Ontario Recreation Facilities Association

Building Community Since 1947

Ice Arena Ammonia Emergency Preparedness Auditing Guideline

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Ontario Recreation Facilities Association

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Introduction

Why does there seem to be an increase in ammonia related incidents in our industry? Since the unfortunate accident in western Canada that claimed 3 lives, all media are focused on reporting events in ice arenas involving ammonia. Refer to: Fernie Arena Accident Report

Contributing to the interest is that ammonia is the most common refrigerant used in rinks across North America. The more facilities that use any chemical increases the opportunities for incidents. The second contributing factor is the age of these facilities and the need to update equipment that will reach or has passed its lifecycle expectancy. The ORFA offers two tools to assist plant owners in developing asset management plans.

Resource #1 **-** Safety Activities For Effective Refrigeration

Resource #2 **-** ORFA offers a Recreation Facility Asset Management software tool at no cost as a benefit of membership.

The ORFA has generated various resources to assist members in better understanding the risks and hazards associated with ammonia as a primary refrigerant. These resources will be referenced throughout this document and should be reviewed as part of the facilities research on the topic. The objective of this guideline is to help facility owners in determining, the current level of preparedness should there be an unplanned release of ammonia by conducting an internal audit that confirms or improves the level of preparedness. By working together we can significantly reduce the chances of an ammonia release.

Ice Arena Ammonia Quick Facts

- Ammonia has been used as an ice arena refrigerant for 100+years - it needs to be respected NOT feared.
- Ammonia is considered environmentally friendly when compared to other refrigerants – it is an important, natural chemical that is essential to life.
- Ammonia comes in two (2) forms - liquid and vapour – both have different risks to consider in emergency planning.
- Ammonia should not enter the human body, however when small amounts are digested it will be naturally changed within the body and/or naturally expelled without any long-term health effects.
- Its pungent odour makes it easy to detect, creating a natural warning when contact is made.
- Most ammonia release incidents in ice arenas are caused by poor operations and lack of training.
- Currently, it is estimated that 90% of all ice arena workers are inadequately prepared to properly deal with any level of leaking ammonia effectively.

WHMIS and First Aid

WHMIS is a tool that cannot be left in the toolbox. Too often, obtaining a WHMIS certificate of successful completion is where facility management ends the training. It is the important that all SDS's be current and up to date. Facility management must evaluate First Aid certificates and the level of preparedness of all operators to quickly respond to ammonia exposure. A facilities health and safety culture are often identified at this regulated minimum obligation to be met.

Quick Risks and Hazard Facts

- Ammonia liquid releases are most often caused by failing equipment or occur during plant maintenance.
- When ammonia is released as a vapour it is 25% nitrogen and 75% hydrogen at 70°F.
- A liquid ammonia release will become a cloud with temperatures reaching as low as -107F. At -108°F, ammonia will become a solid.
- Released ammonia sends a decay signal to insects – flies in the plant room could be a sign of leakage.
- When ammonia leaks as a vapour there is no visual effect.
- Vapour leaks are more predominant in an ice arena as seals or packing leak or are released during routine maintenance.
- Ammonia is stable until water or another chemical is introduced – water increases ammonia's pH level - workers often rely on "fire fighting" training skills for all types of emergencies – all emergency stakeholders must be cautioned as to the effect of adding water directly to an ammonia leak.
- Under standard conditions when released, ammonia will rise, however, moisture will force it back down to the ground.
- 1 pound of liquid ammonia when released to vapour will create 800ppm. To determine the maximum amount of potential vapour release if the system has a critical charge failure multiply the critical charge by 800.
- 1 pound of ammonia occupies 22.5 cubic foot volume of a room when released – however, containing ammonia is considered best practice when safe to do so.
- Although not recommended, most workers exposed to 1-150ppm of ammonia for 1 hour will not experience or develop irreversible or serious health effects.
- Workers have less than 30-minutes to escape levels of 220-300ppm of ammonia before a serious risk to injury occurs.
- At 700ppm, permanent eye injury will occur.
- 1700ppm coughing and bronchial spasms should be expected.
- 2500ppm will be fatal within 10 minutes.
- 10,000ppm skin damage begins.
- 50,000ppm immediate fatality.
- Over time, operators can build up a tolerance to ammonia which can create a false sense of being safe.

Resource #3

Anhydrous Ammonia Exposure Worker Safety resource is a tool that can be used to assist in training ice arena staff.

