

Ammonia

Employer Information for Ice Rinks and Recreational Facilities



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Introduction

This document provides some basic information for B.C. employers using ammonia in ice rinks and similar recreational facilities. This document should be used in addition to the more extensive WorkSafeBC resource [Ammonia in Refrigeration Systems](#).

The document provides guidance on:

- Keeping track of the ammonia you have on site
- How to conduct a risk assessment to identify the level and types of ammonia risk that exist at your facility
- Typical controls you can use to reduce risks
- Developing and implementing an exposure control plan and an emergency plan
- Monitoring and alarm systems that can help notify workers if ammonia levels are hazardous
- Reviewing the critical components of equipment and machinery handling ammonia
- Working with external responders before and during emergency situations

Relevant sections of the Occupational Health and Safety Regulation are also referenced, and sources of additional information are provided.

If you, as the employer, do not have sufficient information or expertise to answer the questions in this document or to ensure that you are complying with the requirements of the Regulation, consider obtaining the advice and assistance of qualified personnel or contractors.

If you have any questions or require any assistance, contact your local WorkSafeBC office (worksafebc.com/contact).

Contact WorkSafeBC to report a worksite fatality, a serious injury or incident, a major chemical release, or unsafe working condition in B.C.:

1.888.621.7233 (1.888.621.SAFE)

To report a chemical spill that may be an environmental emergency, call the B.C. Environmental Emergency Reporting line:

1.800.663.3456

What is ammonia and what are the health risks?

Ammonia is a clear, colourless liquid or gas. When ammonia is used in a sealed pressure system it is not harmful to people or the environment. However, when it escapes from the pressure system it is a toxic process gas that can lead to an unsafe environment for workers.

Even in low concentrations, ammonia can be irritating to the eyes, skin, and lungs, and can cause headaches, loss of the sense of smell, nausea, and vomiting. Very high concentrations can be immediately fatal, and can also be explosive.

Ammonia can easily be smelled in air as it has a low odour threshold (2–55 ppm) unless you have been repeatedly exposed over time to low levels and your ability to smell ammonia has been compromised. This means that most people will seek relief when ammonia is detected at low concentrations. In larger quantities, ammonia vaporizes into a toxic gas that, at high concentrations, can be flammable and/or result in chemical-type burns to skin, eyes, and lungs. These burns can cause severe damage including blindness.

Ammonia gas is lighter than air and will rise, so generally it dissipates and does not settle in low-lying areas. However, in the presence of moisture (such as high relative humidity), the liquefied ammonia gas forms vapours that are heavier than air. Depending on the terrain, weather, and nature of the release, ammonia can present a risk to people a considerable distance away from a facility where a leak occurs.

Regulatory requirements

Part 6 of the Occupational Health and Safety (OHS) Regulation, sections 6.116 to 6.132 outline the requirements specific to toxic process gases including ammonia. Part 5 of the OHS Regulation outlines general requirements for all chemical and biological agents.

The following sections in particular relate to ammonia risks:

- Section 6.118 on risk assessment
- Section 6.119 on exposure control plan
- Sections 6.127 on appropriate personal protective equipment, including the requirement to provide emergency escape respirators and for workers to wear the appropriate type of respirators when performing hazardous work
- Sections 5.48 to 5.59 on controlling exposure, including the requirements for an exposure control plan under section 5.54

- Sections 5.85 to 5.96 on emergency washing facilities that must be provided within a work area where a worker's eyes or skin may be exposed to harmful or corrosive materials such as ammonia
- Sections 5.97 to 5.102 on emergency procedures, which are required at any workplace where hazardous substances, including toxic process gases, are present in quantities that may endanger workers in an emergency

More detailed regulatory references are listed later in this document.

How to conduct a risk assessment

Section 6.118 of the Regulation requires employers to ensure that a risk assessment is conducted at every operation where a toxic process gas such as ammonia is used. Section 5.99 of the Regulation requires employers to ensure that a risk assessment is conducted at every operation where there are risks posed by the accidental release, fire, or other such emergency of a hazardous substance such as ammonia.

You can conduct a single risk assessment to comply with both sections.

The questions in the following tables are provided to help you understand what should be included when conducting a risk assessment at your workplace. However, remember that every workplace is different so there may be other hazards at your workplace that are not addressed by these questions.

Consider this list a starting point for your risk assessment. [OHS Guideline G5.99](#) is also a useful tool in developing your risk assessment.

Outlining hazardous materials information

Start by tracking the ammonia you have on site, recognizing that the amounts may change from time to time based on usage. Ensure that you can answer all the following questions.

