



Ammonia Exposure Control Program

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Ammonia Exposure Control Program

STATEMENT OF PURPOSE

The Ammonia exposure control program will eliminate or minimize the risk of workers' exposure to ammonia in our ice rink operations. It will ensure that all workers whose duties require handling or having contact with ammonia have appropriate knowledge, training, work procedures and equipment to perform their work safely.

The work procedures we establish will protect not only our workers, but all contractors and visitors to Northern Rockies Regional Recreation Centre located at 5500 Alaska Highway, Fort Nelson., BC.

RESPONSIBILITIES

THE EMPLOYER (NORTHERN ROCKIES REGIONAL MUNICIPALITY (NRRM))

- Ensure that a comprehensive Ammonia Exposure Control Plan (Ammonia ECP) is developed and that all employees having potential for exposure to ammonia understand and follow the Plan;
- Ensure that records are kept which document training provided, results of fit-testing, ammonia handling equipment inspections and maintenance;
- Ensure that a review of the Exposure Control Plan is conducted at least annually in consultation with the Recreation JH&S Committee, or Worker Health and Safety Representative, and the plan is updated as required;
- Ensure that an investigation in consultation with the Recreation JH&S Committee, or Worker Health and Safety Representative, is carried out if an employee reports exposure to ammonia;
- Maintain records of investigations related to ammonia exposure for a minimum of 10 years;
- Ensure that an adequate supply of required personal protective equipment is available at each worksite where ammonia is present;
- Ensure that mechanical and electrical equipment necessary for the safe handling of ammonia is kept in good operating condition;
- Ensure that local fire departments are aware of the presence of stored ammonia at ice rink facilities;
- Notify the appropriate authorities of any accident that involves the major release of a hazardous substance;
- Ensure that the emergency response plans are reviewed by all employees annually and that drills are carried out as required;

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SUPERVISORS

- Have a thorough understanding of all elements of the Ammonia ECP;
- Ensure that all workers under their control understand the hazards presented by ammonia, are trained to perform their duties safely and demonstrate competence;
- Ensure that contractors and other temporary site visitors working around ammonia handling equipment are aware of the hazards presented by ammonia and the action required in the event of a release;
- Ensure that all workers use personal protective equipment specified in the Ammonia ECP and follow safe work procedures;
- Ensure that equipment is maintained in good operating condition;
- Ensure that investigations are carried out if ammonia alarms are activated, if symptoms of ammonia exposure are reported or if equipment malfunction occurs;
- Ensure results of investigations are posted at the workplace;
- Carry out an annual review of the emergency response plans and execute drills as required;

WORKERS

- Understand the hazards of ammonia and symptoms of exposure;
- Understand and follow safe work procedures contained in the Ammonia ECP;
- Use personal protective equipment in accordance with training and inspect the equipment before use;
- Report to the supervisor the absence of, or any defect in any personal protective equipment or ammonia handling equipment;
- Report to supervisor any suspected exposure to ammonia and participate in incident investigations;
- Participate in drills to ensure familiarity with responsibilities and roles in the event of an emergency evacuation.

RECREATION JH&S COMMITTEE OR WORKER HEALTH AND SAFETY REPRESENTATIVE

- Participate in the development of the Ammonia Exposure Program;
- Participate in annual review of the Exposure Control Plan;

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INTRODUCTION

The Northern Rockies Regional Municipality (NRRM), Recreation Department, uses ammonia both its liquid and gaseous forms at different points in the ice rink refrigerant system. The ammonia is contained within a closed system and exposure does not occur during routine daily operations. There are two routine maintenance activities which have the potential to expose workers to ammonia: draining the chiller pot and changing the oil in compressor units. Chiller pots are normally drained on varying frequency throughout the year while compressor oil is changed every two to three years. In addition to these potential sources of exposure, leaks may develop at valve packing glands.

A serious malfunction of the ice plant could conceivably release a large amount of ammonia gas. Accidental release of ammonia gas has the potential to cause serious injury to employees and may endanger the general public. An Ammonia Exposure Control Plan is required to ensure that employees are not exposed to concentrations of ammonia above WorkSafeBC occupational exposure limits during routine operations or during accidental releases.