PART I - Ammonia Emergency Avoidance Steps

The ORFA believes that the best emergency management is doing everything possible to avoid an emergency.

Step One – Regulatory Awareness and Compliance

Ensuring the plant is being properly maintained to meet all current Acts, Codes and Regulations is

essential plant management. There are two common pitfalls associated with this objective:

1. Acts, Codes and Regulations are minimum requirements to be met and too many facility managers either fail to meet the minimum or stop once minimum has been obtained.
2. Acts, Codes and Regulations constantly change to improve safety. These changes are most often only applied to new construction or retrofits with facility managers of older buildings failing to cross reference updates to current construction. Managing a recreation facility includes the updating of senior staff or plant owners on how the operation might be better served through updating of current equipment, processes or tools.

Resource #4

The ORFA offers members an opportunity to better understand regulated requirements with the Basic Arena Refrigeration Governance and Quiz.

Step Two – Plant Maintenance

The investment in plant maintenance and life-cycling of equipment is an essential step in emergency avoidance. The condition of all safety devices, piping that transfers ammonia in a liquid or vapour form as well as the condition of vessels that house refrigerants in the various states of the refrigeration cycle, the less risk of release. In addition, maintenance and calibration of permanently mounted sensing devices is critical emergency avoidance investment (refer to manufacturer testing recommendations).

Resource #5

The Importance and Benefit of Planned Facility Sensing Maintenance and Equipment Calibration Guideline outlines information on this topic.

Specific to ammonia/brine refrigeration plants, it is essential to monitor brine health. When brine pH shifts from the recommended levels which are based on the type of inhibitor, sealed equipment can quickly begin to fail. Understanding and maintaining secondary refrigerant health is also an essential emergency avoidance strategy.

Resource #6

The Importance of Monitoring Secondary Refrigerant resource is recommended reading to all plant operators.

Resource #7

The proper marking of all valves and piping is a regulated requirement. As part of the planning process it is important to review beginning on page 3, the TSSA Plant Safety Series 11 - Periodic Plant Inspections resource.

- Exercising all plant valves twice per year is an industry standard. This involves the opening and closing of the valve to ensure it is properly functioning.
- Leaks that continually release small amounts of vapour into the room must be addressed. Although they may be quickly ventilated making the room safe to enter, the more important potential risk is that the ammonia vapour will attack brass, copper, zinc and other soft metals in the room. Consider the design of the electrical panel components as well as plumbing parts that may be found inside the room. Conducting a metal type audit and placing this information into the plant's operational manual and life-cycle plan is considered diligent.
- Conducting plant equipment scans or x-raying should also be considered. Plant operators should also perform mechanical integrity audits. Rust needs to be removed from all equipment. Vibration inspections are also critical to safe plant operations. These types of professional audits will help identify improperly functioning or failing devices and will greatly assist in emergency avoidance. Discuss what scans and inspections would specifically assist the equipment's owner with a refrigeration contractor.

Step 3 – Worker Training

The better staff are trained, the less risk of an emergency type ammonia event to occur. It is essential to have those responsible to maintain the refrigeration plant and support equipment capable to understand all aspects of regulated responsibilities and plant function. It is strongly recommended that all ice arena plants have a designated "responsible person" who directly represents the owner in the day-to-day operations of the plant.

Resource #8

ORFA Refrigeration Plant Responsible Person Guideline

The ORFA offers different training opportunities to assist in meeting this goal. Those who have responsibilities to monitor the plant should be able to describe the function of the plant, the cycle of refrigeration, risks and hazards as well as all plant safety device functions. They should be able to evaluate plant performance and take the necessary steps to reduce any change in operation that may present risk if left unchecked. They must also have the ability to take charge of the facility should an evacuation be required. The Basic Arena Refrigeration (BAR) course will also assist plant owners in setting a path of competency for basic maintenance of the plant. Providing BAR graduates with comprehensive workplace specific training on tasks such as adding or removing oils, or refrigerants can be within reach. The ORFA Basic Arena Refrigeration course sets a strong foundation toward these goals.

The ORFA recommends that every plant have a Certified Arena Refrigeration Plant Technician (CARPT) on site. The professional development path to receive this accreditation requires over 100-hours of classroom-based education, that includes 4 examinations to be completed. An additional 2-years of proven experience in an ice arena environment is required to complete the certification. Once complete, a CARPT will be confident in their responsibilities to represent the plant owner in meeting their regulated responsibilities through the design of operational and maintenance plans.

