

Occupational Health and Safety Programs



Ammonia Exposure Control Program Keating Centre

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1.0 PURPOSE

The purpose of this program is to protect the campus and surrounding communities from the potential hazards of working with or being within proximity to anhydrous ammonia.

2.0 SCOPE

This Ammonia program forms part of StFX's OHS Management System and complies with the requirements of the Nova Scotia Occupational Health and Safety Act and Regulations. This program is specifically designed to be used at the Keating Centre, which is the location of the university's ice rinks. An emergency response alarm for the Keating Centre will also sound in Saputo Centre.

3.0 RESPONSIBILITY

General Responsibilities

Employer	Will review this program on a regular basis and ensure it is implemented and remains compliant.
Supervisor	Will ensure all workers are trained, have appropriate personal protective equipment (PPE) and comply with these procedures.
Worker	Is responsible to follow all procedures, maintain their PPE and wear it according to procedures.

4.0 DEFINITIONS

Anhydrous Ammonia	Ammonia gas that has been condensed into a pure liquefied form for use in refrigeration systems.
Cartridge	A filter used in conjunction with a full-face respirator that can be used by workers involved in ammonia plant maintenance or entry when ammonia concentration is greater than 0ppm and less than 250ppm.
Controlled Leak	A release of gas which occurs while maintenance work is being done where the source of the release is immediately known and can be quickly remedied or corrected.
IDLH	Immediately Dangerous to Life or Health.
Incident Commander	This individual assumes command of the scene and is responsible for the overall command of the emergency response. There is always an Incident Commander. The first Safety and Security Officer who arrives on scene becomes the initial Incident Commander, until relieved and transferred to someone who is more senior or qualified based on the nature of the incident (e.g., Antigonish Volunteer Fire Department

	{AVFD}), if applicable. If the AVFD so decides, the Incident Commander role may stay with the initial StFX person.
NH₃	The chemical formula for ammonia.
PPM	Parts Per Million.
PPE	Personal Protective Equipment (boots, gloves, respirator, glasses, etc.)
Qualified Person	Employees knowledgeable of the work, the hazards involved and the means to control the hazards by reason of education, training, experience or a combination thereof.
Uncontrolled Leak	A release of gas where the immediate cause of the leak is unknown, or when maintenance work is being done a release of gas occurs of a nature that cannot be quickly remedied, corrected, or controlled.
WHMIS	Workplace Hazardous Materials Information System.

5.0 AMMONIA PROPERTIES / HAZARDS

Ammonia – What is it?

Ammonia is a colourless, highly irritating gas with a sharp suffocating odor. It is made up of Hydrogen and Nitrogen ions (NH₃). It can easily be turned into a liquid through a cooling process. Ammonia is flammable, and containers may explode when exposed to high heat.

Several characteristics of ammonia include:

- 1 Extremely reactive with strong oxidizers such as chlorine, bromine, iodine, calcium, gold, mercury, silver and hypochlorite bleach. The mixture would be explosive in nature.
- 2 Very irritating to the eyes, nose and other parts of the respiratory tract which makes it easy to detect at low concentrations in the air.
- 3 Although ammonia itself has a low fire rating, the presence of oil or other combustibles increases its fire rating.
- 4 Ammonia gas is lighter than air, so it tends to collect in higher areas like ceilings.
- 5 Ammonia is corrosive and can cause chemical burns all over the body. It also corrodes most alloys, rubbers and plastics.
- 6 When ammonia enters the body because of breathing, swallowing or skin contact, it reacts with water to produce ammonium hydroxide. The chemical is very corrosive and damages cells in the body on contact.

For more information on the characteristics and chemical properties of anhydrous ammonia, refer to its [Safety Data Sheet \(SDS\)](#).

Exposure Limits and Health Effects

Table 1: Ammonia Exposure Limits

Ammonia Concentration (parts per million)	Effect
2 to 55 ppm	Range of odour threshold *
70 ppm	Stinging or burning of eyes, nose and throat; headache, watering eyes, sneezing, coughing
250 ppm	Severe irritation of eyes, nose and respiratory tract; difficulty breathing, possible burning in lungs (IDLH level)
2000 ppm or more	Can be fatal after a few breaths

Table 2: Toxic Effects of Ammonia

Exposure Limit (parts per million)	Description of Exposure Limit
25 ppm	Maximum allowable concentration averaged over an 8-hour period
35 ppm	Maximum allowable short-term (15 minutes) exposure limit
250 ppm or more	Immediately dangerous to life and health (IDLH) concentration. The concentration at which a person without appropriate respiratory protection could be fatally injured or could suffer irreversible or incapacitating health effects.

**Note: This does not apply to workers who routinely work with ammonia, as they are often desensitized to the smell of ammonia and are unable to detect it.*

6.0 EDUCATION AND TRAINING

Workplace Hazardous Materials Information System (WHMIS)

The StFX WHMIS Program ensures that those who work near ammonia are trained in the general hazards of chemicals and know how to obtain the necessary information to safely manage chemicals they may encounter in the workplace. A competency test on the topics covered in the WHMIS training is administered to all participants.