The program will minimize or eliminate leaks during routine operations and prevent, insofar as possible, accidental releases of large amounts of ammonia.

Specific work procedures, general work practices and training to facilitate the implementation of the Ammonia ECP are an integral part of the ammonia exposure control plan.

AMMONIA

Ammonia is:

- Gas, easily liquefied under pressure
- Dissolves readily in water to form a corrosive base, Ammonium Hydroxide
- Both liquid and gas are extremely reactive with other substances
- Gas is Explosive
- Difficult to ignite - presence of iron or steel lowers the ignition temperature
- Non-conductor of electricity
- Very high coefficient of thermal expansion therefore at its boiling point one volume of liquid will yield 800 volumes of gas

The physical properties of ammonia are presented in Table 1.

Table 1 - Physical Properties of Ammonia	
Gas	Liquid
Suffocating, pungent, penetrating odour	Clear fluid
Colourless	Boils at about -33 C. (-28 F.)
Ammonia gas is one half as heavy as air, if it escapes it tends to collect in high or ceiling areas. As the concentration drops the gas is dispersed throughout the confined area.	Freezes about -78 C. (-108 F.)

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POTENTIAL FOR EXPOSURE TO AMMONIA IN THE WORKPLACE

Ammonia is present in the refrigeration system as a gas and as a liquid. Workers may be exposed if ammonia is released from the system during routine maintenance activities or if leaks develop, for example, at valve packing glands. The primary route of exposure to ammonia is by inhalation of ammonia gas. Dermal exposure to gas and liquid is also possible.

Due to the high coefficient of thermal expansion, release of 1000 lbs. of ammonia from the refrigeration system will yield 23,000 cu. ft. of PURE ammonia gas. Over 900,000,000 cu. ft. of air would be required to dilute this to 25 ppm. (900,000,000 cu. ft. is equivalent to a building fourteen times the size of B.C. Place Stadium).

External heat must never be applied to any part of an ammonia system containing the liquid. The immediate increase in pressure can rupture the tank or pipe.

AMMONIA HEALTH HAZARDS

Ammonia gas is very irritating to the eyes, nose and respiratory system. Thus, low concentrations in the air are readily detectable. This irritation makes it unlikely that any person will remain in an atmosphere contaminated with high concentrations of ammonia unless trapped or unconscious.

At varying concentrations, ammonia can cause coughing, chest pain, breathing difficulty, bronchial-pneumonia, pulmonary edema and death from bronchial spasm. It is a severe eye irritant that can penetrate the eye quickly, causing permanent blindness. Contact lenses shall not be worn when exposure to ammonia is possible. Contact with the skin or eyes can cause severe burns and, if extensive, they can be fatal.

Repeated exposure to ammonia can dramatically affect the ability to smell the gas. Employees, who have worked regularly with ammonia, have demonstrated an inability to detect the odour at concentrations immediately dangerous to life and health. Table 2 presents health effects of ammonia at various concentrations.

Ammonia Concentration (ppm)	Effect
2-55	Normal range of odour threshold
70	Stinging or burning in the eyes, nose or throat. Can be watering of the eyes, sneezing or coughing.
300	Severe irritation of the eyes, nose or respiratory tract, which becomes intolerable after a few minutes
300	Difficulty in breathing. Can be burning of the lungs. (I.D.L.H.).
2000	Can be fatal after a few breaths

Note: The “normal range of odour thresholds” in Table 3 (Toxic Effects of Ammonia) do not apply to those who have become de- sensitized by long term exposure to ammonia.

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AMMONIA PHYSICAL HAZARDS

FIRE

The fire hazard rating of ammonia is usually stated as "Slight". However, the presence of oil or other combustible materials increases the hazard of fire.

Ammonia is explosively flammable in air between concentrations of 16% and 27% (by volume).

CHEMICAL ACTION

Contact with strong oxidizers can cause fire and explosion. Ammonia can form explosive mixtures with ammonia, bromine, iodine, calcium, hypochlorite bleaches, gold, mercury and silver.

CORROSIVE ACTION

Ammonia dissolves in water very readily to form a corrosive chemical, ammonium hydroxide. Ammonia can cause chemical burns to all moist body surfaces. Ammonia may also attack copper, zinc, tin, cadmium and most of their alloys. It will corrode many rubbers and plastics.