Personal Protective Equipment (PPE)

Are all recommended PPE items as identified on the SDS available to staff who enter the plant room and is PPE actually being worn when work is being performed? Having and using Personal Protective Equipment (PPE) when conducting any maintenance to the plant is an important emergency risk reduction tool. Ice arena ammonia leaks often occur when operators are conducting routine work and a small amount of ammonia is released without warning. Operators have a natural reaction toward life safety in these situations of leaving a valve unclosed or equipment operating as they escape the area. These situations will then require an elevated response to bring the plant back to safe operating conditions. The plant's operating manual must contain an up to date Safety Data Sheet (SDS) that is reviewed each time an operator has an opportunity to come in contact with ammonia. Without exception, all SDS recommended PPE must be properly worn.

Work Clothes

Beyond durability, there are reasons why brand work clothes such as Carhartt® are expensive. The design of this type of clothing reduces the amount of chemical that is actually absorbed by the materials at contact. Nylon clothing should never be worn in a refrigeration plant room. It is important to remember, under extreme exposure levels that a worker's clothing can freeze to their skin. As much as removing the clothing when using a deluge shower is recommended, a caution is extended that some thawing may be required prior to removal to avoid damaging the person's skin.

Real Time Detection

Plant owners need to consider the benefits of having real time detection available for operators. Real time

protection includes wearable or handheld detection devices.

Breathing Protection

Plant worker breathing protection is one of the most underutilized emergency risk reduction tools in the industry. Having proper lung protection during routine maintenance will often give the operator the necessary time to take corrective action should a release occur.

The ORFA strongly recommends that all plant tasks that present any risk of ammonia release has the operator or refrigeration contractor wearing an appropriate Air-Purifying Respirator (APR).

Escape Hoods

The newest PPE being made available to ice arena plant refrigeration operators are escape hoods. Escape hoods are designed to be easily donned and protect users from toxic industrial and fire-related gases, vapours and particles for up to 15 minutes. Depending on the exact risks and hazard level of the plant room, these tools can be considered as part of the emergency preparedness plan.

Self-Contained Breathing Apparatus (SCBA)

Currently in Ontario, there is no legal obligation to have these devices on site. The use of SCBA are an important tool when ammonia levels exceed acceptable levels for the use of an APR. They must be restricted to properly trained personnel. Ice arena owners must consider the benefits and potential challenges associated with these devices.

Resource #9

ORFA Understanding Recreation Worker Respirator Protection Guideline

Resource #10

ORFA SCBA in a Refrigeration Plant Room Guideline

Levels of Ammonia Body Protection

A hazmat suit (hazardous materials suit), also known as a decontamination suit, is a piece of personal protective equipment that consists of an impermeable whole-body garment worn as protection against hazardous materials. There are different levels of protection these suits can provide.

Level "A" Protection

The highest level of protection for the skin, eyes and respiratory system that are all at risk when exposed to the dangerous chemicals in any state. Level A suits require:

- Full face Self Contained Breathing Apparatus (SCBA)
- Two-Way radio
- Proper footwear including Safety steel-toe boots with shanks on the outside
- Chemical-resistant gloves

Level "B" Protection

Very similar to Level A, the Level B suit is extremely protective, and the difference is that these suits

contain less skin and outer body protection compared to an "A" level suit. Most often used when the worker may require less skin protection but still a very high level of respiratory protection. Level B suits require:

- Full face Self Contained Breathing Apparatus (SCBA)
- Two-Way radio attached either inside or outside the suit to avoid contamination
- Chemical-resistant gloves
- Proper footwear including Safety steel-toe boots with shanks on the outside
- Secured wrist, ankles, facepiece and waist areas for splash protection

Level "C" Protection

The most commonly used suit, the Level C, possesses similar characteristics as Level B but does not have the same level of respiratory protection. The suit is predominately used when the hazardous material is identified, measurable and contained and is utilized when contact with the substance will not cause harm to the skin. Level C suits require:

- Full-face air purifying respirators.
- Chemical-resistant gloves.
- Proper footwear including safety steel-toe boots with shanks on the outside.
- Two-way radio.
- Haed protection.

The use of this PPE must be left to properly trained personnel. It is recommended that ammonia levels above 300ppm have a specific plan of attack that includes the expected level of protection to be worn specific to the circumstance in the facilities' emergency planning documents.