Considerations	Notes
How much ammonia is on site?	
Where is the safety data sheet (SDS) for the ammonia located?	

Considerations	Notes
Where is the ammonia located? (Include every location, including within pipes and in storage locations.)	
Is the ammonia safely stored in an appropriate storage location? (Answer for each location.)	

Ensure that your risk assessment includes the following:

Considerations	Notes
<p>What circumstances, events, failures, or errors could cause conditions leading to an emergency?</p> <p>(Examples may include issues when draining oil from the system or charging the system, servicing or maintenance by operators or contractors. emergency rescue situations. or any other situations that would lead to alarms sounding.)</p>	
For each situation identified above, what could happen to workers and how bad could the exposure be?	
What is the worst-case emergency that could occur?	
What are the most likely emergency scenarios that could occur?	

Considerations	Notes
Where could an accidental release leading to worker exposure occur?	
If there was an ammonia-based fire, what nearby substances would make the fire worse (including combustible products)?	
For each emergency situation identified, how many workers could be exposed and how could they be exposed?	
Is there risk to adjacent workplaces? What is this risk?	
Do you have the required emergency washing facilities in place?	
Has personal protective equipment been identified? Is this personal protective equipment available to workers?	
What monitoring and alarm systems are present to notify workers of an emergency? Are there gaps in the monitoring and alarm system?	

Implementing controls based on your risk assessment

After conducting your risk assessment, you will have a better idea of the controls that should be implemented in order to improve the safety at your site. These control measures can be both engineering controls (mechanical and/or automated) and administrative controls (such as safe work practices, training, and developing and implementing both an exposure control plan and an emergency plan).

If you have identified ways that workers could be exposed to ammonia, ensure you have controls in place to address the related risks and hazards. If you have identified gaps in your systems, ensure you address and correct these gaps.

Typical controls

The following are some of the standard types of controls that are typically implemented in facilities with ammonia on site:

- Detailed exposure control plan
- Detailed emergency plan, including procedures for safe evacuation and rescue of workers
- Monitoring and alarm systems — to both track the level of ammonia in all applicable locations on site and to alert all workers if there is a leak or related event — including:
 - Pressure relief device monitors
 - Continuous/fixed monitors
 - Personal monitors
- Ventilation systems
- Servicing and maintenance system (including schedule, procedures, qualified and trained personnel, and redundancy)
- Restrictions on access to only authorized personnel, including signage, procedures, and training
- Emergency shutdown system (equipment) and procedures
- Personal protective equipment (PPE), which typically includes:
 - Eye protection
 - Skin protection
 - Respiratory protection
- First aid and washing stations specifically designed for response to ammonia exposure

Exposure control plan (ECP)

Section 6.119 of the Regulation requires employers to develop and implement a plan to control exposure to any toxic process gases, including ammonia, within the workplace, if they pose a risk of adverse health effect to workers. This exposure control plan must meet the requirements of section 5.54 of the Regulation.

Ensure you address the following in your exposure control plan:

- A brief description of what the ECP is designed to do (e.g., protect workers from exposure to ammonia and any other named toxic process gases that may be on site)
- A list of assigned responsibilities with respect to the ECP — who is supposed to do what? (This may include specific employer representatives, workers, external responders, etc.)
- Risk identification — what hazardous substances are present, in what quantities, where are they located, etc.?
- Risk assessment — how might workers be exposed? Identify the positions and work activities, and the specific ways that workers might be exposed, the expected extent of the exposure, and the likelihood that this exposure would happen.
- Risk control — what measures are available and used to reduce or eliminate the risk?
- Education and training:
 - Which workers have been trained?
 - What does the training include?
 - How often are workers tested or retrained?
- Written work procedures, when required
- Hygiene facilities and decontamination procedures, when required — such as washing stations
- Health monitoring, when required
- Documentation, when required — including training records.

Certain items need to be covered in both an exposure control plan and an emergency control plan. However you do not need to repeat these items. Instead you can develop these items once and simply cross-reference them, or copy and paste them into the separate documents.

Emergency plan

Section 5.97 of the Regulation requires employers to develop and implement a plan to deal with emergency situations. This emergency plan must address the requirements of sections 5.98 to 5.102 of the Regulation.