Qualified Personnel Training

A reference to “qualified personnel” is made throughout this document with regards to StFX employees who are permitted to enter the ammonia plant and perform routine maintenance on the ice refrigeration system. The following job descriptions are qualified personnel, providing that they have completed the training in Table 3 below:

- Chief Power Engineer (*Minimum: 2nd Class Refrigeration Operators’ Certificate*)
- Rink Operator (*Minimum: 2nd Class Refrigeration Operators’ Certificate*)

Table 3: Training

Training Topic	Frequency	Course Facilitator
Ammonia Exposure Control Program	Annual	Chief Power Engineer Manager, OHS
Respiratory Protection & Fit Testing	Bi-Annual	Manager, OHS

7.0 ICE REFRIGERATION SYSTEM / AMMONIA PLANT

Ammonia Storage

Approximately sixteen hundred pounds of liquefied ammonia are stored inside the plant in a sealed liquid receiver. The refrigeration system is a closed system that continuously uses and reuses the ammonia inside the tanks. Any correction to ammonia levels is not routine and will only be performed by competent personnel.

Key points regarding ammonia storage include:

- 1 Never apply heat to ammonia storage tanks or valves as rupture could occur.
- 2 The temperature of storage containers must never reach 50 degrees Celsius.
- 3 Do not store bleach anywhere inside the ammonia plant.
- 4 Do not block access to emergency equipment and doors.

Ammonia Alarms

The following are characteristics of the ammonia alarms located at the Keating Centre Ice Plant:

- 1 An **audible, visible and digitally displayed** alarm located immediately outside of the ammonia plant room activates when the ammonia concentration in the ammonia plant room reaches 25 ppm.
- 2 **An audible and visual** alarm activates near the skate sharpening area when the ammonia concentration in the ammonia room reaches 25 ppm. The display flashes and a strobe light is activated.
- 3 In addition to these on-site indicators of an alarm, an **audible and visual** alarm also sounds in the Security Operations Centre (SOC) when the ammonia concentration in the ammonia room reaches 25 ppm.
- 4 In addition to these on-site indicators of an alarm, an emergency email is automatically sent out to the following people when an alarm is triggered:
 - Chief Power Engineer
 - Facility Management Maintenance Manager
 - Facility Operations Manager

The alarm systems are calibrated annually (minimum) and tested as outlined in the manufacturer's instructions.

Alarm Response

Only Qualified Personnel are to respond to ammonia alarms. If a possible ammonia leak is indicated on the ammonia gauge (concentration higher than 1ppm) and the indicated level is below 250 ppm, qualified personnel are to follow the detailed leak control Safe Operating Procedures B and C in the appendices of this document (a copy is also placed near the ammonia plant entry door). If the ammonia concentration on the alarm monitor is above 250 ppm, commence Emergency Response Procedures, which can be found in Safe Operating Procedure D in the appendices of this document (a copy will also be kept beside the ammonia concentration gauge).

Working Alone

There must be a check-in system to ensure the continued well-being of workers who are working alone or isolated. Entry into the ammonia room during an alarm state (concentration is between 25ppm –249ppm), or entry to drain the ammonia oil pots is only permitted with a minimum of two staff members involved, with one person being a standby to call for assistance if necessary. Entry to the ammonia room in a non-alarm state (less than 25ppm) and not for the purpose of draining the oil pots or investigating a leak requires the entrant to inform a co-worker of the estimated duration of the entry and subsequent contact with that co-worker upon exit. If the co-worker is not contacted within the given time frame, the co-worker will investigate and initiate emergency response, as necessary.

8.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Respirator

A full-face dual canister air purifying respirator is required when ammonia concentrations are greater than 25 ppm. The full-face respirator must be equipped with gas cartridges that protect the worker against ammonia exposure. The worker must be clean shaven while wearing a respirator and have been fit tested within the last two years. All respiratory protection will be NIOSH approved and the wearer shall be trained and fit-tested to use the equipment in accordance with StFX's Respiratory Protection Program. Workers shall follow the procedures that they have been trained on regarding respirator use and care.

When respirator cartridges are removed from their packaging, they must be labeled with the date of opening. The cartridges are to be disposed of and replaced at a minimum of every six months, pending the usage frequency and ammonia exposure concentration. If at any time the user finds the cartridges cause difficulty in breathing (i.e., clogged), or smells the chemical through the respirator, the cartridges must be disposed of immediately.

Following is the required protection for parts per million (PPM) levels of ammonia:

0 to 25 ppm – Respiratory protection not required.

26 to 250 ppm – Don full-face respirator.

>250 ppm – DO NOT ENTER, call 911 immediately, initiate emergency response.

NEW: A Rescue Air Pack is maintained in the Ammonia Plant. To use the respirator, simply put the plastic bag over your head and turn the valve. This respirator will provide the user with 10 minutes of breathing air in case of an unexpected failure and exposure to ammonia.

Hand / Foot / Body Protection

Due to the corrosive effects of ammonia, it is necessary during some tasks to cover up skin that may be exposed. This may include boots, gloves and coveralls. The individual Safe Operating Procedures (SOPs) in this document will outline the protection required for each task. It is important to note that clothes must not be contaminated with grease, lubricants or cleaners as they can react violently with ammonia gas causing severe burns.

Eye Protection

When eye protection is required for certain tasks (see SOPs), it will be achieved with the use of the full-face respirator. It is very important that contact lenses are **not** worn whenever entering or working in the ammonia plant.

Emergency Equipment and First Aid Kits

The Keating Centre ammonia plant has an emergency shower and eye wash station inside the vestibule. The shower/eyewash is plumbed with tempered water to avoid the increased severity of exposures that cold water can cause. First aid kits are available at several locations in the complex.

9.0 EMERGENCY RESPONSE

Emergency Contact List

A list of emergency contact numbers for qualified ammonia plant entrants, managers and other key personnel will be kept current (see next page). The list should be posted by the Rink Operator, the Box Office, Conference Services, Alumni Aquatics Centre, Athletics, Facilities Management, Safety and Security and the OHS Office. It should be posted in prominent locations as a resource for staff on site.