Engineered Controls

Ontario refrigeration plants must have functioning ventilation that can only be started outside the room and shut off occurs inside the plant as an operator leaves the area. Confirming that the ventilation system meets current turnover standards should be discussed and confirmed with the plant's refrigeration contractor. The fan requires regularly scheduled maintenance and testing. Operators must be trained to not immediately start ventilation when elevated levels of ammonia are detected, as keeping the release in the room until the best release conditions are confirmed is a safer approach.

Portable Fans

Low level ammonia exposures can be addressed by moving air across the person with a fan who has been exposed. Having these devices on site can also be considered as part of the facilities ammonia emergency planning.

Eyewash and Deluge Showers

The national CSA Standard B52-99, Mechanical Refrigeration Code, establishes requirements for the design, construction, installation and maintenance of mechanical refrigeration systems, so as to minimize the risk of injuries to workers and the general public. This Standard requires all new plants to install flushing equipment with the Technical Standards and Safety Authority (TSSA) directing all older plants to comply. Properly installing and maintaining these devices takes operational commitment which often goes unchecked as plant operators do not envision a need of use. Having these devices in proper working order will assist in determining an exposure recovery timeframe.

The matter of locating deluge showers near a condenser when high risk work is being performed must form part of emergency planning discussions with the refrigeration contractor.

Resource #11

Facility Eyewash and Deluge Shower Installation and Maintenance Guideline is designed to assist facility operators in better understanding these devices.

PART II - Ammonia Emergency Preparedness

Introduction

Emergency preparedness is the responsibility of the ice arena owner to ensure all regulated responsibilities are met. This may not be a direct expectation to meet the application of regulations and codes but rather a responsibility to have competent persons managing and operating the facility. This commitment would include but not be limited to providing the necessary resources to maintain equipment, safety devices as well as providing the necessary training for staff to perform these duties.

Regulated Responsibilities to be Prepared

Ice arena owners have a general responsibility to comply with the Fire Code. The Fire Code is a set of building and property regulations designed to establish a mandatory standard for a building's ability to resist the start and spread of a fire as well as facilitating the prompt and safe evacuation of the occupants. The Fire Code requires plans to be developed and practiced. However, Section 1.2.3.1. further states that *"compliance with the Fire Code does not relieve the owner from compliance with other applicable Acts and regulations, and, where a requirement of an applicable Act or regulation conflicts with a requirement of this Code, the more stringent requirement prevails, unless the more stringent requirement is in this Code and this Code says that the requirement of the other Act or regulation prevails."*

Section 46 of the Operating Engineers Regulation (OER) *states that* "every owner of a plant shall keep on the premises of the plant an up-to-date, detailed operating procedures manual that sets out the procedures relating to training and the operation of all equipment and systems of the plant and all emergency procedures."

As ice arenas regularly invite the public into the building, compliance to the Occupier's Liability Act must also be considered. Excerpts from the Act include:

"Occupier" includes, (a) a person who is in physical possession of premises, or (b) a person who has responsibility for and control over the condition of premises or the activities there carried on, or control over persons allowed to enter the premises,

Occupier's Duty 3 (1) An occupier of premises owes a duty to take such care as in all the circumstances of the case is reasonable to see that persons entering on the premises, and the property brought on the premises by those persons are reasonably safe while on the premises. (2) The duty of care provided for in subsection (1) applies whether the danger is caused by the condition of the premises or by an activity carried on the premises.

Confined Space Entry

Under current Occupational Health and Safety Act regulations, ice arena refrigeration plant rooms, under any conditions, are not considered to be confined spaces under any circumstance. However, significant refrigerant leaks should be given the same level of respect and preparedness as any other confined space type entry.

Resource # 12

ORFA Confined Space FAQ

Hot Work Permits

Hot work is any work that involves burning, welding, using fire or spark-producing tools, or that produces a source of ignition. Welding and cutting operations are common servicing operations. Workers conducting such work in a plant room must test for flammable gases in the work area before starting any hot work. The plant operator must oversee the

permitting process prior to any work being performed.

It's Always Better to Pump Down and Isolate

Standard Operating Procedure for plant rooms should be to never work on a live system. It is considered best practice to pump down and isolate whenever possible before conducting work.

Logbook Review

A reminder of the importance to continually review plant logbooks to identify changes in operational temperatures and pressures. These changes can help identify potential issues, allowing for proactive action to occur to reduce an emergency.