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RISK IDENTIFICATION AND ASSESSMENT

The current WorkSafeBC occupational exposure limits for ammonia are presented in Table 3:

25 ppm	Maximum permitted concentration for an 8 hour day
35ppm	Maximum permitted short-term (15-min.) exposure

These are the maximum allowable exposures permitted without respiratory protection. See “Respiratory Protection” for allowable limits with respirators.

According to the US National Institute for Safety and Occupational Health the “Immediately Dangerous to Life and Health (IDLH)” concentration for ammonia is 300 ppm. Above this concentration an unprotected individual may be incapacitated to the point that they may be unable to leave the area and may suffer severe and possibly life threatening injury.

Potential for exposure to ammonia gas will be continually assessed by the buildings ammonia sensors. There are two fixed ammonia monitors: one Analygas Systems monitor and one Hansen Technologies Corp. monitor. The digital display for the Analygas System is located outside the compressor room. The monitoring system includes an alarm function as follows:

- Y Audible siren at concentrations greater than 30 ppm.

The Analygas Systems monitor detector is placed in the vestibule just outside the machine room. The sensor for the Analygas unit is located ceiling height above Compressor #2, near the centre of the Main Ice Plant Room. At 30 ppm a red light is activated and an audible alarm is sounded. Additionally, there are blue lights and sirens placed throughout the Recreation Centre complex that are activated. The alarm is calibrated annually by CIMCO Refrigeration.

The Hansen Technologies Corp. monitor detector is located inside the enclosed Heat Exchanger (HEX) box located outside of the Recreation Centre on the Condenser stand. This sensor is connected to the Analygas display system and the same internal Recreation Alarms.

Records of monitored results that exceed WorkSafeBC exposure limits will be retained as part of this exposure control program.

- Record levels if they are greater than 50% of the 8-hour limit, i.e. 12ppm. -

Both ammonia monitoring detectors are tested on a monthly basis and calibrated annually. Annual calibration is completed by CIMCO as part of the annual maintenance contract. Monthly testing is completed by Utility Maintenance Arena Operators and the safe work procedure is attached in Appendix A.

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EXPOSURE CONTROL

Exposure control for ammonia will include the following actions:

- Training
- Use of personal protective equipment
- Use of safe work procedures
- Emergency response procedures

TRAINING

Training on the hazards and safe handling of ammonia will be performed by the employer or the employer's designate. Records of attendance, dates of training and training material will be documented and retained. Additional training or reference material on ammonia will be made available to employees upon request.

Worker training will cover the following areas:

- The risk of exposure to ammonia and the signs and symptoms of exposure
- Review of the Ammonia ECP
- Correct use and maintenance of personal protective equipment
- Safe Work Procedure for identifying and correcting ammonia leaks
- Emergency Response Procedure for building evacuation
- First aid response for exposure to ammonia gas or liquid

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Hearing protection must be worn inside the compressor room while the Ice Plant equipment is in operation.

EYE PROTECTION

Eye protection is not mandatory for simple entry into the compressor room under normal operating conditions; however contact lens shall not be worn while in compressor room. If work on equipment has the potential to release ammonia the use of full face respirators is required.

SKIN PROTECTION

Chemically resistant gloves must be worn when working on equipment has the potential to release ammonia.

Coveralls or other clothing covering arms and legs should be worn in while in ice plant.

Footwear should offer protection by enclosing the foot (no open sandals).

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RESPIRATORY PROTECTION

Mouth Piece Escape Respirators: All Utility Maintenance – Arena Operators are issued this type of respirator. These respirators are issued by the Chief Engineer and do not require fit testing. However instruction on use and limitations must be provided. All staff entering a room where ammonia is used or stored must carry their escape respirator with them into the room. These respirators are for escape only and shall not be used for entry into known ammonia contaminated areas.

Full Face Respirator: This respirator can only be worn by individuals who have been fit tested for the unit. The full face respirator does require fit testing on annual basis. These respirators can be used for entry into ammonia contaminated areas no greater than 300 ppm. Instruction on proper use, care and limitations are provided by the Supervisor.

