**

Drawn By: **JW**

Project Number: **-**

Drawing No. **SK1**

Roles and Responsibilities

The following individuals are directly involved in an emergency response situation at the ISC ammonia plant:

Facilities Management Shift Engineer is responsible for:

- assessing the condition of the plant and conducting on-site investigation
- determining a location for a potential external assembly point
- taking immediate action where appropriate to isolate, contain or make immediate repairs to the plant as necessary

Campus Security Dispatch is responsible for:

- relaying information regarding ammonia releases to Shift Engineer
- coordinating evacuation with ATRS rink personnel, Custodial Services staff and Alumni House occupants.
- communicating with first responders (Saanich Fire, Saanich Police)
- remote monitoring of compressor room via closed-circuit camera
- notifying EOC members in the event of an evacuation

Standby Person is responsible for:

- providing support to Shift Engineer when entering compressor room;
- communicating with Campus Security Dispatch if Shift Engineer is unable to do so.
- assisting Shift Engineer to exit facility if under duress.

The Standby Person is NOT to enter the Compressor room at any time. The Standby Person is required to wear a full-face respirator while fulfilling their role in the electrical ante room.

Personal Protective Equipment Required

The shift engineer and Standby Person must be wearing coveralls, Viton/Teflon gloves and CSA-rated safety footwear when entering the electrical ante room and Compressor room.

A full-face respirator with green-labeled cartridge filters for protection against gaseous ammonia MUST be worn in the following events:

- Entry into the compressor room under non-alarm conditions to investigate an odour.
- Entry into the electrical ante room or compressor room under low-level alarm conditions.

Full-face respirators are stored in the Shift Engineer vehicle and Mechanical Shop safety cabinet. All workers wearing respirators MUST BE CLEAN SHAVEN and have been fit tested in the past year.

Procedures

Procedures for the various departments and functions are listed below. Procedures have been created for:

- Facilities Management (FMGT)
- Campus Security Services (CSEC)
- Athletics & Recreation (ATRS)
- Alumni House
- Occupational Health, Safety and Environment (OHSE)
- University Communications & Marketing (UC+M)
- Manager, Emergency Planning

During identified maintenance activities, Facilities Management (FMGT) staff will advise Campus Security (CSEC) to disregard alarms unless advised otherwise. CSEC will continue to monitor the compressor room via closed circuit video feed.

The following procedures detail the emergency response to an ammonia leak when the system is unattended, or the Mechanical Shop staff require assistance.

Procedures for Facilities Management (FMGT)

FOR ALL POTENTIAL AMMONIA ODOUR REPORTS, IMMEDIATELY ENSURE THAT FMGT RADIOS ARE ACQUIRED AND TURNED TO THE "SECURITY" CHANNEL. TEST RADIO PRIOR TO ENTERING SPACE.

WHEN a **suspected ammonia odour** is reported in or around the ammonia plant (no alarm triggered), the FMGT Shift Engineer will:

- 1) Immediately notify CSEC that FMGT Mechanical Staff are responding to the ISC Ammonia plant to investigate reported odours. Collect a two-way radio from the District Energy Plant prior to proceeding to the ammonia plant.
- 2) Upon arrival at ISC, determine prevailing wind direction and speed using the windsocks on the approach (located on the roof at the southeast corner of the building and at the northeast corner of the fieldhouse). Identify a potential muster point based on ambient weather conditions and report this to CSEC.

If the wind is from the north/northwest/west, approach the entrance via the alleyway on the north side of the building.

If the wind is from the south/southeast/east, attempt to approach the entrance from the south side of the building (adjacent to tennis courts), exiting through the former fitness room (Room 140).

- 3) Monitor ambient ammonia concentrations using the hand-held personal monitor prior to entering the electrical ante room. Look for maintenance or other activities in adjacent areas that may be the source of the odour. Check if the blue ammonia alarm light above the outer door is on, indicating

greater than 25 ppm of ammonia in the ante room. If no ammonia is detected, open door and enter ante room.

- 4) Approach the compressor room door and check the sensor readings on the sensor panel to the right of the door to determine if any ammonia gas has been detected in the compressor room. Observe the plant through the window in the compressor room door and look for any signs of leakage or other issues.
- 5) Should entry into the compressor room be undertaken, ensure ventilation fan is activated. Summon Chief Engineer or FMME Shop Supervisor to act as Standby Person prior to entry. Standby Person will collect two-way radio and full face respirator from District Energy Plant or Mechanical Shop prior to arriving at ISC.
- 6) If all monitors indicate the gaseous ammonia concentration is below 25 ppm, don full face respirator and Viton/Teflon gloves prior to room entry. Have the Standby Person present in the ante room, ready to assist if necessary. Notify CSEC Dispatch that you are entering the compressor room. Use ammonia gas "sniffer" to assist in determining the source of the ammonia odour.

Workers on-site must ensure that their full face respirators have the green labelled ammonia cartridges attached to the face piece and carry out a seal check immediately prior to entry. All workers wearing respirators MUST BE CLEAN SHAVEN.

- 7) Report results of assessment back to CSEC (e.g. all functioning, false alarm, minor leak that didn't trigger alarm).
- 8) If any work is required to be performed on the system, isolate the system and arrange for refrigeration contractor to service.
- 9) At any time, should the compressor room low level alarm activate or hand held detector read ammonia concentrations higher than 25 ppm, exit the compressor room and close the door. Move to a safe location (electrical ante room or outside) to re-assess the circumstances and proceed to Step 10.

WHEN a **low level alarm** is activated (at greater than 25 ppm) in either the compressor or electrical ante room, the FMGT Shift Engineer will:

10) Leave the compressor and ante room immediately if inside.

Verify the alarm via the DDC software. If alarm is valid, then proceed as follows:

- a. Contact Campus Security and confirm alarm. Inform them you are on site or en route to investigate.
- b. If not already present, summon Chief Engineer or FMME Shop Supervisor to act as Standby Person prior to entry. Standby Person will collect two-way radio and full face respirator from District Energy Plant or Mechanical Shop prior to arriving at ISC.

11) Approach the exterior door to the electrical ante room from the upwind side by referencing the windsocks on the approach (located on the roof at the southeast corner of the building and at the northeast corner of the former weight room), to determine the wind direction and speed. Identify a potential muster point based on ambient weather conditions and report this to CSEC.

If the wind is from the north/northwest/west, approach the entrance via the alleyway on the north side of the building.

If the wind is from the south/southeast/east, attempt to approach the entrance from the south side of the building, exiting through the former fitness room (Room 140).

12) **The Shift Engineer cannot enter the electrical ante room without a Standby Person present. CSEC personnel are not to be used as on-site backup.** Assess the situation from outside the ammonia plant via DDC using handheld device or tablet.

13) Once the Standby Person arrives, prepare to enter the ammonia plant electrical ante room:

- a. Ensure the Standby Person is in place to monitor entry into the ante room. On-site personnel must be equipped with a minimum of a full face respirator, appropriate gloves, coveralls, steel-toes footwear and communication device. .

Workers on-site must ensure that their full face respirators have the green labelled ammonia cartridges attached to the face piece and carry out a seal check immediately prior to entry. Full-face respirators are stored in the Shift Engineer vehicle and Mechanical Shop safety cabinet. All workers wearing respirators **MUST BE CLEAN SHAVEN**.

- b. Enter the electrical ante room once the Standby Person is in place. Use the personal monitor or Draeger tubes (located in the safety cabinet to the right of the door) to check the ammonia concentration on the approach to the compressor room door and at the door itself.
- c. **IF** airborne concentration remains **less than 200 ppm**, then confirm compressor room exhaust fan operation using DDC software on hand held device or computer. **Continue on to Step 14.**
- d. **IF** airborne concentration is **greater than 200 ppm**, **THEN go to step 18.**

- 14) Shut down the chiller unit compressor using the control system terminal located in the electrical ante room.
- 15) Check sensor display panel and on-site alarms to confirm the ammonia concentration in the compressor room is less than 200 ppm.
- 16) Assess the compressor room visually through the window in the door and using the local computer workstation.