Life Safety Is #1

In Ontario, all ammonia refrigeration plants must have an ammonia alarm system that activates at 25ppm. This should be considered as an early warning signal with operator action being required. It would be reasonable to not expect facility evacuation between 25-200ppm however, this must be a site-specific decision, based factor, such as, but not limited to, the age of the plant, level of maintenance, lifecycle of equipment and proximity of users to the leak. Above 200ppm additional consideration for evacuation is required with levels of 300ppm+ being considered as a recommended mandatory evacuation. Staff who are on site representing the owner must be given clear direction as to what is expected of them should there be an ammonia leak that causes an alarm. These early actions are essential for life safety. These skills are not natural, making the need for specific training a requirement to be met.

Public Awareness

Facility management must discuss how users are to be advised of the potential risks associated with a significant ammonia release. Often, management does not want to openly discuss the matter out of concern that it may create unwanted operational issues. However, having users aware of the risks and the need to follow staff's direction during an ammonia incident is essential emergency management. The ice arena will have various alarms or signals that staff must understand.

- Alarm signal means an audible signal transmitted throughout a zone or zones or throughout a building to advise occupants that an emergency exists.
- Alert signal means an audible signal to advise designated persons of an emergency.

Each signal requires a different level of action to be taken.

Shelter-In-Place (SIP) is a directive by the person(s) in control of an ammonia release to have persons stay within the facility rather than potentially evacuate to the outside into a more dangerous environment. This action requires the person in charge to know the potential risks, hazards and variables associated with a significant ammonia leak. Under some conditions it would be better to have users stay in a dressing room with the showers going and a wet cloth or paper towels over their faces until told it is safe to evacuate. However, an understanding on how the facilities HVAC system is connected is vital information to give such direction.

How this information is provided must form part of the emergency planning discussions. Fear of ammonia can generate panic which can be more of a life safety hazard than the chemical. Posting general awareness information on the facility's bulletin board or adding information to user agreements are important emergency planning tools to be considered.

Regular User Groups

Informing user groups should form part of the facility's emergency planning strategy. Coaching staff should be well informed of the facilities emergency plans and what role they can play should such an event occur.

Plant Emergency Shut-off

Refrigeration plants are required to have an emergency plant shutdown control button located outside the plant room. These important safety devices will assist facility staff in controlling the plant's operation during a leak however, not all conditions should have the button pushed. For example, a leak on the low side of the plant's refrigeration cycle that has the plant deactivated may cause additional safety conditions that will need to be addressed. Knowing what the device shuts off

must be assessed. For example, will it deactivate the rooms ventilation system which may be needed as part of the control plan?

Plant Internal Technologies Plans

Today's technology allows plant managers to digitally capture data from all valves and related safety devices. Having the different shut down steps in a visual form for properly prepared emergency responders to use once inside the plant room would greatly assist. Having a video tour of the room would also be a positive addition to the emergency plan toolbox.

Plant External Media Plans

Staff require direction on how the media will be handled should there be any interest expressed surrounding an ammonia release. This plan should also provide direction on social media posts by staff.

Weather Conditions

Plant operators must be able to evaluate current weather conditions to formulate an emergency evacuation plan. Ammonia reacts to wind and temperature. Knowing wind direction is essential however, what the wind is doing near the top of the building and at ground level are two different impact potentials. Hot, dry, windy days are the best possible conditions to address an ammonia leak. However, ice rinks are often in full operation in cold, humid and low wind seasons. These conditions will take much longer to have ammonia gas dissipate. The traditional windsock or facility flag wind direction marker may need to be supported by ground wind detection devices.

These devices should form part of the facility's emergency preparedness toolbox.

Environmental Impacts

Ammonia released to air in the right conditions will quickly dissipate reducing potential damage to soils, shrubs and trees. However, ammonia that is released into streams or rivers only requires a small amount to kill microbes and fish. This damage will be the financial responsibility of the plant owner to correct.

Calculating Potential Impact Zones

The potential for a significant ammonia release from an ice arena is low but must be planned for. Facility management must include a worst-case scenario for an ammonia plume impact zone.

An ammonia plume may be several hundred feet downwind in small spills or hundreds of yards downwind in larger spills. Standard protective action zones for ammonia plume release during the day is 550ft. or .5 miles while at night a 1.3-mile distance is recommended. Capturing a Google Earth overview of the facility and infrastructure inside the potential impact zone should form part of the facilities emergency plan.