In an emergency event, the following people must be called immediately:

STFX Security	902-867-4444
Emergency Services (AVFD)	911
Chief Power Engineer (CPE) (T. Keats)	Office 902-318-4222 Cell 902-870-0407
Director of Risk Management (R. Peters)	Office 902-867-3889 Cell 902-870-0705
Facility Operations Manager (K. Benjamin)	Office 902-867-5404 Cell 902-523-3870
Keating Centre Box Office	902-867-3361
Conference Services Manager (A. Archibald)	902 867 3355
AAC Pool Desk	902- 867-2181
CIMCO 24-hour Assistance	1-902-469-0023

Then contact the following people in this order, if not already contacted above (call cell number first):

StFX Personnel	Office	Cell
Mechanical & Elect. Supervisor (K. Latimer)	902-867-2342	902-870-0750
Director Facilities Mgmt. (B. Maltby)	902-867-2289	902-338-0717
Director Ancillary Services (B. Hale)	902-867-2101	902-879-5982
Manager, HSSE (L. Reid)	902-867-4932	902-318-5309
Nova Scotia Environment	1-800-565-1633 (to be contacted by CPE)	
Nova Scotia OH&S – LAE	1-800-952-2867 (to be contacted by CPE)	
Provincial HazMat Team (cleanup)	1-902-893-1810 (not an emergency number)	

Ammonia Leak Emergency

An ammonia leak is considered an emergency when the concentration in the ammonia plant reaches 250ppm. As previously stated, the audible alarm will engage when the ammonia concentration reaches 25 ppm. Qualified personnel are to be contacted immediately to address the situation.

Important Notes:

- **DO NOT open the doors leading from the vestibule to the walking track.**
- **DO NOT attempt rescue of any employees / members of the public that are unconscious in IDLH area. The Antigonish Volunteer Fire Department (AVFD) will advise whether rescue is possible.**

Evacuation

The location of Muster Points will depend on wind directions. Windssocks are installed on the south end roof of Keating Centre, near the Rink Operator's office and on the north end roof of Saputo Centre. Contingency plans will be developed by the Facility Operations Manager, taking into consideration weather conditions, medical conditions and clothing worn by evacuated persons.

Key Evacuation Steps:

1. Call 911, advise that there is an ammonia leak at the facility, provide the address (**back of Keating Centre – across from 2100 Varsity Drive**) and ask for Antigonish Volunteer Fire Department (AVFD) to respond.
2. Contact Security to let them know of the emergency and that an evacuation needs to occur.
3. Security will proceed to the Keating Centre to act as Incident Commander.
4. SOC Operator will call everyone on the Emergency Contact List, who hasn't already been called.
5. Mass Notification Message will be initiated by the Director of Risk Management and sent by the Director of Communications to the entire campus community.
6. The Manager of Facility Operations, under the direction of the Incident Commander, will utilize staff on site to facilitate the emergency response during business hours ensuring that the following tasks are accomplished:
 - a) Box Office staff clear all ice surfaces and change rooms.
 - b) Conference Service staff clear office to Saputo Centre and upstairs meeting rooms.
 - c) Aquatic Centre/Welcome Desk staff clear pools, change rooms and Therapy Centre.
 - d) Athletics Staff clear the rest of Saputo Centre, including upstairs.
 - e) All staff not involved in facilitating the emergency response will remove themselves from these areas and assemble at the muster station.
7. Determine the direction of the wind and if the primary muster station, P11, is downwind of the ammonia room, then a new location upwind of the ammonia

room for mustering must be chosen. Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the north-end roof of Saputo. Muster points will depend on wind direction, as follows:

- Wind coming from the East: P11 (primary muster point for building)
- Wind coming from the West: P11 (primary muster point for building)
- Wind coming from the North: P11 (primary muster point for building)
- Wind coming from South: P10 (secondary muster point for building)

It is vitally important that people are told where to or where not to evacuate.

Always stay upwind of ammonia plant.

8. Await arrival of AVFD and university management representatives. Any information about the leak and the site should be passed along to the AVFD.
9. The Incident Commander will determine when it is safe to allow re-entry into the building.
10. During non-business hours, whomever discovers the leak must leave the area immediately and radio Security to let them know.

Emergency Response Roles & Responsibilities

Rink Operator

These are workers who have received formal ammonia training and are primarily responsible for responding to alarms. Qualified and properly trained workers respond to alarms and perform these duties during an **EMERGENCY**:

1. Respond to alarm and follow safe operating procedures (SOPs) for leak investigation.
2. Initiate emergency response by radio announcement.
3. Ensure the nearest pull station is pulled, as required.
4. Perform any roles that the Antigonish Volunteer Fire Department (AVFD) asks of you once they are on scene and await the decision on re-entry or facility closure by the AVFD or the Incident Commander.

NOTE: If a major leak occurs, it will be an 'all hands-on deck' scenario where personnel who do not typically respond to emergencies, will be asked to help with the incident, depending on number of people in building, time of day, events, etc. Training will be provided to individuals to ensure they understand their role in incident response.

Chief Power Engineer

The Chief Power Engineer will:

1. Assist Rink Operator, as required, in person or by phone, depending on location.
2. Contact NS Departments of Environment and Labour as required.