IF the inspection indicates that the leak cannot be quickly or easily repaired, or could worsen,
AND an evacuation has not already been initiated, then:

- a. advise CSEC who will advise ISC BECs and FECs to prepare for possible muster at the internal Building Emergency Assembly Points areas. CSEC should initiate contact with the Fire Department.
 - b. isolate system operations and contact Refrigeration Contractor.
- 17) If the Shift Engineer enters the compressor room, the Standby Person is to observe the Shift Engineer through the door window and monitor the ammonia concentration on the display to the right of the compressor room door. The Standby Person will notify the Shift Engineer if the ammonia concentration reaches 100 ppm, and if it is increasing, decreasing or staying steady.

WHEN:

- the **high level alarm** in the compressor room is activated (at higher than 200 ppm), or
- the **rink alarm** is activated, or
- the **external pressure relief valve alarm** is activated,

then the FMGT Shift Engineer will:

- 18) Immediately leave the ammonia plant, if working inside. Instigate plant shut down remotely;
- 19) Contact Campus Security and confirm high-level alarm situation;
- 20) Meet up with Incident Command (CSEC or Fire Department) at the designated muster location to provide assistance;
- 21) Contact Rocky Mountain Refrigeration for assistance, as required.

Rescue & Basic First Aid

IF the Shift Engineer becomes incapacitated or requires assistance to leave the compressor room, the on-site backup personnel **will not** enter the room, but immediately call 9-1-1 to request emergency response (i.e., Fire Department). When emergency response arrives, assessment of appropriate PPE, exposure levels and rescue personnel will be determined.

Burns from liquid ammonia should be drenched with large amounts of water using the emergency shower in the electrical ante room. Remove all contaminated clothing from the person who has been exposed to liquid ammonia. Bandage affected skin loosely with sterile bandages/gauze and apply ice packs. Eyes exposed to ammonia can be rinsed using the eyewash station located next to the outer door of the electrical ante room.

For inhalation, begin artificial respiration if breathing stops. If the victim is having difficulty breathing, place the individual in the most comfortable position, usually semi-sitting. If an oxygen therapy unit and trained personnel are available, administer oxygen. Transport the victim to hospital for assessment in case of a delayed reaction in the form of pulmonary edema.

Procedures for Campus Security Services (CSEC)

During identified maintenance activities, Facilities Management (FMGT) staff will advise Campus Security (CSEC) to disregard alarms unless advised otherwise. CSEC will continue to monitor compressor room via video feed.

Upon notification of a **suspected ammonia odour** by University staff, CSEC Dispatch will immediately:

1. Notify FMGT Shift Engineer and inform them of reported odour. Shift Engineer will provide updates as the investigation proceeds.
2. Await Shift Engineer assessment, maintaining communication with Shift Engineer via radios, cell phone and/or monitoring via compressor room video feed (as necessary);
3. Provide update to building occupants/caller on findings (i.e. not ammonia, false alarm, etc.) once assessment is completed or as situation develops.

If a **Low Level Alarm** (at great than 25 ppm) activates in the compressor room or electrical ante room during scheduled work activities, CSEC staff will immediately:

4. Confirm alarm with Shift Engineer and request status report. Shift Engineer will provide updates as the investigation proceeds.
5. Contact Saanich Fire Department alarm room and notify them of low level alarm.
6. Call CSEC staff for assistance and direct full attention to monitoring. At any point if the Shift Engineer communicates or appears in distress, call 9-1-1 to notify Fire Department for emergency hazmat response (ISC address: 3964 Gordon Head Rd, Victoria, BC V8N 3X3).

7. Contact Rink Attendant and direct them to be prepared for possible assembly at either the internal or external Building Emergency Assembly Points. Attempt to contact Rink Attendant in the following order:

1. Rink attendant via 2-way radio or emergency cell phone	250-812-7420
2. ATRS main reception via phone*	250-472-4000
3. ISC rink landline	250-472-5604

* If contacting the ATRS main reception, ask staff to contact rink attendant via radio.

8. Contact Alumni BECs/FECs and direct them to be prepared for possible assembly at either the internal or external Building Emergency Assembly Points.

Alumni House, Building Emergency Coordinator	Rachel Drummond – local 6000 Gregory Churchill – local 5032
Alumni House, Floor Emergency Coordinator – Level 2	Anna Karpova - local 6267 Lena Imada – local 8908
Alumni House, Floor Emergency Coordinator – Level 1	Charlotte Duncan– local 6007 Alice Marriner – local 3154 Caitlin Pierce – local 5429
Alumni House, Floor Emergency Coordinator – Level 1 (after hours, weekend)	Asiyah Robinson– local 7637 Supervisor of Student Callers – local 6002

8. Await Shift Engineer assessment, maintaining communication with Shift Engineer via radios, cell phone and/or monitoring via compressor room video feed (as necessary);
9. Provide updates to Alumni/ATRS BEC's/FEC's on findings (i.e. not ammonia, false alarm, etc.) once assessment is completed or as situation develops.

CSEC Dispatch will proceed with the steps below in the following events:

- **Alarm in rink or safety relief valves;**
- **High Level alarm in compressor room**

10. Contact Shift Engineer to confirm alarm status. Request the specific information:

- Have you been able to safely approach the area to make an assessment?
- What are your findings from the assessment?
- What is the prevailing wind direction?
- Can you stop the leak?
- Based on your assessment, what is your plan of action?
- Are you aware of any injuries?

11. Contact Saanich Fire Department via 911 and notify them of alarm. Confirm location of Incident Command Post and forward to Shift Engineer

12. Send Security Officers to Incident Command Post. The Security Officer will assume the role of Incident Commander to control:

- Building access as needed;
- Radio communication with the CSEC office;
- Traffic and crowd control, and;
- Emergency First Aid

NOTE: tasks above dependent on incident command post location.

The Security officer will continue as Incident Commander until command is transferred to the Fire Department personnel.

13. Notify ATRS, FMGT Custodial Services and Alumni House following steps 14 through 16. Convey the following instructions based on alarm locations:

- If the alarm is in the RINK, direct building occupants to EXTERNAL Building Emergency Assembly Points.
- If the alarm is in the COMPRESSOR ROOM or PRESSURE RELIEF VALVES, direct building occupants to INTERNAL Building Emergency Assembly Points.

14. Contact rink attendant. Attempt contact in the following order:

1. Rink attendant via 2-way radio or emergency cell phone	250-812-7420
2. ATRS main reception via phone*	250-472-4000
3. ISC rink landline	250-472-5604

* If contacting the ATRS main reception, ask staff to contact rink attendant via radio.

15. Contact Alumni House Building or Floor Emergency Coordinators (BEC/FEC) to proceed to internal or external Building Emergency Assembly Points as decided in step 13.

Alumni House, Building Emergency Coordinator	Rachel Drummond – local 6000 Gregory Churchill – local 5032
Alumni House, Floor Emergency Coordinator –Level 2	Anna Karpova - local 6267 Lena Imada – local 8908
Alumni House, Floor Emergency Coordinator – Level 1	Charlotte Duncan– local 6007 Alice Marriner – local 3154 Caitlin Pierce – local 5429
Alumni House, Floor Emergency Coordinator – Level 1 (after hours, weekend)	Asiyah Robinson– local 7637 Supervisor of Student Callers – local 6002

16. Contact FMGT Custodial Services via two-way radio on the “Janitorial Day” channel to inform their supervisors of the alarm. Supervisors will indicate if any FMCS are on site. If there is no radio response, attempt contact by phone using the following numbers:

- Mon-Fri - 250-883-3748
- Saturday –250-216-7982
- Sunday – 250-216-9028

17. Notify CSEC Management that a Site Response Team needs to be activated, and that a Security Officer is on site as acting Incident Commander.
18. Notify the Manager, Emergency Planning at local 6355 (if after hours use CSEC Callout)
19. Notify the Occupational Health, Safety and Environment Department (if after hours follow OHSE Departmental Emergency Callout).
20. Notify University Communications & Marketing (UC+M) at local 7636 (if after hours follow UC+M Emergency Callout).
21. In the event building occupants are still at the internal building assembly points, CSEC will relay directions from the Fire Department (Incident Commander) to ISC staff regarding building evacuation.