The following procedure must be followed when using this respirator:

- May only be used for entry into ammonia contaminated areas no greater than 300ppm.
- Cartridges must be replaced upon expiry or according to manufacturer recommendations.
- Fit testing records are held in the Human Resources personnel file.

EMERGENCY EYE WASH AND SHOWER STATION

The emergency eye wash and shower is located in the entrance vestibule outside of the compressor room. It is critical to start eyewash within ten seconds of contact with ammonia. The contaminated area must be flushed for a minimum of fifteen (15) minutes.

SAFE WORK PROCEDURES

Under normal operating conditions NRRM employees are not exposed to ammonia unless a leak develops, the chiller pot is emptied or compressor oil is changed.

Work procedures for emptying the chiller pot are presented in Appendix A.

EMERGENCY RESPONSE PROCEDURES

AMMONIA ALARM

The operator/manager discovering a leak in the refrigeration system must immediately assess the severity of the emergency:

1. Determine the concentration of the refrigerant in the affected areas: low (0.1 to 10.0ppm); a minor concentration (10.1 to 25.0ppm); a major concentration (25.1+ppm). The concentration of Ammonia can be read directly from the Ammonia Gas Sensor display.
2. Determine the degree to which public/staff safety is affected. Find out which way the wind is blowing by observing one of the wind socks to determine where the Ammonia will be going.

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3. Implement *Emergency Evacuation Procedures*.
4. Based on concentration of ammonia released and detected, determine the nature of corrective action required and implement either the *Minor or Major Ice Plant Alarm Procedures*, or call in competent personnel to determine the corrective action required.
5. The decision to use the pressure relief vent in the exterior Red Emergency Box will **ONLY** be made by the Fire Chief or designate.



For all levels of ammonia leak, public and worker safety is the priority. Normally with our prevailing wind direction, we ask the public and staff to evacuate the building by going towards Simpson Trail. If the wind direction prevents this, then steer the evacuation to an exit that the wind is not blowing towards.

If there are two Arena Operators on duty, one will conduct the evacuation and the other will determine the ammonia release hazard level. If there is only one Arena Operator on duty, first priority is to conduct the evacuation and then consult with responding emergency services to determine ammonia release hazard level.

EMERGENCY EVACUATION PROCEDURES

1. Remain calm;
2. **DO NOT** enter the plant room;
3. Push the Emergency Stop and the Emergency Exhaust Fan Buttons, located near the Gas Detection Panel;
4. Contact the Fort Nelson Fire Department at 250-774-2222 to confirm the Ice Plant Auto-

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dialler has reported the concern.

5. Evacuate everyone from the building through the nearest safe exit, avoiding the West exits;
6. As soon as practicable, contact the Director of Recreation & Facilities at 250-775-0066;
7. At the Muster Station, determine if anyone is unaccounted for;
8. Upon their arrival, notify Emergency Personnel of anyone that is not accounted for;
9. Direct emergency personnel to the source of the original problem.

DETERMINING AMMONIA RELEASE HAZARD LEVEL

1. **DO NOT** enter the Plant Room;
2. Ensure safety partner is with you;
3. Ensure your Canister type, full-face mask respirator is ready for use, for each of you;
4. Is the Plant Ammonia Alarm active?
5. What ppm is displayed by the Ammonia Alarm?
6. Through the window in the Plant Room Door
 - Check the interior of room;
 - Are there any leaks evident? If so, are they visually major or minor? Compare estimate with the gas detector reading.
7. Check exterior of room - is the exhaust fan actually running;
8. Stop to formulate a plan if a problem exists.

AMMONIA LEAK PROCEDURES

Small Leak Handling Procedure – Less than 10ppm

1. Notify supervisor;
2. Make sure the Ammonia Alarm Procedures are being followed;
3. Check to make sure the Compressors did shutdown when the Emergency Stop button was pushed. If not, shut the three Compressors down using the Plant Room graphic display computer;
4. Have Fire Rescue, with full Ammonia Hazard PPE, check to see where leak is and mark it;
5. Using the Plant schematic, check to see which valves can be closed to isolate the leak. Have Fire Rescue personnel close those valves;
6. If the leak cannot be closely isolated, close the King Valve located on the Thermosyphon;