Safety and Security (Incident Command)

When a major leak of ammonia is discovered the Ammonia alarm will sound in SOC:

The SOC Officer will then perform the following tasks:

1. Contact Rink Operator on duty (if not already done) – see SOP K at end of this document.
2. Initiate Emergency Response if requested by Rink Operator or Chief Power Engineer – See ERP #3.
3. Call 911 and request the presence of the AVFD, if they haven't already been called.
4. Contact the Chief Power Engineer.
5. Dispatch all available Security Officers to Keating.
6. Contact Director of Risk Management
7. Announce on radio for all non-emergency response personnel to not use the radios, until further notice, monitor and remind as necessary.
8. Send mass notification (more details required) – requires Director of Risk Management's approval.
9. Contact everyone on the Emergency Contact List, in the order presented on the list.
10. Complete occurrence report

The responding Security Officers will perform the following tasks:

1. Proceed to Keating Centre.
2. DO NOT ENTER AMMONIA PLANT.
3. **A trained officer will take on the role of Incident Commander.**
4. Direct emergency personnel to area (if more than one officer)

Facility Operations Manager (or designate)

The Facility Operations Manager will be notified of any facility emergency response and will arrive on site to perform the following roles:

1. Take direction from and aid the Incident Commander.
2. Ensure the facility is secure in accordance with direction of the Incident Commander.
3. Determine direction of wind and whether muster station needs to be moved (It must be upwind of the ammonia plant) for evacuating.
4. Help ensure assignments of building areas to staff for sweeping and evacuation are followed.
5. Assist with relocating or evacuating building occupants, as required.
6. Record any injured, disabled persons located in stairwells or areas of refuge.
7. Ensure consistent messaging to public both indoors and at the muster station.
8. Report any missing or injured/disabled persons to the AVFD.
9. Liaise with Incident Commander and University management representatives as they arrive and debrief on situation.
10. Initiate the Keating Centre/Saputo Centre Emergency Response Contingency Plan.
11. Supervise the clean-up.
12. Arrange assistance and first aid for workers if required.

13. Conduct an incident investigation and report findings.

Facility Staff (Box Office, Conference Services, Alumni Aquatic Centre)

When a major leak of ammonia is discovered the Ammonia alarm will sound in Keating. Facility employees will:

1. Pull the nearest pull station if the alarm has not yet been deployed.
2. Follow the directions of the Incident Commander or Facility Operations Manager to do the following:
 - a) Box Office staff clear all ice surfaces and change rooms and notify Sodexo staff in the Keating Café.
 - b) Conference Service Staff clear office and upstairs meeting rooms.
 - c) Aquatic Centre/Welcome Desk staff clear pools, fitness centre, courts, gymnasiums, classrooms, change rooms and Therapy Centre.
 - d) Athletics Dept. to clear varsity team room, varsity gym and offices.
3. Move persons to Muster Station when tasks are completed.
4. The Facilities Operations Manager will confirm with leads in areas noted above when all areas within the complex have been cleared.

Director of Risk Management

1. Advise senior management.
2. Determine type of mass notification.
3. Respond to media requests.

Antigonish Volunteer Fire Department (AVFD)

During the incident, AVFD will:

1. Respond and upon arrival, the AVFD will determine if they take charge of the scene and communicate this information to the StFX Incident Commander.
2. Initiate Special Hazards Response Unit, if required.
3. Determine if Town or Country coordination is necessary (liaise with area EMO).
4. AVFD will leave the scene with a responsible person, will not participate in clean-up of the incident and will not participate in cleanup of hazardous materials. If required, the hazardous waste clean-up contractor should be contracted by the Facility Operations Manager.

10.0 FIRST AID AND HEALTH MONITORING

First Aid will only be administered by trained First Aid Attendants.

Inhalation Treatment

Ensure that the concentration in the ammonia room is below 250 ppm and you are wearing your full-face respirator. Move victim to fresh air. First Aid Attendant will provide first aid treatment in accordance with [current protocols](#) . **Obtain medical attention immediately.**

Eye Contact Treatment

If liquid or gaseous ammonia contacts the eyes, the employee needs to be removed from the contaminated area and continuously flush eyes with tempered water for 20 minutes. The eye wash station is located directly outside of the ammonia room in the pre-entry room. Ensure that the eyes are held open and there is direct contact between the water and eyes.

Skin Contact Treatment

Liquid ammonia causes the moisture in the skin to freeze (almost instantly with higher concentrations). Skin should be continually flushed with tempered water. If a large area has been exposed, do not remove clothing until you have thoroughly rinsed in the emergency shower. After rinsing, remove any contaminated clothing and obtain medical attention.

Health Monitoring

The Nova Scotia government currently have no requirements for medical surveillance of ammonia exposure. Medical surveillance is intended to protect workers from developing occupational disease by detecting early biological indicators or adverse health effects at an early stage.

The effects of ammonia on humans are largely acute and victims of ammonia exposure more than exposure limits will often feel the effects immediately. Workers who may be exposed to levels of ammonia more than exposure limits should seek medical aid following exposures, regardless of route of entry.

11.0 RECORD KEEPING AND INVESTIGATION

Record Keeping

Proper activity logbooks will be maintained regarding any ammonia issues. Detailed information will be entered into the logbook for any release large enough to set off the low ammonia alarm (greater than 25 ppm). Investigations are conducted for any release large enough to set off the high ammonia alarm (greater than 250ppm) and or if an evacuation is performed. See the section below for information on ammonia release reporting requirements. Any outstanding maintenance or supplier issues must be noted in the logbook and receive follow up promptly.