Procedures for Athletics & Recreation (ATRS) – Ice Rink

Upon detection of an **ammonia odour** during normal hours of operation,

1. Rink staff will leave the affected area and immediately contact Campus Security at 7599 to report the odour.
2. Rink staff will prepare to direct people to either indoor or outdoor Building Emergency Assembly Points if directed to do so by Campus Security, and remain on standby to obtain information regarding the status of the situation (e.g. no alarm detected, sending out Shift Engineer, maintenance activities, etc.).

Upon receiving notification of a **low level alarm** in Compressor Room or electrical ante room:

3. Follow the directions of Campus Security and prepare to direct people to either indoor or outdoor Building Emergency Assembly Points. Remain on standby to obtain information from Campus Security regarding the status of the situation.

Upon activation of **Rink alarm**, ATRS staff will:

4. Direct all rink occupants to external Building Emergency Assembly Points. Check with occupants to determine if anyone is not accounted for.
5. Contact Campus Security (at 7599) to notify them of alarm and actions taken.
6. Communicate any additional information to Incident Commander (Campus Security or Fire Department) as requested. Be prepared to travel to Incident Command location (provided by Campus Security) if necessary.

Upon notification of **High Level Alarm in Compressor Room or Pressure Relief valves**, ATRS staff at rink will:

7. Direct all rink occupants to internal Building Emergency Assembly Points. Check with occupants to determine if anyone is not accounted for.
8. Contact Campus Security (at 7599) to notify them of actions taken.
9. Wait for further directions from the Incident Commander (Campus Security or Fire Department), including building evacuation. Communicate any additional information requested (ie, medical needs, people unaccounted for, etc).
10. Once evacuated, meet with the Incident Commander to confirm evacuation and provide additional information as required.

Procedures for Alumni House

(This group consists of Alumni & Development and Civil Engineering)

Upon detection of an **ammonia odour** during normal hours of operation:

1. Staff will leave the affected vicinity and immediately contact Campus Security at 7599 to report the odour. Report odour to the Building or Floor Evacuation Coordinator (if present in building). Close any open doors or windows.
2. The BEC/FEC staff will prepare to direct people to Building Emergency Assembly Points if directed to do so by Campus Security, and remain on standby to obtain status information (e.g. no alarm detected, sending out Shift Engineer, maintenance activities, etc.).

Upon receiving notification of a **low level alarm** in Compressor Room or electrical ante room:

3. The Building or Floor Emergency Coordinators will receive a call from Campus Security that an ammonia alarm has been triggered.
4. The BEC/FECs will initiate a building sweep to inform key building contacts of a pending internal Building Emergency Assembly and/or building evacuation.
5. The BEC/FECs will be advised by Campus Security of alarm status and any further instructions.

Upon receiving notification of an **uncontrolled release of ammonia (all other alarms)**:

6. CSEC will inform Building or Floor Emergency Coordinators immediately and instruct them to prepare to direct staff to either internal or external Building Emergency Assembly Points.
7. BEC/FECs will inform building occupants and direct them to either internal or external Building Emergency Assembly Points as directed by Campus Security (see Appendix C - Internal Emergency Assembly Plan).
8. If directed to **external Building Emergency Assembly Points**, BEC will meet with Incident Commander (CSEC or Fire Department) and confirm evacuation of Alumni Wing.
9. If directed to **internal Building Emergency Assembly Points**, all staff will wait for instruction from the Incident Commander on scene before evacuating the Alumni Wing.
10. Once directed by the Incident Commander, evacuate the building. The Incident Commander will consider wind direction and other weather conditions when deciding on how to evacuate the building. The Building Emergency Coordinator (BEC) or alternate will determine building evacuation status and report to the Incident Commander.
11. Once the building has been evacuated, the BEC will remain on site and become a resource to the UVic Site Response Team (SRT).
12. Floor Emergency Coordinators will maintain an appropriate perimeter as set by the Fire Department until they are relieved or until the order to re-enter the building is given.

Procedures for Occupational Health, Safety & Environment (OHSE)

For an ammonia leak situation above 25 ppm, OHSE will be contacted immediately, and:

1. Respond to the scene to provide advice and guidance on appropriate action on ammonia leak response from a health and safety perspective.
2. Where necessary, notify and liaise with outside agencies that, for regulatory reasons, may need to become involved or are already involved.
3. Where necessary, call for additional OHSE staff to attend.
4. OHSE will become part of the UVic Site Response Team.

Procedures for University Communications & Marketing (UC+M)

Upon notification by CSEC of an ammonia leak situation above 25 ppm, a UC+M staff member will immediately report to the UVic Site Response Team to provide appropriate action on communication issues related to the event.

Procedures for Manager of Emergency Planning

Upon notification by CSEC of an ammonia leak situation above 25 ppm, the Manager, Emergency Planning will immediately respond to the scene to become part of the UVic Site Response Team.

At the conclusion of the event, the Manager, Emergency Planning will arrange and coordinate the incident debriefing, and provide reports to University Administration.

Emergency Operations Centre (EOC)

The EOC may be partially or fully activated in the event of a significant ammonia release as per UVic's Emergency Response Plan.

Appendix A – Emergency Contact Information

Shift Engineer	250-880-0194
Refrigeration Contractor (Rocky Mountain)	250-884-3364
Facilities Management Main Office	250-721-7616
Alumni House, Building Emergency Coordinator	Rachel Drummond – local 6000 Gregory Churchill – local 5032
Alumni House, Floor Emergency Coordinator – Level 2	Anna Karpova - local 6267 Lena Imada – local 8908
Alumni House, Floor Emergency Coordinator – Level 1 (after hours, weekend)	Asiyah Robinson– local 7637 Supervisor of Student Callers – local 6002
Alumni House, Floor Emergency Coordinator – Level 1	Charlotte Duncan– local 6007 Alice Marriner – local 3154 Caitlin Pierce – local 5429
Athletics & Recreation Services, Main Line – CARSA	250-472-4000
Ian Stewart Ice Rink Attendant	250-472-5604 (office) 250-812-7420 (cell)
Custodial Services Supervisor	Mon-Fri - 250-883-3748 Saturday –250-216-7982 Sunday –250-216-9028
Campus Security/First Aid	250-721-7599
Emergency Planning Manager	250-721-6355
Occupational Health, Safety & Environment	250-721-8971
University Communications & Marketing	250-721-7636
Mount Douglas Secondary School	250-477-6977
South Island Property Management (University Park Terrace)	250-595-6680 (24-hour)
Saanich Fire Department	250-475-5500
Saanich Police Department (non-emergency)	250-475-4321
Ministry of Environment	1-800-663-3456
WorkSafeBC	1-888-621-7233
Technical Safety BC	1-866-566-7233

Appendix B - Ammonia Emergency Procedures Flow Charts

Ammonia Odour Detected No Alarm (<25 ppm)				
FMGT		CSEC	ATRS	Alumni
Contact CSEC and Supervisor of odour		Direct ATRS, Alumni to be prepared for possible muster and wait for further information	Contact CSEC of Odour detected	Contact CSEC of odour detected
Arrange for backup personnel and proceed to Ammonia plant		Contact FMGT of odour detected	Rink staff prepare for possible muster	BEC's/FEC's prepare for possible muster
Enter ammonia plant and assess/repair as necessary/possible		Monitor situation via closed-circuit monitor		
Repair successful	Repair unsuccessful			
	Shut down/isolate system			
	Contact supervisor, CSEC and advise			
	Contact Refrigeration Technician to provide service			
	Continue Monitoring			
Repair successful				
Contact supervisor, CSEC and advise		Contact ATRS, Alumni of incident resolution	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties
Conduct incident debriefing/inform necessary parties		Conduct incident debriefing/inform necessary parties		

Low Level Alarm in Ammonia Plant During Scheduled Work (>25ppm)

FMGT		CSEC Dispatch	ATRS	Alumni
Contact CSEC to confirm alarm		Contact FMGT Shift Engineer to confirm alarm		
Notify Supervisor of alarm. Arrange for backup personnel and proceed to Ammonia plant		Direct ATRS, Alumni to be prepared for possible muster and to wait for further information	Contact rink staff to prepare for possible muster	BEC's/FEC's prepare for possible muster
Approach ante room and use Draeger tubes and/or personal monitor to determine presence, concentration of		Monitor situation via closed-circuit monitor		
Enter ammonia plant and assess/repair as necessary/possible				
Repair successful	Repair unsuccessful			
	Shut down/isolate system			
	Contact supervisor, CSEC and advise			
	Contact Refrigeration Technician to provide service			
	Continue Monitoring			
Repair successful				
Contact supervisor, CSEC and advise		Contact ATRS, Alumni of incident resolution		
Conduct incident debriefing/inform necessary parties		Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties

Major Ammonia Release			
Rink Alarm Activated			
FMGT	CSEC	ATRS	Alumni
Shift Engineer contacts CSEC to confirm alarm status	Dispatch calls FMGT shift engineer to confirm alarm status	Rink attendant directs all rink occupants to external muster station	
Shift Engineer initiates shut down of ammonia plant remotely	Dispatch contacts CSEC officers (radio) Fire Department (call) and alerts them of alarm	Rink attendant notifies CSEC of alarm	
FMGT Shift Engineer attends site with CSEC officer	Dispatch contacts: ATRS staff (radio) Alumni House (call) and instructs them to proceed to internal muster stations		BEC/FECs guide occupants to external muster station
	CSEC Officer attends site with FMGT Shift Engineer	rink attendant contacts CSEC to indicate muster complete	BEC contacts CSEC to indicate muster complete.
Conduct initial site assessment, inform Fire Department upon arrival		Wait for instruction from Site Response Team	Wait for instruction from Site Response Team
EP,UC+M & OHSE attend, establish Site Response Team			
Follow directions of Incident Commander regarding evacuation, perimeter and re-entry	Follow directions of Incident Commander regarding evacuation, perimeter and re-entry		
Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties

Major Ammonia Release			
Low Level alarm in Plant Room with unknown source,			
High level alarm in Plant Room or			
Alarm from Outside Pressure Relief Valves			
FMGT	CSEC	ATRS	Alumni
Contact CSEC to confirm alarm status	Dispatch calls FMGT shift engineer to confirm alarm status		Blue ammonia alarm light illuminates in Alumni Wing
Initiate shut down of ammonia plant, building HVAC system remotely	Dispatch contacts CSEC officers (radio) Fire Department (call) and alerts them of leak		BEC/FECs contact CSEC to report alarm
FMGT Shift Engineer attends site with CSEC officer	Dispatch contacts rink attendant (radio), Alumni House (call) and instructs them to proceed to internal muster stations	Rink attendant guides rink occupants to internal muster station	BEC/FECs guide occupants to internal muster stations
	CSEC Officer attends site with FMGT Shift Engineer	rink attendant contacts CSEC to indicate muster complete	BEC contacts CSEC to indicate muster complete.
Fire Department, FMGT,CSEC arrive, conduct initial assessment		Wait for instruction from Site Response Team	Wait for instruction from Site Response Team
EP,UC+M & OHSE attend, establish Site Response Team			
Follow directions of Incident Commander regarding evacuation, perimeter and re-entry			
Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties	Conduct incident debriefing/inform necessary parties

Appendix C - Internal Emergency Assembly Plan (floor plan)

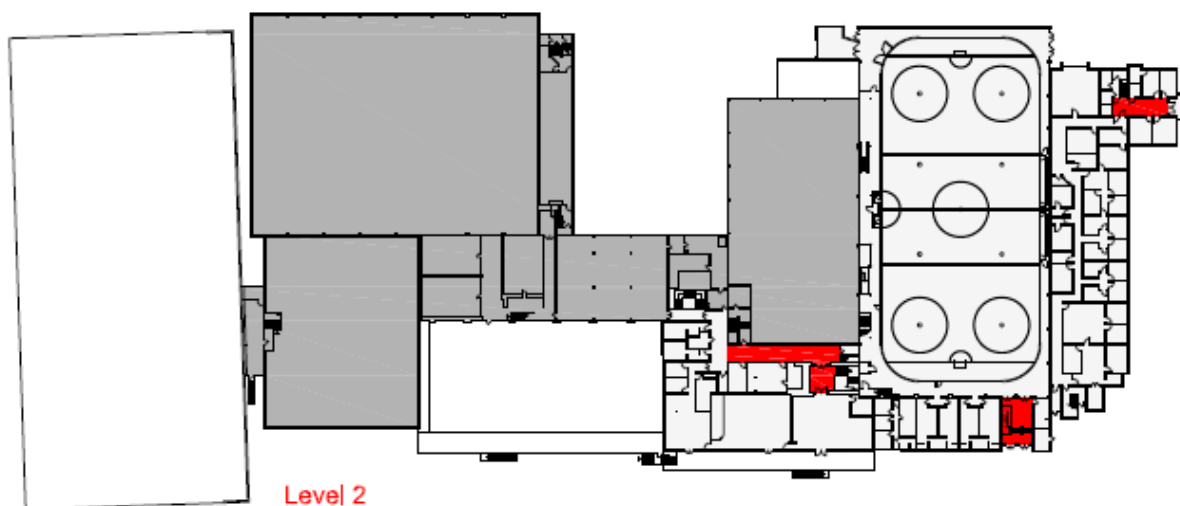
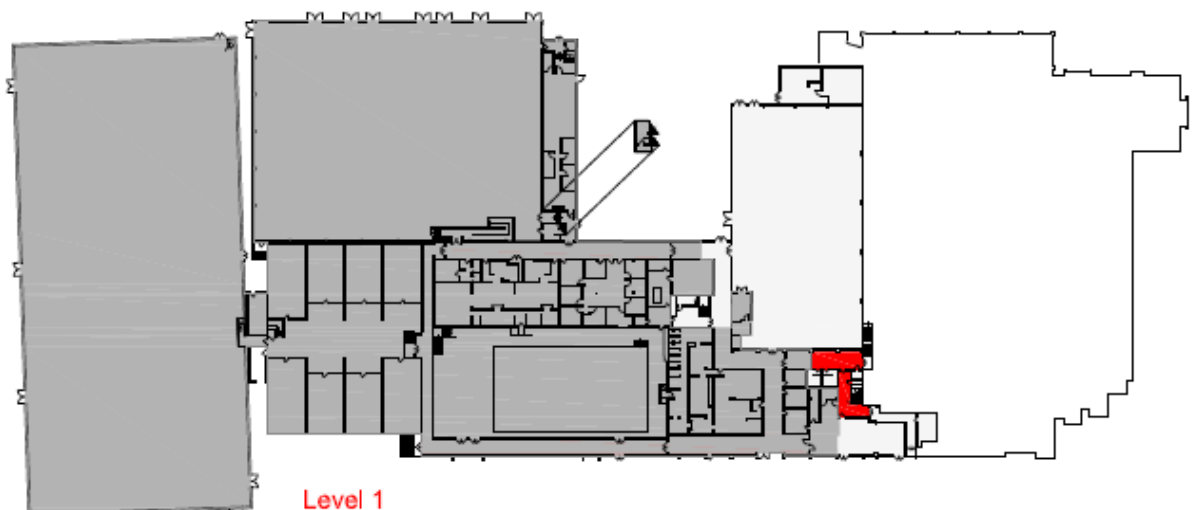
**University
of Victoria**

Internal Emergency Assembly Plan

 Assembly Area
 Restricted Access

**Stewart Complex
Building # 125**

 **Levels 1 & 2**



Revised July 2018

Appendix D - Saanich Fire Department Public Notification Agreement



SAANICH FIRE DEPARTMENT

760 Vernon Avenue, Victoria, British Columbia V8X 2W6
THE CORPORATION OF THE DISTRICT OF SAANICH
Tel: 250-475-5500 | Fax: 250-475-5505

June 20, 2018

Robert Johns
Manager, Emergency Planning
University of Victoria
By Email: epmanager@uvic.ca

Dear Rob:

Re: UVic Ian Stewart Complex Ammonia Plant Emergency Plan

We understand you are in the process of updating the ammonia leak response plan for the Ian Stewart Complex at the University of Victoria (UVic) and have had several discussions with the Saanich Fire Department (SFD) in this regard.

During these discussions agreement was reached that the SFD would provide direction for the notification of the general public in the surrounding area in the event of an uncontrolled leak of ammonia from the Ian Stewart Complex ammonia plant.

In the event of an uncontrolled leak of ammonia from the Ian Stewart Complex ammonia plant, UVic is not expected to alert neighbours as the SFD will provide direction for the safe notification of personnel and properties specific to conditions on the day of any incident.