Building Evacuation Zone Identification

Some building owners no longer use a compass to identify the different entrances and egress of the facility. Replacing North-East-West-South with:

A – Address side of the building (Main Entrance)

B – Left side of the building

C – Back of building

D – Right Side of building

Designing emergency plans with these identification markers will help confirm that evacuation information is relayed correctly.

Facility Communication Systems

Having a great plan but not being able to communicate it is not a "great plan". Being able to communicate during an evacuation is essential to life-safety. If users are straining their hearing for general announcements, the system is most likely inadequate during emergency conditions. Investing in a quality facility sound system that provides for information to all rooms in the building is required emergency preparedness. Having systems that allow staff to communicate during an electrical failure must be available.

Fire Department's Role

Facility management should contact the responding fire hall or the one considered the closest to the facility to discuss emergency planning options. First responders should be made aware of the statistical data associated with the building. Having emergency information immediately available will assist in the response. Fire departments are also positive resources to assist in final approval of the plan. It is important to be reminded that a fire department's primary role is to deal directly with the emergency; their secondary role is to assist with evacuation. It is the staff's responsibility to take control of the evacuation of the building. It is important that a chain of command be developed that handles the discovery of a leak to final recovery. This plan will be based on the amount of refrigerant and related risks and hazards associated with the facility.

Refrigeration Contractor Role

The plan should identify the projected response time for the contractor, if required, to assist should an emergency occur. Part of the contracted relationship with the refrigeration contractor is to identify how they plan to ensure a plan is in place for work that may be considered high risk. It may be best to have no members in the building during such work. A reminder that it is the plant owner's responsibility to ensure all contractors work safely and prepare emergency plans for all high-risk work. These details should be in writing and approved by the plant's responsible person.

Resource #13

ORFA Recreation Facility Contractor Guideline

Resource #14

The ORFA Ammonia Charge Release to Atmosphere Guideline provides additional information on this topic.

Event Reporting Responsibilities

Once the event has concluded, facility management will have a variety of reports to be completed. Who will need to be advised will be determined by the outcomes of the release. If a person is injured or killed, this will elevate the reporting responsibility.

- Local police
- Ministry of Labour
- WSIB
- Technical Standards and Safety Authority
- Ministry of Environment

Lessons learned must then be transferred into the original emergency plan documents.

Resource #15
ORFA Reporting Health and safety Incidents in a Recreation Environment Guideline

Facility Emergency Action Planning

An ammonia refrigeration plant emergency plan cannot be one dimensional. It must be layered from minor leak to major release that immediately requires life safety. It is important to develop stages of response so that workers, users, the public and EMS always remain safe. Attached to this document is an information and process auditing form to assist in developing a facilities ammonia emergency plan.

Resource #16
ORFA Recreation Facility Emergency Planning Resource

AMMONIA SAFETY & TRAINING INSTITUTE™
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ASTI Training

The Ammonia Safety and Training Institute (ASTI) mantra is ***" Prevent them all or stop them small"!*** This document has focused on prevention and discussed the requirement and benefit of having an emergency plan that is written, practiced and regularly refreshed. ASTI offers comprehensive training, site specific evaluations of risk and will assist in developing a plan that woks. Developing emergency plans is a huge undertaking that can be accomplished by staff how possess appropriate professional development and have the time to invest in such a project. ORFA members responsible for large ammonia charges or multi-site facilities are encouraged to consider ASTI to assist in meeting their objectives. Refer to: https://ammonia-safety.com/

ORFA ICE ARENA EMERGENCY MANAGEMENT AUDITING FORM

The following form is designed as a checklist of items to be considered when creating or updating an ammonia plant emergency plan. It should not be considered complete. The audit should be completed by the plant's "responsible person." (See Resource #8 in guideline)