Investigation and Reporting

An incident is any unplanned or unwanted event, which resulted in, or could have resulted in injury or damage to equipment, property, process or environment. If enough ammonia is released to initiate emergency response, the Chief Power Engineer must investigate to discover the cause(s) of the incident. The Facilities Operations Manager will investigate the effectiveness of the emergency response. The investigations must also examine measures

that will prevent similar incidents in the future. Copies of the investigation reports will be provided to the Joint Occupational Health and Safety Committees.

Note: StFX must immediately notify Nova Scotia Environment and the OHS Division of the Nova Scotia Department of Labour about any major release of a toxic substance.

REVISION SUMMARY		
DATE	REVISION	SUMMARY
18 Mar 24		NEW PROGRAM

SAFE OPERATING PROCEDURES

**NOTE THE FOLLOWING PAGES OF PROCEDURES AND RESPONSE ARE MEANT
TO BE STAND-ALONE DOCUMENTS THAT CAN BE USED FOR
QUICK REFERENCE OR POSTING.**

**Safe Operating Procedure A
Ammonia Plant Entry**

Required PPE	Safety boots, safety glasses, respiratory and hand protection as required.
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools/Eqpt	Radio

This procedure is applicable to all Ammonia Plant Entrants and is enforceable when the ammonia plant is in operation. This group includes, but is not limited to the following occupations:

Rink Operator	Chief Power Engineer	Electricians
FM Supervisors	OHS	Contractors
Inspectors	AVFD	

Entry Requirements: Entrants must possess at a minimum: 2nd Class Refrigeration Operators' Certificate. Anyone without this certification must be accompanied by a certified person.

1. Ensure that you satisfy the above entry requirements and are not wearing contact lenses.
2. If you are performing an alarm response or adding or draining oil, let your supervisor or co-worker know that you are entering the Ammonia Plant.
3. View the ammonia concentration gauge located to the left of the door in the pre-entry room and ensure that the reading is less than 250ppm. NO ENTRY WHEN LEVELS ARE ABOVE 250ppm.
4. A full-face respirator shall be worn when:
 - Concentrations are greater than 25 ppm
 - An audible / visual alarm is observed while in the Ammonia Plant (after respirator is donned, immediately evacuate the ammonia plant)
 - Minor fluctuations in ammonia concentration are being investigated
 - The strong smell of ammonia is encountered
 - As per SOPs contained in this document
5. Complete your work / plant logs, then inform your Supervisor or co-worker upon plant exit.

*****NOTE – If the audible alarms engage at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 250 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

**Safe Operating Procedure B
Minor Leak**

Required PPE	Safety boots, safety glasses, full-face respirator on person always, hand protection as required
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools/Eqpt.	Radio

Alarm has sounded or ammonia smell is evident. Vent fan has started.

The Rink Operator will perform the following steps:

1. Check ppm levels on monitor outside room.
2. Put on appropriate respiratory protection, depending on ppm levels.
3. Moisten a strip of indicator paper with water and check for the approximate area of the leak.
4. After locating the approximate area of the leak, use fresh strips of indicator paper to determine the exact source of the leak.
5. Do not attempt to stop the leak until a second worker is present.
6. Perform minor maintenance to stop the leak (for example, tighten the flange), if it can be done safely.
7. Wait a few minutes, then re-test the leak with indicator paper.

**Safe Operating Procedure C
Minor Leak (Outside Assistance Required)**

Required PPE	Safety boots, safety glasses, full-face respirator on person always, hand protection as required.
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools/Eqpt	Radio

Alarm has sounded or ammonia smell is evident. Vent fan has started. <250 ppm.

The Rink Operator will perform the following steps:

1. If steps in Procedure B for Minor Leak are not successful in stopping leak and leak is not bad enough to shut plant down, continue to operate Vent fan.
2. Call CIMCO refrigeration at 1-902-469-0023 to request a technician come to StFX and assist with the leak.
3. If leak is repaired, shut off Vent fan and return to normal operation.
4. If minor procedures do not stop the leak, initiate the Shutdown Procedure to prepare for repair.
5. Do not isolate liquid refrigerant within suspected failed/leaking equipment.
6. Do not isolate secondary coolant systems without pressure relief.

Safe Operating Procedure D
Major Leak (Emergency Response Required)

Required PPE	Safety boots, safety glasses, full-face respirator on person always, hand protection
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools / Eqpt	Radio, ammonia monitor

Alarm has sounded or ammonia smell is evident. Vent fan has started. >250 ppm

The Rink Operator will perform the following steps:

1. If the leak involves a major release of ammonia (tank or piping rupture), do not enter Compressor room.
2. Immediately activate one of the Emergency Plungers, which are located on the vestibule wall and on the outside wall of the Compressor plant adjacent to the door. This plunger will stop all Compressor plant motors and close all solenoid operated valves, limiting the amount of gas release.
3. Check ppm levels on the monitors outside entrance.
4. If safe to do so, don a personal ammonia monitor and required PPE, enter the Diesel Generator room and open the Electrical supply breaker (#22) in Panel # EM1 for the Compressor plant vent fan. This will prevent a large release of ammonia to atmosphere. Use red danger tape the area to keep people out.
6. Contact Security to initiate evacuation, then pull nearest pull station to sound alarm.
7. SOC will call 911 to alert Fire Department and RCMP, then call all emergency contacts.
8. Security will assume control of the scene when they arrive. Other personnel will assist as requested.
9. Call CIMCO refrigeration at 1-902-469-0023 to request a technician come to STFX and assist with the leak.