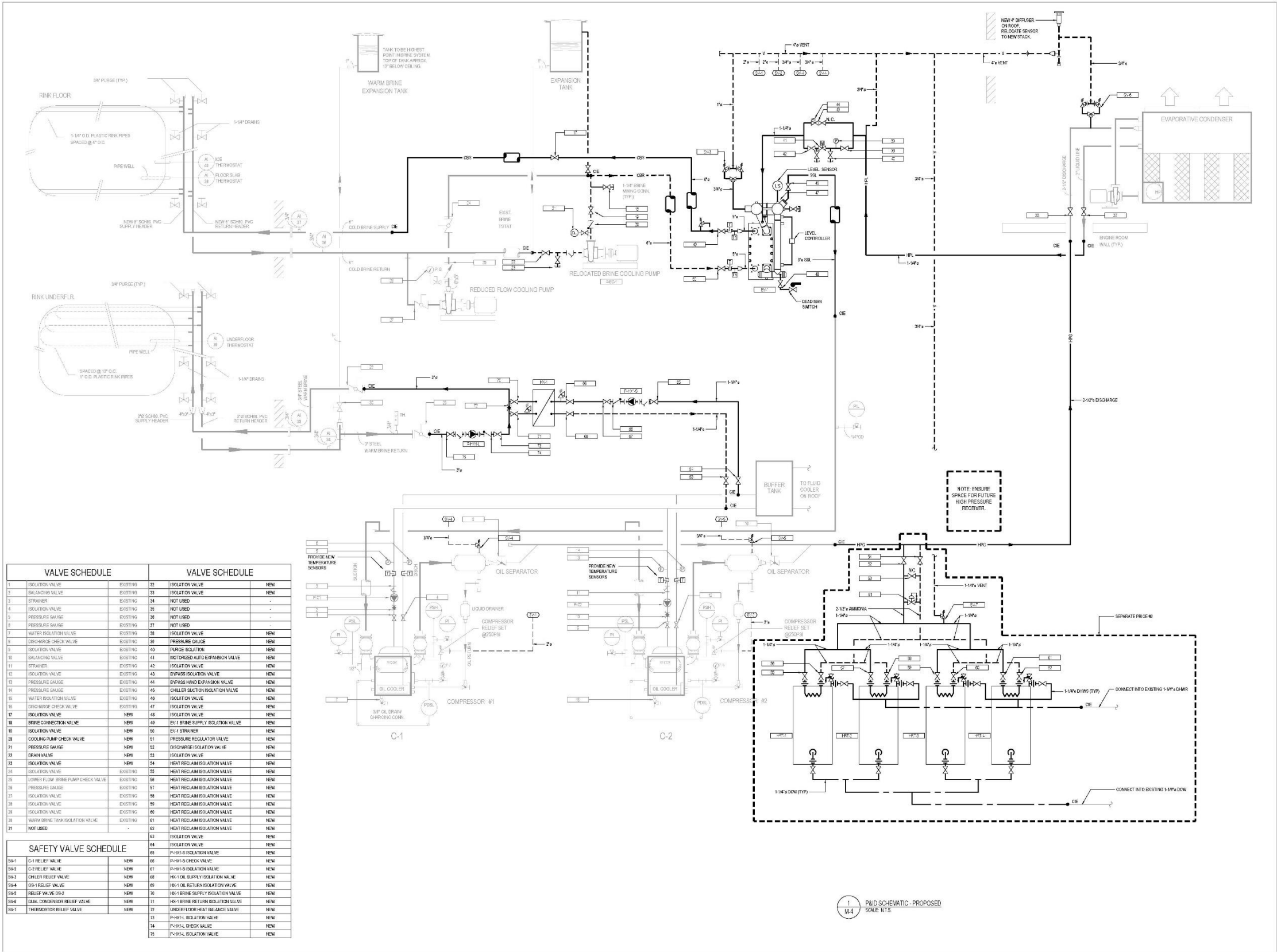
Please contact myself or Deputy Chief Dan Wood with any questions.

Sincerely,

Frank Macdonald
Deputy Fire Chief

cc: Deputy Chief Dan Wood, Saanich Fire Department
Assistant Deputy Chief Brock Henson, Saanich Fire Department

Appendix E – Schematic of Ammonia Plant



REVISION RECORD		
NO.	DATE	DESCRIPTION
1	30SEP19	95% REVIEW
2	18OCT19	99% REVIEW
3	01NOV19	ISSUED FOR TENDER
4	13NOV19	ADDENDUM 1
5	30JAN20	ISSUED FOR CONSTRUCTION
6	26AUG20	ISSUED FOR RECORD DRAWING

KEY PLAN

CLIENT:



VICTORIA OFFICE
400-1101 ISLAND HIGHWAY
VICTORIA, BC V8B 1J1

www.rpe.ca
ph: 778-620-9875

SEAL:

WE, FRASER VALLEY REFRIGERATION, HEREBY CERTIFY THAT THE SET OF RECORD DRAWINGS ATTACHED HERETO, COMPRISING OF 8 SHEETS, IS A COMPLETE AND TOTAL RECORD OF THE BUILDING AS CONSTRUCTED. WE FURTHER CERTIFY THAT THE DRAWINGS SHOW ACCURATELY ALL MECHANICAL SERVICES EXPOSED OR HIDDEN AND THAT THE OWNER MAY FULLY RELY ON THEIR ACCURACY IN ANY FUTURE CONTEMPORATED REPAIRS, MODIFICATIONS OR ADDITIONS TO THIS WORK.

SIGNED:

DATE:

PROJECT STATUS:

ISSUED FOR
RECORD DRAWING

COPYRIGHT RESERVED:

THIS DRAWING IS THE PROPERTY OF FRASER VALLEY REFRIGERATION. IT IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED HEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF FRASER VALLEY REFRIGERATION.

PROJECT TITLE:

IAN STEWART COMPLEX
CHILLER & DEHUMIDIFIER
UPGRADES

CLIENT:

UNIVERSITY OF VICTORIA

DRAWING TITLE:

PIPING & INSTRUMENTATION
DIAGRAM - PROPOSED

PROJECT NUMBER:

19427-S

DRAWN:

SL

DESIGNED:

KH

CHECKED:

28 Aug 2020

DATE:

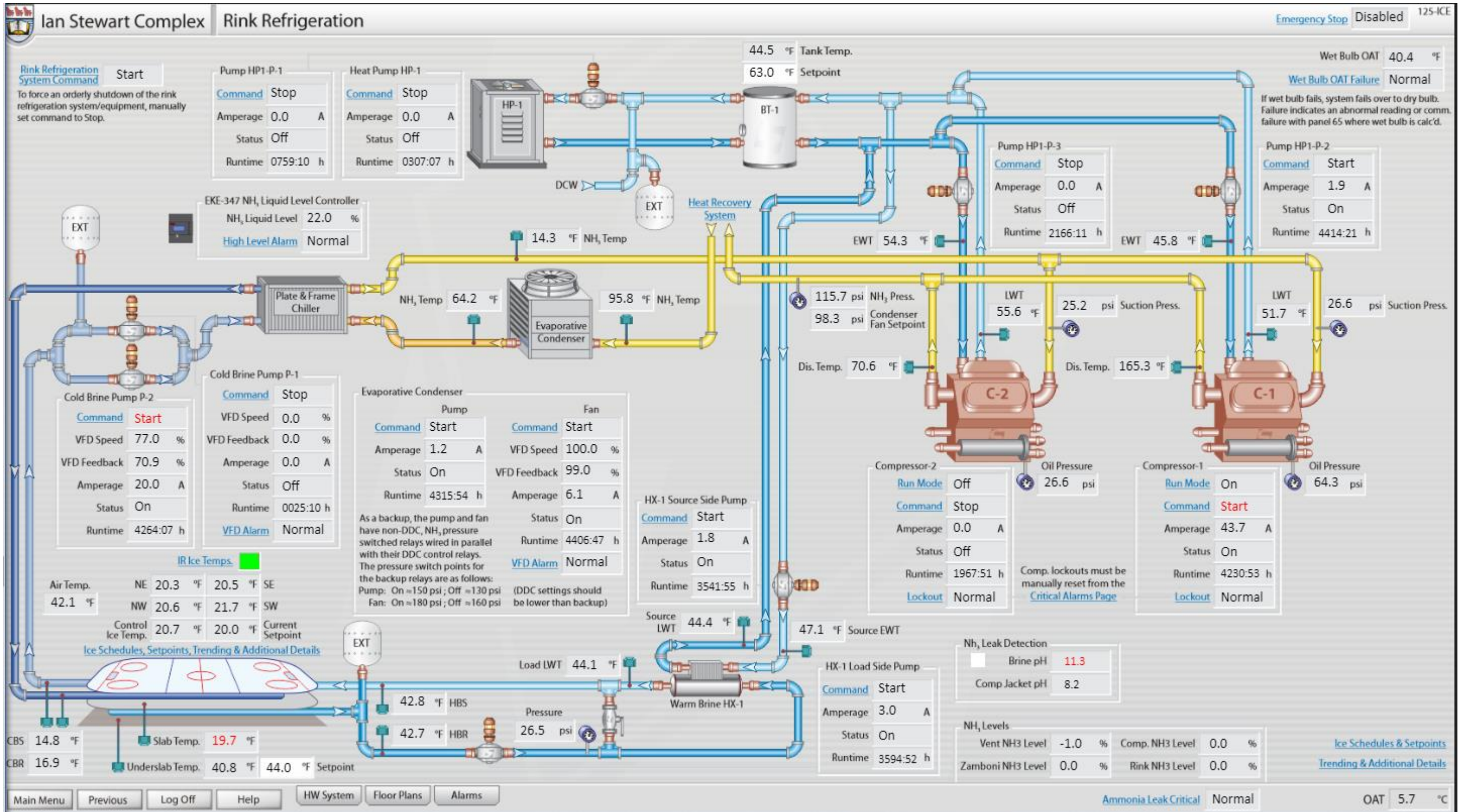
SCALE:

AS NOTED

DRAWING NUMBER:

M-4

5 OF 5



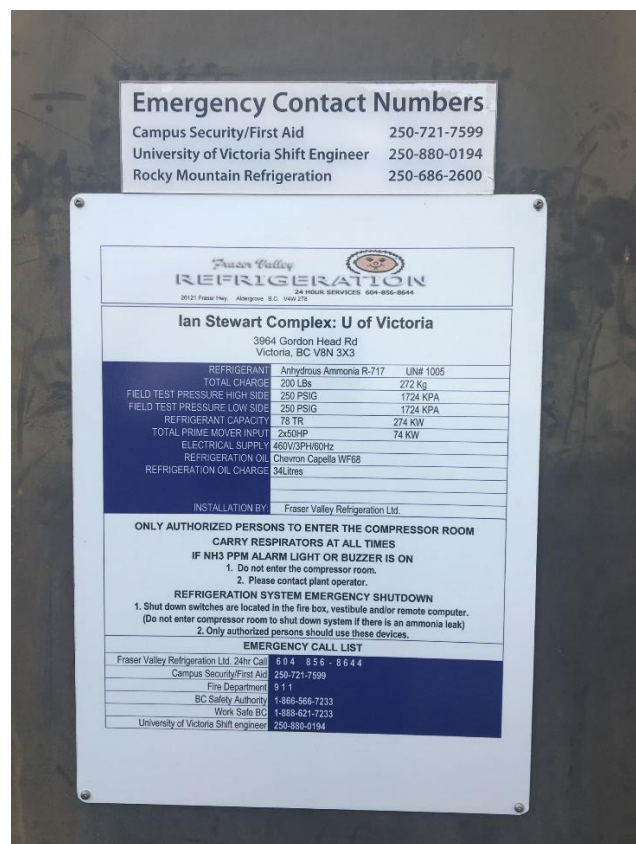
Appendix F - Photographs of Ammonia Process



Entrance to Ante Room



Alarm light and sign above door



Signage on door



Zamboni propane tanks outside of Electrical room



Inside Ante Room



Eyewash to left of Electrical ante room door



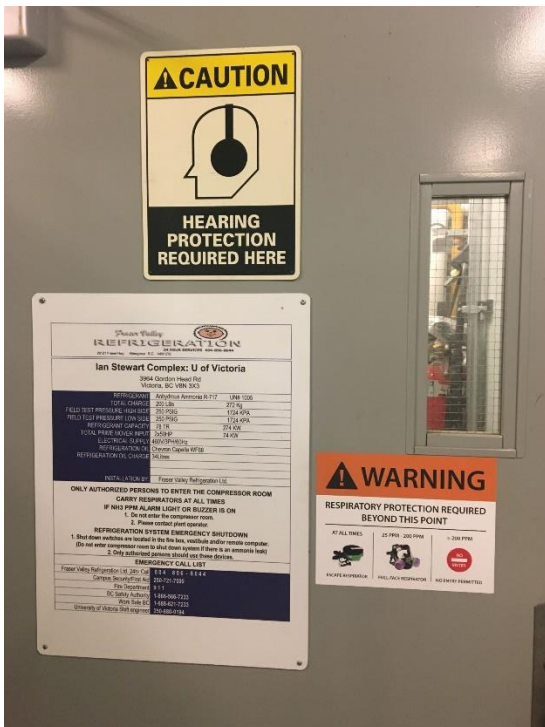
First Aid cabinet to right of Electrical ante room door



Ammonia sensor calibration gas



Emergency Shower in front of Compressor Room



Door to Compressor Room



Emergency shut down switches for Ice Plant



Alarm Display Panel



Emergency "bite block" respirator



Compressor Room



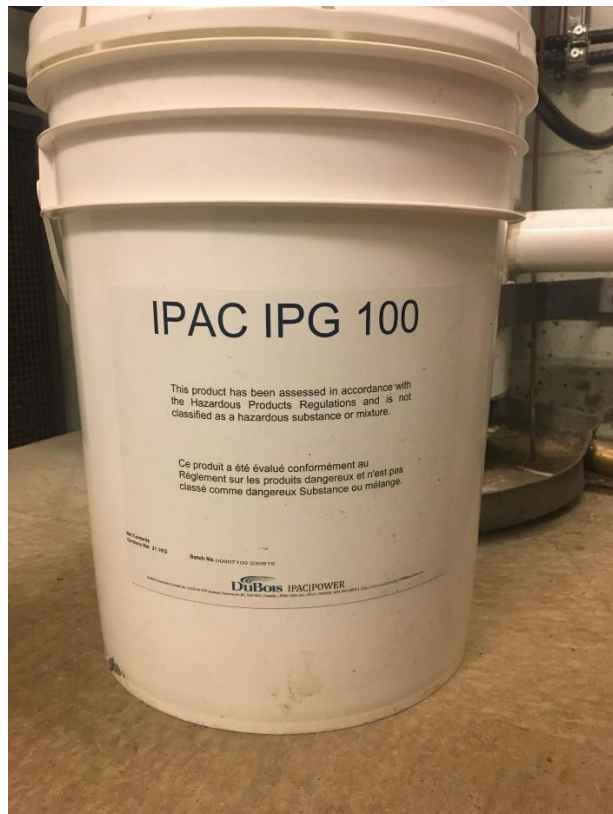
High and Low alarm lights in compressor room



Campus Security closed circuit camera (arrow)