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7. Close other valves that will isolate the section of the Plant where the leak is;
8. Have a competent and certified person repair the leak;
9. Once the leak is repaired, open any valves previously closed;
10. Start up and recheck for leaks;
11. If no leaks are detected, return to normal operations;
12. If unable to repair the leak, then classify the leak as MAJOR and proceed to the Major Leak Handling Procedures;
13. Document this event in the Ice Plant Log Book with report to Director of Recreation Services and Director of Human Resources;
14. Director of Recreation Services or Chief engineer will report this Incident to the BC Safety Authority

Major Leak Handling Procedures – Greater than 10ppm

1. **DO NOT** enter the Plant Room;
2. Notify supervisor;
3. Contact the Northern Lights College at Reception 250-774-2741 and Laurie Dolan at 250-500-3481.
4. Pre-entry check, make sure compressor room exhaust fans are operating;
5. Check to make sure the Compressors did shutdown when the Emergency Stop button was pushed. If not, shut the three compressors down using the plant room graphic display computer.
6. Have Fire Rescue, with full Ammonia Hazard PPE, locate the leak and close nearest valve(s).
7. Have a refrigerant specialist (CIMCO or equivalent) repair the leak.
8. Document this event in the Ice Plant Log Book with report to Director of Recreation Services and Director of Human Resources;
9. Director of Recreation Services or Chief Engineer must immediately report this event to the BC Safety Authority

COMPRESSOR ROOM VENTILATION

The refrigeration plant room is equipped with an exhaust ventilation Fan. The fan will bring in fresh air while dispersing the contaminated air outside. The compressor room ventilation system is tied in with the ammonia detector. The low speed fan is controlled by the Ice Plant Computer System which operates 24/7. The fan kicks in when the detector reads a level of 10 ppm. This is in accordance with the BC Safety Authority and WorkSafeBC recommendations.

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DOWNWIND EVACUATION ZONE

If ammonia is evident in a downwind direction at the edge of the initial isolation circle, then the isolation zone must be extended out on the downwind side. The width of this extended isolation zone beyond the initial isolation circle should be equal to the length of the zone.

Evacuation areas may be altered due to varying weather conditions. Very light winds may shorten evacuation areas, while strong winds may preclude increasing the evacuation area. Incident Command should be cautious of wind direction and wind speed changes occurring during the operation. While higher wind speeds will help to disperse the ammonia gas into the atmosphere more rapidly, it will also extend the isolation area farther downwind during the early stages of the operation. Precipitation in any form, drizzle, rain, snow, etc., may suppress the expansion of the ammonia cloud into the atmosphere, but it will keep the cloud more dense in the initial area. NRRRC employees will be making decisions with regard to evacuation zones.

FIRST AID FOR AMMONIA EXPOSURE

RESCUE

The Fire Department members are trained to work in Hazardous environments; all Rescues are *ONLY* to be performed by the Fire Department.

EXPOSURE TO AMMONIA VAPOUR BY INHALATION

1. Remove victim to fresh air.
2. Call 250-774-2344 to summon an ambulance.

EXPOSURE TO LIQUID AMMONIA - EYES

1. FLOOD IMMEDIATELY with water for at least 15 minutes. Eyelid must be held open during washing.
2. Call 250-774-2344 to summon an ambulance.
3. If possible, determine if patient is wearing contact lenses and advise medical personnel.

EXPOSURE TO LIQUID AMMONIA - SKIN

1. FLOOD IMMEDIATELY with large quantities of water for at least 15 minutes.
2. Call 250-774-2344 to summon an ambulance.
Decontaminate the victim with water before transporting in the close confines of an ambulance.
3. Flood clothing with large quantities of water. CAUTION: Skin may be frozen to clothing.
4. Decision to remove clothing should be made by medical personnel only.

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5. Advise medical personnel that burns are from ammonia and salves or ointments should not be applied.

FIRST-AID KITS

Standard First-aid kit-is located in the Zamboni Room. Incident forms or Employee accident forms must be completed for every injury or incident.