**Safe Operating Procedure E
Draining Ammonia Plant Oil Pots**

Required PPE	Safety boots, safety glasses, butyl gloves, full-face respirator
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools / Eqpt.	Radio, Pot draining bucket

1. This task requires an additional person to accompany you into the ammonia plant. This person may place themselves anywhere between you and the exit door but must remain within sight and at a distance where conversation can take place.
2. Obtain an oil pot draining bucket from the storage room.
3. Turn the ventilation fan to a "HIGH" setting before entering the ammonia room.
4. Once in the ammonia room, let your partner know where you would like them to be.
5. Turn off the associated brine pump. Place the draining bucket beneath the chiller pot red needle valve and turn the valve in a counterclockwise direction to open.
6. Use the dead man's switch / valve on the oil pot to begin releasing the mixture into the bucket.
7. Drain the mixture slowly until spitting occurs (this signals that draining is complete) and then release the dead man switch.
8. Tighten up the needle valve by turning it in a clockwise direction, being careful not to spill any of the mixture. Allow oil to settle and record the amount of liquid drained.
9. After sealing bucket, transport the filled bucket to barrel under the stairs near the forklift bay. Do not take off your PPE until the transport procedure is complete.

*****NOTE – If the audible alarm engages at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 25 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

**Safe Operating Procedure F
Evaporator High Pressure**

Required PPE	Safety boots, safety glasses, butyl gloves, full-face respirator on person always
Hazards	Explosion, skin burns, eye damage, respiratory damage, death
Tools / Eqpt	Radio

1. Disable rink that does not have high level alarm.
2. Place compressors #2 and #3 offline.
3. Close ammonia inlet to evaporator with high level.
4. Remove glass cover over high level alarm instrumentation.
5. Soft load compressor #1 (open valve to disable two pistons).
6. Lower ice temperature setting to turn on rink with high level.
7. Pinch off evaporator ammonia outlet to control suction pressure at approximately 14 psi.
8. Once evaporator level is back to normal, open ammonia inlet to evaporator.
9. Open evaporator ammonia outlet 100%.
10. Open valve on compressor #1 to enable two pistons.
11. Place compressors #2 and #3 back online.
12. Enable rink that did not have high level.

**Safe Operating Procedure G
Addition of Brine**

Required PPE	Safety boots, safety glasses, butyl gloves
Hazards	Skin burns, eye damage
Tool/Eqpt	Radio, Portable pump, hygrometer

1. Place small portable pump on level surface – floors or stairs to calcium chloride tanks.
2. Connect garden hoses to suction and discharge of pump, making sure flow will be in correct direction.
3. Use water hose to fill green barrel approximately ½ full.
4. Add a full bag of calcium chloride to green barrel and use hygrometer to check the density of the liquid in the barrel – target is minus ten (-10) degrees Celsius.
5. Continue adding calcium chloride and/or water to get the amount of product at the proper density.
6. Adding calcium chloride will drop the reading below minus ten (-10) degrees Celsius and adding water will bring it back to or above minus ten (-10) degrees Celsius.
7. When density and amount of product is correct, plug in small portable pump.
8. Fill calcium chloride head tanks to approximately 5/8 to 3/4 full.
9. When finished, unplug pump, disconnect and flush with fresh water.

**Safe Operating Procedure H
Changing Brine Filter**

Required PPE	Safety boots, safety glasses, face shield
Hazards	Skin burns, eye damage
Tools	Radio, Filter Wrench

1. Close inlet and outlet valves to Brine Filter.
2. Use filter wrench to remove filter container.
3. Remove used filter from container and insert clean one.
4. Check “O” Ring on top of filter container and make sure it is not damaged.
5. Thread filter container back in place, making sure not to cross thread.
6. Use filter wrench to tighten container, taking care not to over tighten.
7. Open filter inlet valve (left hand side) and depress red button on top of filter to vent any air as filter fills.
8. Open filter inlet valve (right hand) to put filter fully in service.

**Safe Operating Procedure I
Changing Condenser Fan Belts**

Required PPE	Safety boots, safety glasses, butyl gloves
Hazards	Explosion, skin burns, eye damage, electrocution, death
Tools/Eqpt	Radio, Socket and ratchet, box end wrench, LOTO equipment

1. Shut off appropriate fan on electrical control panel in Keating compressor room
2. Open switch on front of fan on Keating roof and lock in open position.
3. Using ratchet/socket remove screen from front of fan.
4. Using ratchet and wrench, open door below fan exposing bottom drive pulley.
5. Remove worn belt and install new one.
6. Close bottom door and reinstall screen on front of fan.
7. Remove lock from switch below fan and close switch.
8. Switch fan back on at compressor room electrical control panel.

Safe Operating Procedure J
Plant (equipment) Alarms in Security Operations Centre (SOC)

PURPOSE

The purpose of this SOP is to ensure a safe, uniform response by Security personnel to PLANT Alarms received at the Security Operations Centre (SOC). Plant Alarms are NOT the same as the Ammonia Alarms (see SOP K) and do not indicate a leak. Plant alarms indicate equipment issues inside the ammonia plant.

DETAILS

- ✓ When the Keating PLANT alarm sounds at SOC, the following will happen: The alarm sounds like a car horn, and the blue light will flash AND it will show as a PLANT alarm on the Insight Program.
- ✓ During the hours of 06:00 to 01:00 (6 am to 1 am) an Operator will be onsite with a radio, unless they advise SOC otherwise.