Ensure you include the following in your emergency plan:

- Inventory of all hazardous substances
- Risk assessment of the risks posed by hazardous substances from accidental release, fire, or other such emergency
- Procedures for evacuation
- Procedures to notify the public
- Procedures to control the release
- Cleanup and re-entry procedures
- Emergency procedure training and drills

Monitoring and alarm systems

The following basic information and recommendations on ammonia monitors and alarms can help you when designing and maintaining your system:

- Continuous, also called fixed, monitors are useful because they are placed in the locations where releases are most likely to happen and can provide ongoing monitoring at those locations. However it is important to also use portable monitors, which rapidly provide accurate information about the concentration where the worker is located. Portable monitors are extremely helpful for certain work activities and when responding to an emergency.
- Continuous/fixed gas monitors are **required** in ammonia machine room enclosures. They must be designed so that workers can obtain the conditions inside the room **before** entering.
- As part of your risk assessment, identify other locations (beyond the machine room) where additional fixed monitors should be placed due to the potential for ammonia to be released.
- Upper set points for monitors should be set at a margin of safety, which is recommend to be well below the 300 ppm IDLH (immediately dangerous to life or health) concentration limit for ammonia. During a release of ammonia, concentrations can vary over time and by location.
- Pressure relief devices must be equipped with detectors and alarms to notify the operators when the pressure relief valve releases ammonia.

The questions in the following table outline considerations for a monitoring and alarm system. Make sure you can answer these questions about your monitors and alarms, and that you have implemented the appropriate controls based on your risk assessment.

Considerations	Notes
Monitor maintenance and alarms	
Is there an emergency alarm system that can be heard and seen throughout the site? If not, what procedures are in place to ensure all workers on site know about an emergency?	
How do you ensure that your alarms are monitored at any time a worker may be exposed in the event of an ammonia release?	
How frequently do you test the monitoring and alarm system? How frequently do you calibrate the monitor?	
What are your procedures for testing the monitoring and alarm system? What are your procedures for calibrating the monitor?	
Who is testing and calibrating your monitors (pressure relief, continuous/fixed, personal)? How do you ensure that these people are qualified?	
Pressure relief device monitors	
Is there monitoring of the pressure relief system in case a pressure relief valve releases ammonia (or generally fails)?	
How are workers operating and monitoring the system notified in the event that a pressure relief valve releases or fails? Do the pressure relief devices have detectors and alarms to notify the workers if it releases ammonia (or generally fails)?	

Considerations	Notes
Continuous/fixed monitors	
Are there monitors located inside the machine room(s) enclosure?	
Does your risk assessment suggest that continuous/fixed monitors should be installed in locations other than the machine room(s) enclosure? If so, have these been installed?	
Can authorized workers determine the conditions inside the machine room enclosure from the monitors before entering the room?	
What are the alarm set points on the continuous/fixed monitors, and why were they chosen?	
If these set points are reached, does the system automatically activate the alarms and shutdown devices?	
Personal monitors	
Does your risk assessment suggest that personal/handheld monitors should be available on site for use in emergency and non-emergency situations?	
If your risk assessment suggests personal/handheld monitors should be available, are they available and located where workers can access them safely in the event of an ammonia release?	

Considerations	Notes
What are the alarm set points on the personal/handheld monitors, and why were they chosen?	

General equipment considerations

Considerations	✓
Are all critical components of equipment and machinery that handle ammonia clearly identified?	
Can the function of every control device be readily determined?	
Are equipment and machinery (such as tanks and compressors) that store or process ammonia located in a separate enclosure designed to prevent releases from entering occupied areas?	
Do these enclosures have access restricted to authorized personnel including signs posted about the hazards and entry precautions?	
Are these enclosures equipped with ventilation that: <ul style="list-style-type: none"> • Draws air in at all times? 	
<ul style="list-style-type: none"> • Exhausts to a safe location? 	
<ul style="list-style-type: none"> • Is monitored to alert operators if critical parts of the ventilation system fail (including the fan, motor, and air flow)? 	
<ul style="list-style-type: none"> • Is vapour-proof, dedicated, and resistant to corrosion? 	
<ul style="list-style-type: none"> • Has fans located outside of the building, where practicable, to keep duct work under negative pressure? 	
Are these enclosures equipped with emergency ventilation that can be safely activated in emergency situations to ensure containment and control of an accidental gas release?	
Is the piping system: <ul style="list-style-type: none"> • Constructed of materials designed to be resistant to corrosion of the gas it carries? 	
<ul style="list-style-type: none"> • Constructed to withstand the pressures to which it is subjected? (e.g., safely routed, supported and protected from impact damage, shock and vibration) 	
<ul style="list-style-type: none"> • Equipped with isolation, pressure venting, or bleed valves designed to purge the lines safely of residual gases before maintenance or servicing procedures? 	
Does servicing and maintenance of equipment and machinery address all critical components?	

Servicing and maintenance

If you contract out the servicing and maintenance done on your site, some of the following questions may require input from your contractors.