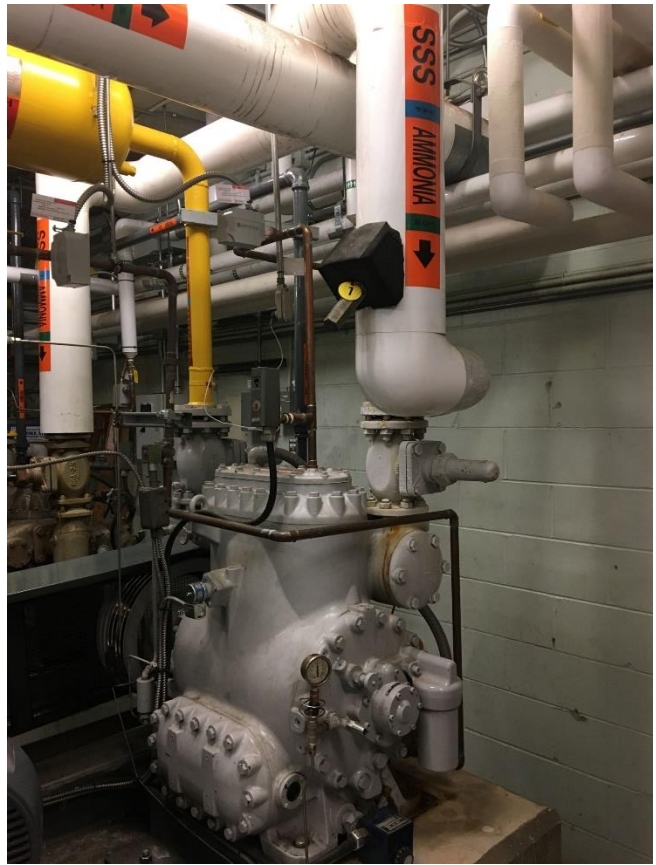


Chemicals for system





Compressor 2



Compressor 1



Heat Exchanger on roof of Zamboni Room



Emergency Pressure Relief Valves and Compressor Room exhaust stacks

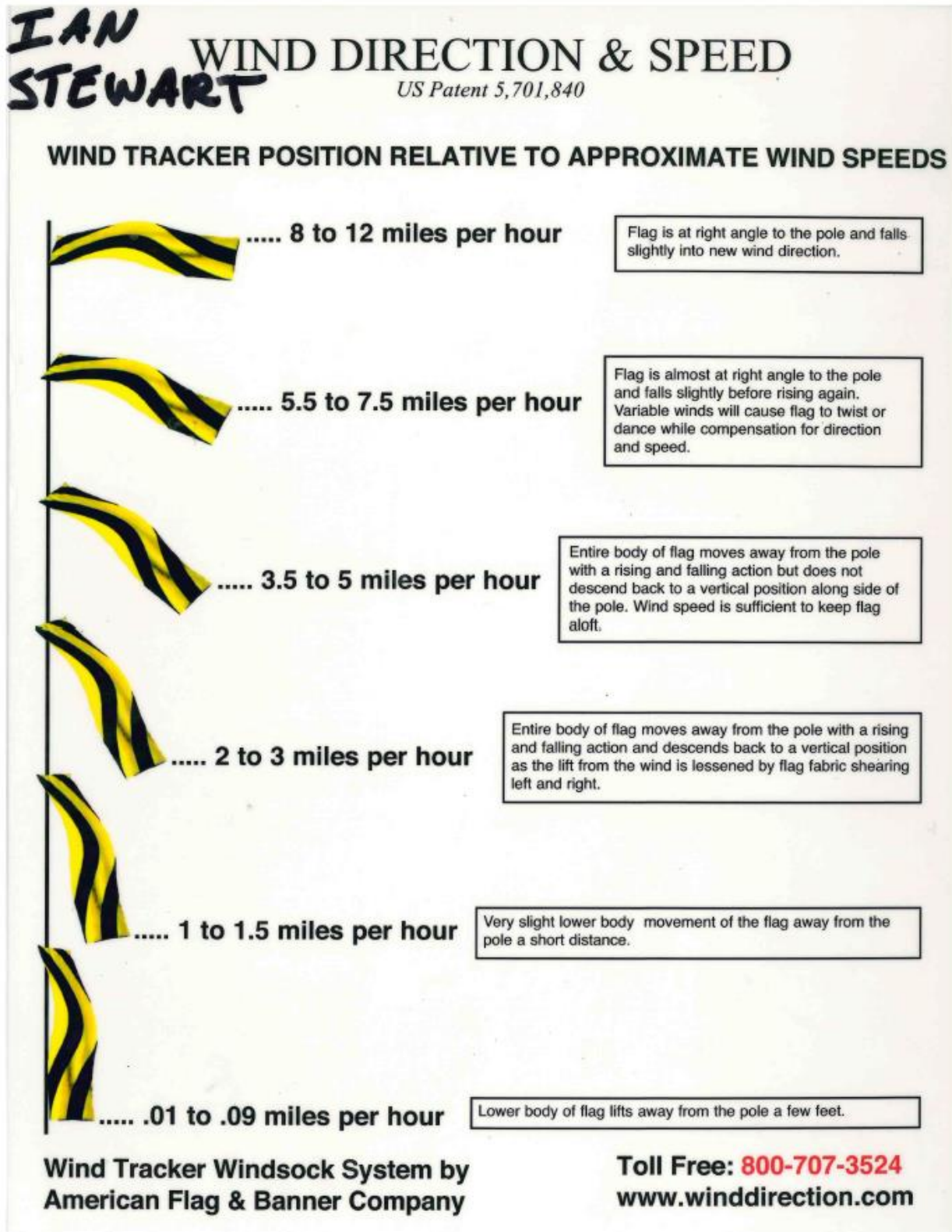


Wind direction flag on north side of building



Wind direction flag at southeast corner of building

Appendix G - Wind Sock Information



Appendix G - Anhydrous Ammonia SDS

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name

AMMONIA, ANHYDROUS

Synonyms

ANHYDROUS AMMONIA; AMMONIA GAS; AMMONIA; SPIRIT OF HARTSHORN; AMMONIA, ANHYDROUS, LIQUIFIED; UN 1005; H3N;

Chemical Family

inorganic, Gas

Product Use

Industrial and Specialty Gas Applications.

Restrictions on Use

None known.

Details of the supplier of the safety data sheet

POLAR CRYOGENICS

2734 SE Raymond

Portland, OR 97202

Phone: (800) 426-0689

Emergency Phone #: Outside the US: 703-527-3887 (Call collect)

Fax: 1-800-424-9300 (CHEMTREC)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.

Flammable Gases - Category 1

Gases Under Pressure - Liquefied gas

Acute Toxicity - Oral - Category 3

Acute Toxicity - Inhalation - Gas - Category 3

Skin Corrosion/Irritation - Category 1

Serious Eye Damage/Eye Irritation - Category 1

Respiratory Sensitization - Category 1

Germ Cell Mutagenicity - Category 2

Specific Target Organ Toxicity - Single Exposure - Category 1 (Respiratory system.)

Specific Target Organ Toxicity - Repeated Exposure - Category 2 (Respiratory system.)

Hazardous to the Aquatic Environment - Acute - Category 1

Hazardous to the Aquatic Environment - Chronic - Category 1

GHS Label Elements

Symbol(s)



Signal Word

Danger

Hazard Statement(s)

Extremely flammable gas.

Contains gas under pressure; may explode if heated.

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

Toxic if swallowed.
Toxic if inhaled.
Causes severe skin burns and eye damage.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Suspected of causing genetic defects.
Causes damage to organs.
May cause damage to organs through prolonged or repeated exposure.
Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s)

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flame/hot surfaces - No smoking.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wear respiratory protection.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
Collect spillage.
If exposed: Call a POISON CENTER or doctor/physician.
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.
IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
Wash contaminated clothing before reuse.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
Immediately call a POISON CENTER or doctor.
Specific treatment (see label).

Storage

Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Protect from sunlight.

Disposal

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

Statement(s) of Unknown Acute Toxicity

Oral 0% of the mixture consists of ingredient(s) of unknown acute toxicity.
Inhalation 0% of the mixture consists of ingredient(s) of unknown acute toxicity.

Statement(s) of Unknown Aquatic Toxicity

0% of the mixture consists of ingredient(s) of unknown acute aquatic toxicity.
0% of the mixture consists of ingredient(s) of unknown chronic aquatic toxicity.

Other Hazards

Frostbite may occur from rapid evaporation of the liquified gas.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

CAS	Component Name	Percent
7664-41-7	AMMONIA, ANHYDROUS	100.0

Section 4 - FIRST AID MEASURES

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin

Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing before reuse. Destroy contaminated shoes.

Eyes

Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

If swallowed, get medical attention.

Most Important Symptoms/Effects

Acute

skin burns, eye burns, allergic reactions, lung damage

Delayed

skin burns, eye burns, lung damage, respiratory system effects Causes genetic defects.

Note to Physicians

For inhalation, consider oxygen. For ingestion, consider esophagoscopy. Avoid gastric lavage.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

carbon dioxide, regular dry chemical, Large fires: Use regular foam or flood with fine water spray.

Unsuitable Extinguishing Media

None known.