DOCUMENTATION

The following documentation is required as part of the Ammonia ECP. There must be a brief description and reference to all documentation in the Ice Plant Log Book.:

- Copies of Exposure Control Program at Worksite
- Records of Worker Training
- Records of Instructor/Supervisor Training
- Written Work Procedures
- Incident Investigation Reports (worker exposures, alarm activation, equipment malfunction)
- Storage Inventory for Ammonia
- Material Safety Data Sheet for Ammonia (must be dated less than 3 yr. old)

REPORTING AND INVESTIGATING EXPOSURES

WORKER EXPOSURE TO AMMONIA

Where a worker has reason to believe that he/she is being or has been overexposed to ammonia the worker will report this to their supervisor and seek medical aid. The supervisor will carry out an investigation in consultation with the JH&S Committee or Worker Health and Safety Representative using the NRRM Incident Investigation Form.

ALARM ACTIVATION OR EQUIPMENT MALFUNCTION

Investigations will also be carried out whenever alarms sound or when equipment malfunction occurs which has the potential to release ammonia.

DOCUMENTATION OF INVESTIGATION

The NRRM will maintain records of the investigations for a minimum of 10 years and these will be made available to affected workers. Records will include the following information:

RECORDS OF WORKER EXPOSURE

The NRRM will maintain records of all workers who are over-exposed to ammonia. These records will be kept in the employee's personnel file. A brief description of the event and reference to these files must be made in the Ice Plant Log Book. Records of air sampling, results of hazard identifications, risk assessments and first aid treatment records will be made available to affected workers.

Worker exposure to ammonia will be documented in the following ways:

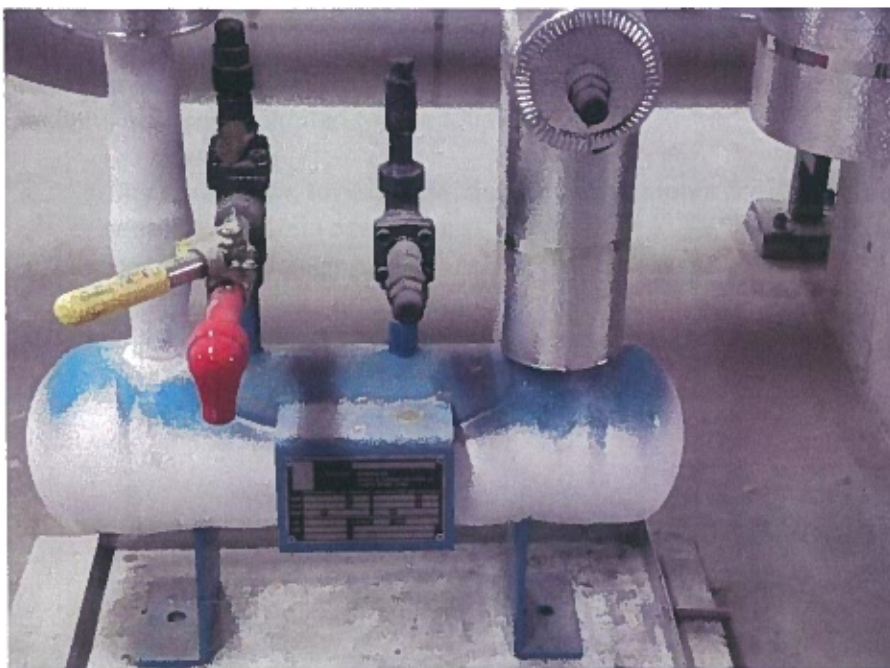
- Incident/Near Miss Reports
- First Aid Treatment Records
- Medical Records, if available

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PURGING ACCUMULATOR PROCEDURES (DRAINING THE CHILLER)

Keep visual check on frost level on purging pot daily. When frost level reaches halfway up pot or more follow draining procedures:

This task should only be performed by a 'competent' worker;



Main Chiller Oil Pot showing frost on the lower portion, the Yellow 'Dead Man' valve and the Red spigot. The Oil Pot isolation valve is located in the upper right portion of this picture.

The need to drain oil is evidenced by lack of frost on the lower portion of the oil pot/pod. The oil pots are located below the West end of each Chiller. The amount of oil that can be allowed to accumulate before draining is necessary will be determined through experience.

HEALTH & SAFETY MEASURES

Workers doing the draining shall wear at least a full face mask respirator with NH₃ rated canister and protective gloves. If a leak is detected by the workers, close the exterior door to control the fumes. Follow the Ammonia Leak Procedures.