Considerations	Notes
What is the schedule for servicing and maintenance activities conducted by both in-house personnel and contractors? Is this determined by manufacturer specifications or CSA standards?	
What are the procedures for servicing and maintenance (by in-house personnel and/or contractors)? Describe the servicing and maintenance of equipment of the critical components.	
Which duties and activities are done by in-house personnel and which are done by contractors? Is this clearly delineated with specific limitations?	
How do you ensure the person(s) conducting ammonia system maintenance is/are qualified?	
During servicing and maintenance, are piping systems isolated upstream to the work area?	

Servicing and maintenance introduces opportunities for ammonia leaks to occur.

Any personnel conducting servicing and maintenance activities relating to any equipment containing or involving ammonia must be qualified. See the requirements from [Technical Safety BC](#).

These qualified personnel must use appropriate written safe work procedures and appropriate personal protective equipment including respirators.

Respirators and other personal protective equipment

All workers conducting servicing and maintenance in the ammonia room where there is the risk of an ammonia leak must wear an appropriate full-face respirator (also known as full faceplate or full facepiece). Some employers may contract out all servicing and maintenance to contractors who have their own full-face respirators. Anyone entering the ammonia room or enclosure must have an escape respirator or a bite block.

Considerations	Notes
Do you have escape respirators, stored outside the ammonia room and available to be put on by any worker before entering the ammonia room?	
Do you have full-face respirators for on-site personnel conducting servicing and maintenance on the system? (e.g., draining oil)	
Are all workers who conduct activities requiring the use of a full-face respirator clean shaven and have they been fit-tested?	
Has other personal protective equipment been identified? Is this personal protective equipment easily accessible and available to workers? Where is it located?	

Reserve supply emergency shutdown

Section 6.126 of the Regulation outlines the requirements for emergency shutdown devices. If your system has a reserve supply, you must ensure that these devices can isolate the reserve supply within the system (i.e., within the receivers) and stop the flow of the gas. This can be done either through an automated system or manually from a safe, remote location.

Considerations	Details
How is the reserve supply shut down in normal (non-emergency) situations?	
How would the reserve supply be shut down in an emergency situation? (i.e., automated shut down or manually from a safe, remote location?) Ensure you have a detailed shutdown plan.	
When the automated or remote shutdown device is activated, how are operators alerted?	

Developing your emergency plan

Employers must ensure that they develop, maintain, and implement written emergency procedures that address all emergency response requirements, including evacuation, roll call, and notification of authorities. Calling 911 is not sufficient as an emergency plan. See sections 5.97 to 5.102 and 6.120 of the Regulation for more detail.

Considerations	Notes
Do you have a detailed plan for emergency situations, such as an ammonia leak or fire?	
Are shutdown procedures in the event of an emergency included in that emergency plan?	
Is the emergency plan reviewed annually in conjunction with the joint committee or a worker representative?	
Who has been trained on emergency procedures? Who is the backup?	
Are roles and responsibilities assigned for developing and implementing the site emergency plan?	
Do you hold emergency drills for significant ammonia release on a regular basis? This would include both evacuation and, as applicable, response by workers or external responders to manage or stop the release.	

Emergency procedures

Emergency procedures are critical for responding to a variety of emergency situations. Well-developed procedures and drills on those procedures will help ensure appropriate responses to emergency situations.

Ensure your written emergency procedures include the following components:

	✓
Identify the circumstances or events that would trigger an evacuation	
Identify the worst case scenario (e.g., maximum concentration) that you could respond to in-house	
Explain, step by step, how a shutdown, isolation of part of the system, use of the fire dump, and other anticipated measures to respond to the incident could safely take place in an emergency (visual supports may help)	
Identify all equipment necessary for responding and where it is located	
Identify the location of critical valves and equipment that may need to be operated in the event of an emergency	
Explain, step by step, for evacuation: <ul style="list-style-type: none"> • Unambiguous conditions that trigger evacuation 	
<ul style="list-style-type: none"> • How workers, including first aid attendants, will be notified of an emergency and the need to evacuate 	
<ul style="list-style-type: none"> • Identify where workers will muster (including use of alternate muster points in case the primary muster point is unsafe) 	
<ul style="list-style-type: none"> • Identify the process for checking and confirming that workers have been safely evacuated 	
Explain, step by step, your response to control a release, perform cleanup and/or neutralize a spill, and to carry out testing prior to re-entry, including: <ul style="list-style-type: none"> • How workers will be adequately protected to perform this work (including personal protective equipment and monitoring equipment) 	
<ul style="list-style-type: none"> • What equipment is available to perform this work, where this equipment is located, and how workers can access it 	
<ul style="list-style-type: none"> • How a release will be brought under control 	
<ul style="list-style-type: none"> • How search and rescue will take place 	