RESPONSE TO AN ALARM

When a PLANT alarm is received on Insight, take the following steps:

1. If you are sure there is no Operator onsite, proceed to Step 3.
2. If an Operator is onsite, contact the Operator by radio by saying “Rink Operator come in, there is a Plant Alarm”. Confirm you are speaking with the onsite Operator. If contact is not made, try to radio the operator two more times.
3. If there is no response from the Operator after Step 2, or they are not onsite, call the following persons (using the SOC cellphone) in the following order on the cellphone numbers noted below, until you get a hold of someone:
 - 1) Tyson Keats (Chief Power Engineer) – 902 870-0407
 - 2) Dana Myette (Operator) – 902 870 5242
 - 3) Sam Sinclair (Operator) – 902 890 4738
 - 4) Ethan Mattie (Operator) – 902-870-5488
 - 5) Kevin Latimer (FM Supervisor) – 902 870 0750

**Safe Operating Procedure K
Ammonia (leak) Alarms in Security Operations Centre (SOC)**

The purpose of this SOP is to ensure a safe, uniform response by Security personnel to Ammonia Alarms received at the Security Operations Centre (SOC).

DETAILS

- ✓ When the Keating AMMONIA alarm sounds at SOC, the following will happen: The alarm sounds like a car horn, and the blue light will flash.
- ✓ During the hours of 06:00 to 01:00 (6 am to 1 am) an Operator will be onsite with a radio, unless they advise SOC otherwise.

RESPONSE TO AN ALARM

When an ammonia alarm is received, take the following steps:

1. If you are sure there is no Operator onsite, proceed to Step 3.
2. If an Operator is onsite, contact the Operator by radio by saying “Rink Operator come in, there is an ammonia alarm”. Confirm you are speaking with the onsite Operator, and ensure they are OK. If contact is not made, try to radio the operator two more times. If contact is still not made, proceed to Step 3. If contact is made, proceed to Step 4.
3. If there is no response from the Operator after Step 2, or they are not onsite, call the following persons (using the SOC cellphone) in the following order on the cellphone numbers noted below, until you get a hold of someone:
 - 1) Tyson Keats (Chief Power Engineer) – 902 870-0407
 - 2) Dana Myette (Operator) – 902 870 5242
 - 3) Sam Sinclair (Operator) – 902 890 4738
 - 4) Ethan Mattie (Operator) – 902-870-5488
 - 5) Kevin Latimer (FM Supervisor) – 902 870 0750
4. If not already done, call Tyson Keats 902 870-0407 (using the SOC cellphone) to tell him about the alarms and the steps taken so far, i.e., who was called, their response, etc. If he does not answer, leave him a voicemail to let him know about the alarm.
5. Initiate Evacuation as requested by Rink Operator or Chief Power Engineer.
6. Complete an Occurrence Report and email.

EMERGENCY RESPONSE PLANS FOR MAJOR AMMONIA LEAK

NOTE THE FOLLOWING PAGES OF RESPONSE ARE MEANT TO BE **STAND-ALONE DOCUMENTS** THAT CAN BE USED FOR QUICK REFERENCE OR POSTING.

These response sheets are meant to be a quick reference guide to be posted or distributed as noted. This information is mostly contained elsewhere in this document as well.

**KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #1 FOR MAJOR AMMONIA LEAK
Custodian Response**

1. UPON HEARING BUILDING ALARM, MONITOR RADIO AND CELL PHONE FOR EMERGENCY COMMUNICATIONS.
2. EVACUATE THE BUILDING.
3. CHECK WINDSOCKS AND PROCEED UPWIND OF AMMONIA PLANT:
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo, just above the main entrance. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***
4. PROCEED TO MUSTER POINT, RADIO SUPERVISOR AND AWAIT FURTHER INSTRUCTION.

(this page shall be provided to all affected Custodial employees)

KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #2 FOR A MAJOR AMMONIA LEAK
Security Officers' Response (Incident Commander)

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN KEATING CENTRE:

1. DON HI-VISIBILITY CLOTHING AND PROCEED TO KEATING CENTRE
2. **DO NOT ENTER AMMONIA PLANT**
3. TAKE COMMAND OF INCIDENT.
4. DIRECT EMERGENCY PERSONNEL TO AREA (if two officers responding).
5. KEEP AT SAFE DISTANCE.
6. KEEP PEOPLE OUT OF AREA.
7. ASSIST WITH EVACUATION (IF 2ND OFFICER IS PRESENT, #6 IS PRIORITY).
8. CHECK WINDSOCKS AND KEEP EVERYONE UPWIND OF AMMONIA PLANT
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo Centre. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***

(this page shall be posted at Security and a laminated copy kept in the truck)

**KEATING / SAPUTO CENTRES
EMERGENCY RESPONSE PLAN #3 FOR A MAJOR AMMONIA LEAK
Security Operations Centre (Soc) Response**

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN KEATING CENTRE:

1. DISPATCH ALL AVAILABLE OFFICERS TO KEATING
2. CALL 911 AND REQUEST THE PRESENCE OF THE AVFD FOR AN AMMONIA LEAK, IF THEY HAVEN'T ALREADY BEEN CALLED.
3. CONTACT THE CHIEF POWER ENGINEER.
4. ANNOUNCE ON RADIO FOR ALL NON-EMERGENCY PERSONNEL TO NOT USE RADIOS, UNTIL FURTHER NOTICE – MONITOR AND REMIND AS NECESSARY.
5. CONTACT DIRECTOR OF RISK MANAGEMENT.
6. DO MASS NOTIFICATION MESSAGE (APPROVED BY DIRECTOR OF RISK MANAGEMENT).
7. CONTACT EVERYONE ON THE EMERGENCY CONTACT LIST, IN THE ORDER PRESENTED ON THE LIST.
8. COMPLETE OCCURRENCE REPORT