Special Hazards Arising from the Chemical

Negligible fire hazard. Moderate explosion hazard. Containers may rupture or explode if exposed to heat.

Hazardous Combustion Products

ammonia, oxides of nitrogen

Fire Fighting Measures

Do not get water inside container. Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Keep unnecessary people away, isolate hazard area and deny entry. Stop flow of gas.

Special Protective Equipment and Precautions for Firefighters

Wear personal protective clothing and equipment such as self-contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8.

Methods and Materials for Containment and Cleaning Up

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Stop leak if safe to do so - Prevent entry into waterways, drains, or confined areas. Keep unnecessary people away,

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

isolate hazard area and deny entry. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304).

Environmental Precautions

Avoid release to the environment.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Subject to handling regulations: U.S. OSHA 29 CFR 1910.119.

Conditions for Safe Storage, Including any Incompatibilities

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

Store locked up.

Protect from sunlight.

Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

Incompatible Materials

Acids, combustible materials, metals, oxidizing materials, metal salts, halo carbons, halogens, amines, reducing agents, Cyanides, bases

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

AMMONIA, ANHYDROUS	7664-41-7
ACGIH:	25 ppm TWA
	35 ppm STEL
NIOSH:	25 ppm TWA ; 18 mg/m ³ TWA
	35 ppm STEL ; 27 mg/m ³ STEL
	300 ppm IDLH
Europe:	20 ppm TWA ; 14 mg/m ³ TWA
	50 ppm STEL ; 36 mg/m ³ STEL
OSHA (US):	50 ppm TWA ; 35 mg/m ³ TWA
Mexico:	25 ppm TWA VLE-PPT ; 18 mg/m ³ TWA VLE-PPT
	35 ppm STEL [PPT-CT] ; 27 mg/m ³ STEL [PPT-CT]

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

There are no biological limit values for any of this product's components.

Engineering Controls

Provide local exhaust ventilation system. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Individual Protection Measures, such as Personal Protective Equipment

Eye/face protection

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection

Wear appropriate chemical resistant clothing.

Respiratory Protection

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Glove Recommendations

For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Not available	Physical State	gas
Odor	pungent odor	Color	colorless
Odor Threshold	1 - 5 ppm	pH	11.6
pH Solution	1 N	Melting Point	-78 °C (-108 °F)
Boiling Point	-33 °C (-27 °F)	Boiling Point Range	Not available
Freezing point	Not available	Evaporation Rate	Not available
Flammability (solid, gas)	Not available	Autoignition Temperature	651 °C (1204 °F)
Flash Point	Not available	Lower Explosive Limit	15 %
Decomposition temperature	Not available	Upper Explosive Limit	28 %
Vapor Pressure	6658 mmHg @ 21 °C	Vapor Density (air=1)	0.5967
Specific Gravity (water=1)	Not available	Water Solubility	38 % (@ 20 °C)
Partition coefficient: n-octanol/water	Not available	Viscosity	Not available
Kinematic viscosity	Not available	Solubility (Other)	Not available
Density	0.7067 g/L at 25 °C	Physical Form	gas, liquid
Molecular Formula	N-H3	Molecular Weight	17.03

Solvent Solubility

Soluble

methanol, ethanol, chloroform, ether, organic solvents

Section 10 - STABILITY AND REACTIVITY

Reactivity

No reactivity hazard is expected.

Chemical Stability

Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

Will not polymerize.

Conditions to Avoid

Minimize contact with material. Avoid inhalation of material or combustion by-products. Containers may rupture or explode if exposed to heat.

Incompatible Materials

Acids, combustible materials, metals, oxidizing materials, metal salts, halo carbons, halogens, amines, reducing agents, Cyanides, bases

Hazardous decomposition products

ammonia, oxides of nitrogen

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Inhalation

Toxic if inhaled. burns May cause allergic or asthmatic symptoms or breathing difficulties if inhaled.

Skin Contact

burns

Eye Contact

burns

Ingestion

burns

Acute and Chronic Toxicity

Suspected of causing genetic defects. May cause damage to organs through prolonged or repeated exposure.

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

AMMONIA, ANHYDROUS (7664-41-7)

Oral LD50 Rat 350 mg/kg (aqueous solution)

Inhalation LC50 Rat 2000 ppm 4 h

Product Toxicity Data

Acute Toxicity Estimate

No data available.

Immediate Effects

Toxic if inhaled. skin burns. eye burns.

Delayed Effects

Causes genetic defects. May cause allergic or asthmatic symptoms or breathing difficulties if inhaled. skin burns. eye burns. Causes damage to organs. May cause damage to organs through prolonged or repeated exposure.

Irritation/Corrosivity Data

No data available.

Respiratory Sensitization

No data available.

Dermal Sensitization

No data available.

Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, NTP, DFG or OSHA

Germ Cell Mutagenicity

May cause genetic defects.

Tumorigenic Data

No data available

Reproductive Toxicity

No data available.

Specific Target Organ Toxicity - Single Exposure

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

No data available.

Specific Target Organ Toxicity - Repeated Exposure

No data available.

Aspiration hazard

No data available.

Medical Conditions Aggravated by Exposure

eye disorders, respiratory disorders, skin disorders and allergies

Section 12 - ECOLOGICAL INFORMATION

Component Analysis - Aquatic Toxicity

AMMONIA, ANHYDROUS	7664-41-7
Fish:	LC50 96 h Cyprinus carpio 0.44 mg/L; LC50 96 h Lepomis macrochirus 0.26 - 4.6 mg/L; LC50 96 h Lepomis macrochirus 1.17 mg/L [flow-through]; LC50 96 h Pimephales promelas 0.73 - 2.35 mg/L; LC50 96 h Pimephales promelas 5.9 mg/L [static]; LC50 96 h Poecilia reticulata >1.5 mg/L; LC50 96 h Poecilia reticulata 1.19 mg/L [static]
Invertebrate:	LC50 48 h Daphnia magna 25.4 mg/L IUCLID

Persistence and Degradability

No information available for the product.

Bioaccumulative Potential

No information available for the product.

Mobility

No information available for the product.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods

Dispose in accordance with all applicable regulations.

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

US DOT Information:

Shipping Name: AMMONIA, ANHYDROUS

Hazard Class: 2.2

UN/NA #: UN1005

Required Label(s): 2.2

Marine pollutant

TDG Information:

Shipping Name: AMMONIA, ANHYDROUS

Hazard Class: 2.2

UN#: UN1005

Required Label(s): 2.2

Marine pollutant

International Bulk Chemical Code

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

AMMONIA, ANHYDROUS	7664-41-7
SARA 302:	500 lb TPQ
SARA 313:	1 % de minimis concentration (includes anhydrous Ammonia and aqueous Ammonia from water dissociable Ammonium salts and other sources, 10% of total aqueous Ammonia is reportable under this listing)
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
OSHA (safety):	10000 lb TQ (anhydrous) ; 15000 lb TQ (solution ,>44% Ammonia by weight)
SARA 304:	100 lb EPCRA RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories

Flammable; Gas Under Pressure; Acute toxicity; Skin Corrosion/Irritation; Respiratory/Skin Sensitization; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity; Germ Cell Mutagenicity

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
AMMONIA, ANHYDROUS	7664-41-7	Yes	Yes	Yes	Yes	Yes

Not listed under California Proposition 65

Canada Regulations

Canadian WHMIS Ingredient Disclosure List (IDL)

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

AMMONIA, ANHYDROUS	7664-41-7
	1 %

WHMIS Classification

A , E

Component Analysis - Inventory

AMMONIA, ANHYDROUS (7664-41-7)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR - KECI - Annex	KR - KECI - Annex	KR - REACH CCA	CN	NZ	MX	TW	VN - NCI (Draft)
----	----	----	----	----	-----------	-----------	-------------------	-------------------	----------------	----	----	----	----	------------------

Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586

							1	2						
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Section 16 - OTHER INFORMATION

NFPA Ratings

Health: 3 Fire: 1 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes

Updated: 05/01/2015

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC - European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX - Mexico; NDSL - Non-Domestic Substance List (Canada); NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL - Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH - Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TCCA - Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW - Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN NCI (Draft) - Vietnam National Chemicals Inventory (NCI) (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information

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Safety Data Sheet

Material Name: AMMONIA, ANHYDROUS

SDS ID: 00232586