If practical, oil should be drained when there are no members of the public in the facility. Prior to draining oil, the worker shall inform the supervisor and co-worker(s) as to the nature and schedule of the work to be performed.

Prior to entering the Ice Plant room, ensure the lighting and ventilation systems are functioning. Manually turn the exhaust fan to 60Hz (100%). The exterior door should be secured in the open position while this work is being done.

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Drain the oil/oil foam into a container of water through a transparent hose or tube which is immersed below the water surface in the container. Normally we would use a 20 litre plastic pail, $\frac{1}{3}$ to $\frac{1}{2}$ full of water, to drain oil into.

MATERIALS/ EQUIPMENT

Wear hearing Protection, Respirator, Gloves, 20 litre pail, oil draining hose

PROCEDURE

1. 24 hours prior to draining the Oil Pot(s) close the valves to isolate the oil pot(s) from the Chiller(s). Isolating and waiting will allow the Ammonia in the oil pot to leave the oil;
2. After the 24 hour wait. Attach the transparent hose to the Red spigot and insert the open end of the hose into a 20 litre pail;
3. Open the Yellow 'Dead Man' valve in a manner which will allow only a slow release of oil from the Chiller. Once the valve is opened, time may be required for the oil to exit.
4. While the oil is releasing make sure the open end of the hose remains inside the 20 litre bucket;
5. Observe the flow of oil through the tube. Close the valve immediately once the oil ceases and any escaping ammonia gas begins.

At no time can the Yellow 'Dead Man' valve be left unattended. (The worker's hand will remain on the valve throughout the procedure).

Once the oil pot has been drained, move the container of water, oil and oil foam outside of the Plant Room. Allow the oil and water to separate. Then the oil can be disposed of in the used oil container at Public Works.

Clean and service the respirators, and then return them to their proper location.

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AMMONIA SENSOR MONTHLY TESTING

WorkSafe BC requires the ammonia alarm system for the ice plant to be tested monthly. This procedure is for the monthly testing and requires two people to conduct.

HEALTH & SAFETY MEASURES

Hearing protection must be worn while in the Ice Plant Room. Carry your respirator or escape respirator (bite block) and flashlight with you in the Ice Plant Room.

MATERIALS/ EQUIPMENT

- Minimum 1.8m step ladder
- Nilite Gloves
- Bottle of "Sudsy Ammonia" cleaner

PROCEDURE

1. Before entering the Ice Plant room, check the Gas Detection Panel, located across from the Emergency shower in the Ice Plant Lobby.



The display must indicate 0.0ppm before entry is permitted.

Choose an appropriate time to trigger the alarm strobes and sirens.

2. Position the step ladder to access the Ammonia Alarm Sensor located above the North end of Compressor #2. Make sure the "Sudsy Ammonia" cleaner is available in the Plant room.
3. Notify:

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- a. The Director of Recreation and Facilities, the Recreation Operations Supervisor, the Chief Engineer and the On Call personnel,
- b. All staff members in the building. Ask staff in the building to watch for the Blue Strobes and listen for the accompanying sirens,
- c. All of the Visitor's Information Center and Concession Kitchen staff in the building,
- d. All User Groups in the building.
- e. The Fire Department.
 - i. Tell the Fire Department:
 - ☒ Your name,
 - There will be a test of the Ammonia Alarm System in approximately " X " minutes. They do not need to respond to the Alarm,
 - ☒ That you will call back when the test is completed.



Analygas Systems Ammonia Sensor located above the North end of Compressor #2

4. Once sure that all people in the building are notified, put on the hearing protection. Then position one person in the doorway between the Ice Plant Vestibule and the Ice Plant Room. This person will be watching the Ammonia Alarm display and the person climbing the step ladder to reach the sensor.