#	ITEM	NOTES	✓
1	Review Fernie, BC arena accident report.	Link found in Introduction section of guideline.	
2	Develop an asset management plan for the refrigeration equipment to determine risk of failure of ammonia system.	Refer to Resources #1 – ORFA Safety Activities For Effective Refrigeration document Refer to Resources #2 – ORFA RFAM.	
3	Safety Data Sheet for ammonia is current and up to date and is copied into the plant's operational manual.		
4	Operators hold current First Aid training and are aware of First Aid measures on SDS.		
5	Operators are aware of risks and hazards of ammonia.	Refer to Quick Risks and Hazards Facts in guideline and resource #3 - ORFA Anhydrous Ammonia Exposure Worker Safety resource.	
6	Confirm an understanding of basic refrigeration governance responsibilities.	Review and complete Resource #4 - ORFA Basic Arena Refrigeration Governance and Quiz.	
7	Develop a facility sensing device maintenance program.	Review Resource #5 – ORFA The Importance and Benefit of Planned Facility Sensing Maintenance and Equipment Calibration Guideline.	
8	If applicable, develop a secondary refrigerant testing program.	Review Resource #6 - ORFA The Importance of Monitoring Secondary Refrigerant	
9	Confirm that all plant piping, valves and equipment are properly marked.	Review Resource #7 – TSSA Plant Safety Series #11.	
10	Develop a planned valve exercising program to ensure that these devices will work when required.		
11	Develop a plant electrical and equipment scanning program.		
12	Confirm that all operators understand the cycle of refrigeration and can identify all safety devices.	Set expected level of competency for all new staff prior to being permitted access to the plant.	
13	Confirm that all required Personal Protective Equipment as outline in the ammonia SDS are available.		
14	Review what type of work clothes materials are acceptable to wear in the plant room.		

#	ITEM	NOTES	✓
15	Review if operators should wear real time ammonia vapour detection devices when in the plant room.		
16	Review breathing protection requirements for both plant operators and refrigeration contractors.	Review Resource #9 – ORFA Understanding Recreation Worker Respirator Protection Guideline and Resource #10 – ORFA SCBA in a Refrigeration Plant Room Guideline.	
17	Review body protection suit levels (A, B, C) and consider need for facility staff to have this type of PPE on site.		
18	Review and confirm that the plant room ventilation system meets current standards – include inspection of the system in annual maintenance program.	Refer to CSA B52 Mechanical Refrigeration Code.	
19	Consider if having portable fans on site to assist with removing ammonia from an exposed worker is required.		
20	Confirm that the plant room's deluge shower and eyewash station meet current standards and train operators on how to use them.	Review Resource #11 – ORFA Facility Eyewash and Deluge Shower Installation and Maintenance Guideline.	
21	Provide Confined Space awareness training to all operators.	Review Resource #12 – ORFA Confined Space FAQ.	
22	Develop a plant room hot work permit policy and procedure.		
23	Develop a staged response plan for operators to follow, should an alarm signal be detected.	Sample ▪ 25 – 299ppm – do not enter room – start plant ventilation system – contact plant responsible person – continue to monitor – determine wind direction. ▪ 300ppm+ - do not enter room – start plant ventilation system – contact plant responsible person – consider if holding people in place or evacuation is best approach.	
24	Consider the benefits of public ammonia safety awareness.	▪ Facility posting. ▪ Include in user contracts. ▪ Define roles of user groups during facility emergencies.	
25	Confirm what equipment and devices are shut off when the plant's emergency shut off is activated.	Is the ventilation system affected?	
26	Create a pictorial overview and/or video to assist responders as to how best to isolate the plant in an emergency situation.		
27	Include a media policy and procedure in the emergency plan.	Confirm who will speak with traditional media's as well as social media posts.	

#	ITEM	NOTES	✓
28	Calculate potential impact zone of a significant ammonia release and design a public awareness approach to the event.		
29	Create a facility evacuation zone plan.	Consider using the recommended A-B-C-D identification system.	
30	Confirm that the facility PA system is adequate and located in all areas to advise users of an issue – a back-up plan for electrical failure must also be in place.		
31	Review emergency plan with the local Fire Department.		
32	Confirm refrigeration contractor response time and include in plan.	Reminder that this needs to be reviewed each time the contractor changes.	
33	Confirm how the refrigeration contractor will prepare for an emergency when performing work on the plant.	Review Resource #13 – ORFA Recreation Facility Contractor Guideline.	
34	Develop a planned release to atmosphere policy and procedure.	Review Resource #14 – ORFA Ammonia Charge Release to Atmosphere Guideline.	
35	Develop a contact list of all governing agencies that must be contacted, should a leak occur.	Review Resource #15 - ORFA Reporting Health and Safety Incidents in a Recreation Environment Guideline.	
36	Using the information reviewed and collected in #1 – 35 of the audit, develop an up to date plant emergency plan.	Review Resource #16 – ORFA Recreation Facility Emergency Planning Resource.	
37	Consider the benefits of additional training from the Ammonia Safety and Training Institute (ASTI).		