(this page shall be posted at SOC)

**KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #5 FOR A MAJOR AMMONIA LEAK
Box Office Personnel Response**

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN THE KEATING CENTRE:

1. EVACUATE OCCUPANTS IN YOUR AREA (RINKS, LOCKER ROOMS) TO MUSTER POINT.
2. CHECK WINDSOCKS AND KEEP EVERYONE UPWIND OF AMMONIA PLANT
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo Centre. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***
3. PROCEED TO MUSTER POINT AND AWAIT FURTHER INSTRUCTION

(this page shall be posted at the Box Office)

**KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #6 FOR A MAJOR AMMONIA LEAK
Conference Services Personnel Response**

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN THE KEATING CENTRE:

1. EVACUATE OCCUPANTS IN YOUR AREA (OFFICE TO SAPUTO, UPSTAIRS) TO MUSTER POINT.
2. CHECK WINDSOCKS AND KEEP UPWIND OF AMMONIA PLANT
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo Centre. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***
3. PROCEED TO MUSTER POINT AND AWAIT FURTHER INSTRUCTION

(this page shall be posted at Conference Services)

**KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #7 FOR A MAJOR AMMONIA LEAK
Alumni Aquatic Centre Welcome Desk Personnel Response**

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN KEATING CENTRE

1. RELOCATE OCCUPANTS IN YOUR AREA (POOL, FITNESS CENTRE, COURTS, GYMNASIUMS, CLASSROOMS, CHANGE ROOMS, THERAPY CENTRE) TO MUSTER POINT.

2. CHECK WINDSOCKS AND KEEP UPWIND OF AMMONIA PLANT
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo Centre. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***

4. PROCEED TO MUSTER POINT AND AWAIT FURTHER INSTRUCTION

(this page shall be posted at the Alumni Aquatic Centre Welcome Desk)

**KEATING CENTRE / SAPUTO CENTRE
EMERGENCY RESPONSE PLAN #8 FOR A MAJOR AMMONIA LEAK
Athletics Personnel Response**

WHEN ALERTED TO A MAJOR AMMONIA LEAK IN KEATING CENTRE

1. RELOCATE OCCUPANTS IN YOUR AREA (VARSITY TEAM ROOMS, VARSITY GYM, OFFICES) TO MUSTER POINT.

2. CHECK WINDSOCKS AND KEEP UPWIND OF AMMONIA PLANT
Check the wind direction as indicated by the windsocks located on the south-end roof of Keating, just outside the Rink Operator's office and on the roof of Saputo Centre. Muster points will depend on wind direction, as follows:
 - Wind coming from the East: P11 (primary muster point for building)
 - Wind coming from the West: P11 (primary muster point for building)
 - Wind coming from the North: P11 (primary muster point for building)
 - Wind coming from South: P10 (secondary muster point for building)***It is vitally important that people are told where or where not to evacuate. Always stay upwind of ammonia plant.***

3. PROCEED TO MUSTER POINT AND AWAIT FURTHER INSTRUCTION

(this page shall be posted in Athletics)

SECTION A: EMPLOYEE INFORMATION					
Job Title:			<input type="checkbox"/> New Worker	<input type="checkbox"/> Annual Review	
Employee Name: (Print Clearly)					
Certification:	<input type="checkbox"/> Refrigeration Safety Awareness Officer	<input type="checkbox"/> Class 4 Power Engineer or Refrigeration Operator	<input type="checkbox"/> Ice Facility Operator		
Supervisor Name: (Print Clearly)					
SECTION B: MAJOR COMPONENTS <i>(Identify Location and Explain Function in System)</i>					
Component				Employee Initials	Supervisor Initials
Evaporator (Chiller)					
Receiver					
Compressor(s)					
Expansion Valve					
Condenser / Cooling Tower					
King Valve					
Fire Box					
Brine Pumps					
Gas Detection System					
SECTION C: PROCEDURES <i>(The Following Procedures Must Be Communicated to All Entrants)</i>					
Procedure	Employee Initials	Supervisor Initials	Procedure	Employee Initials	Supervisor Initials
Ammonia Plant Entry			Changing Brine Filter		
Minor Leak			Changing Condenser Fan Belts		
Minor Leak (outside assistance required)			Plant Alarms		
Major Leak (emergency response required)			Ammonia Alarms		
Evaporator High Pressure			Ammonia SDS review		
Addition of Brine			Emergency Response		
SECTION D: EMPLOYEE AND SUPERVISOR ACKNOWLEDGEMENT					
Employee Signature:			Date:		
Supervisor Signature:			Date:		

AMMONIA PLANT ORIENTATION FORM FOR CONTRACTORS

Contractor Company Name _____

Contractor Worker Name _____

I have received an orientation of the Ammonia Plant at Keating Centre
from _____ on _____
StFX Employee Name **Date**

By signing below, I accept that I have received and reviewed the StFX's Anhydrous Ammonia Exposure Control Program (AAECP).

I understand that I must have a thorough knowledge of, and abide by, the safety standards and practices outlined in the Nova Scotia OH&S Act and Regulations and the AAECP. Furthermore, I acknowledge that performing my tasks in a safe manner is a condition of my contract with the St. Francis Xavier University.

Contractor Worker

Signature _____ **Date:** _____

Arena Maintenance Supervisor

Signature _____ **Date:** _____