**Air flow hole for the Analygas
Ammonia Sensor**

5. The second person then climbs the step ladder. Once able to reach the bottom of the Ammonia Sensor housing with the bottle of "Sudsy Ammonia", open the bottle lid and hold the bottle mouth close to the air flow hole in the bottom of the sensor housing.
6. The numbers on the Ammonia Alarm Display will begin to increase after a few seconds. Have the person watching the alarm note when the alarm is triggered.
7. Once the Alarm has been triggered, let it continue for 30 seconds then the bottle can be removed from near the sensor inlet and re-capped.
8. The Ammonia Alarm Display numbers will begin to decrease as fresh air begins to enter the sensor housing. The Alarm will stop once the Ammonia Alarm Display number falls below 10.
9. Return the ladder and the "Sudsy Ammonia" cleaner to their respective storage locations.
10. Notify:
 - a. the Fire Department, the Director of Recreation and Facilities, Chief Engineer and the On Call personnel that the test is complete and verify they did receive a phone call from the Alarm.
 - b. Notify all staff members, Visitor Information Center staff, Concession Kitchen Staff and User Groups in the Building that the test is completed. Ask if they saw the Flashing Lights or heard Sirens.
11. Document this test by:
 - a. Recording the test and the results in the Ice Plant Log Book.
 - b. Sending an email of the test results to the Director of Human Resources.

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MINOR REPAIRS

Only Certified workers are allowed to work on and repair the Ammonia systems. All workers must be familiar with all the hazards and the safeguards necessary to perform the work safely.

Leaking Packing Gland on Refrigeration Valve.	Make sure valves are either front seated or back seated. Tighten packing nut until leak cannot be detected by using ammonia sulphur stick.
Leaking Trap.	Shut down Compressors and lock out power. Tighten all flange bolts evenly applying same torque to each. Check with ammonia sulphur stick. Restart Compressors.
Ammonia Leak at Compressor.	Switch off inter-lock switch on sub-panel. Shut Suction Valve and Discharge Valve in sequence on leaking Compressor.
Ammonia Leak in Main Suction Line.	Shut off main isolating valves on Compressor Suction Lines. Compressors should shut down.
Ammonia Leak in Main.	Switch off inter-lock Switch Sub-panel. Shut Discharge Valves to each Compressor.
Ammonia Leak in Condenser	Switch off Inter-lock switch on Sub-panel. Close supply and return valves to Condenser.
Blown Safety Valve	Shut down Refrigeration Plant using Emergency shutdown switch. Initiate procedures for evacuation. When public safety is secured, turn on exhaust fan and let room clear. Have Fire Department standing by with a fog hose to cover stack when relieving ammonia to the atmosphere.

BASIC PREVENTATIVE MAINTENANCE

RECORDKEEPING

- 1) Daily Plant Check Sheets
 - a) Analyze these reading each day.
 - b) If readings differ from design or established limits, determine the cause and make corrections immediately.
- 2) Maintain a permanent Preventative Maintenance Log Book
- 3) Maintain a record of:
 - a) Ammonia added to the system
 - b) Oil added and drained from the system
 - c) Operational alarms that have occurred
 - d) Other maintenance done to the ice plant

Ammonia Exposure Control Program

HOUSEKEEPING

- 1) Keep machinery rooms neat and clean.
- 2) Keep all machinery clean.
- 3) Keep all electrical equipment clean.
- 4) Keep all piping and vessels clean, free of rust and painted.
- 5) Keep all pipe and vessel insulation clean and in good repair.

LUBRICATION

- 1) Always use equipment manufacturer's recommended lubricants.
- 2) Always follow equipment manufacturer's frequency schedules.
- 3) Be sure that valve stems are cleaned and oiled before closing any valve.

EQUIPMENT

- 1) Follow the equipment manufacturer's preventive maintenance recommendations for all refrigeration system equipment.
- 2) Test all safety controls and interlocks at least once per year.
- 3) Replace - safety relief valves every five (5) years.
- 4) Maintain correct alignment on all direct drive couplings.
- 5) Inspect and clean condenser troughs and spray nozzles annually.
- 6) Inspect and clean condenser -water storage tank as needed.
- 7) Insure that condenser water treatment equipment and automatic bleed-off systems are functioning properly.
- 8) Locate and repair all refrigerant and oil leaks promptly.
- 9) Perform annual check of all electrical connections for proper tightness.
- 10) Test ammonia detection system operation monthly.
- 11) Service machinery room ventilation systems at least once per year.

MISCELLANEOUS

- 1) Ensure that all personal protective is properly stored and maintained.

All preventive maintenance should be performed by qualified individuals and all safety procedures must be strictly followed.