	✓
<ul style="list-style-type: none"> How spills will be cleaned up 	
<ul style="list-style-type: none"> How testing will be carried out prior to re-entry, and the criteria necessary to allow re-occupancy 	
Explain when the fire department, other emergency responders, and other required agencies will be notified of an emergency	
Include contact information for those agencies	
Explain when and how adjacent workplaces and residences will be notified	
Explain when and how other authorities will be notified of an emergency	
Identify what training is to be provided in preparation for an emergency	
Identify how often training will be conducted in preparation for an emergency	
Identify how often emergency drills for significant ammonia release will occur	
Address having drills for evacuation and responding to investigate and intervene to stop an emergency condition	

Working with external responders in emergency situations

The following questions are for employers that rely on external responders (private or municipal) to provide emergency response. Not all fire and rescue departments are able to respond to ammonia leaks — while they generally secure the people at risk they may not shut down the leak. It is important to know in advance what your designated first responders may or may not be able to do, and ensure you have done all you can to prepare for an emergency. Consider discussing potential emergency response with your designated first responders.

Considerations	Notes
What will your workplace handle in-house without calling in an external responder?	
What are the emergency conditions that would trigger you to call in an external responder?	

Considerations	Notes
What external responder(s) are you relying on? (e.g., fire department, contracted company)	
Have you confirmed that this external responder is willing to respond?	
Have you confirmed that this external responder is capable of responding (including having procedures, training, and appropriate personal protective equipment)?	
Have you confirmed that this external party will be available to respond? Are there any limitations on their ability to respond?	
How long will it take for the external responder to arrive? (What will your workplace do in the meantime?)	
If an external party is responding, what is the role of your workplace in relation to the external responder?	
What is the most appropriate way to contact the external responder in an emergency? (at all hours)	
Does the external party know everything necessary to provide an appropriate response? For example, has the external responder reviewed the storage and process sites at your location? Do they have a copy of the emergency response plan?	

Considerations	Notes
Is first responder and other external party access available and clearly identified?	
What is your alternative if the external responder is not available or capable of responding?	

Relevant regulations

The following sections of the Occupational Health and Safety (OHS) Regulation have been identified as the most relevant relating to facilities with ammonia on site. For more details about the requirements and additional information, consult the [OHS Regulation](#) or contact WorkSafeBC.

Requirement	Regulation
Workplace Hazardous Materials Information System (WHMIS)	5.3 to 5.18
Exposure control plan	5.54
Emergency washing facilities	5.85 to 5.96
Emergency plan — requiring an annual review	5.97
Inventory identifying all hazardous substances	5.98
Conduct a risk assessment of the risks posed by hazardous substances from accidental release, fire, or other such emergency	5.99
Written procedures to evacuate and, as appropriate, notify adjacent workplaces and residences that might be affected	5.100
Spill cleanup and re-entry procedures	5.101
Emergency procedure training	5.102(a)
Emergency procedure drills	5.102(b)
Conduct a risk assessment for toxic process gases (can be done in conjunction with 5.99)	6.118
Exposure control plan must meet the requirements of section 5.54	6.119
Written work procedures regarding safe handling of toxic process gases	6.120(1)
Emergency procedures for safe evacuation and rescue of workers — established and tested on a regular basis	6.120(2)
Emergency procedures for safe evacuation — tested regularly	6.120(2)
Written work and emergency procedures are readily available	6.120(3)
Training — workers are capable of safely operating equipment and machinery	6.121
Where practicable, separate enclosure for toxic process gas handling	6.122
Safe testing for enclosure(s) before entry by authorized workers	6.123
Toxic process gases vented outdoors safely	6.124(a)
Emergency ventilation for containment and control	6.125
Shutdown device for emergency or accidental release	6.126
Appropriate personal protective equipment (PPE) available and used by workers	6.127
Continuous/fixed monitors connected to alarms at designated sites	6.128(1),(2)
Continuous/fixed monitors tested monthly and calibrated annually	6.128(3)

Requirement	Regulation
Pressure relief valves or similar devices that safely direct gas outdoors	6.129(1)
Pressure relief alarm or other reporting system engaged	6.129(2)
Ensure controls involving toxic process gas are all clearly identified with the control function described	6.130
Piping system appropriately constructed, tested, and equipped with systems to safely purge lines	6.131
Ensure appropriate servicing and maintenance	6.132

Additional Regulations that may be relevant at a refrigeration site:

Requirement	Regulation
Documentation (training of workers)	3.25
Safe machinery and equipment	4.3
Personal protective clothing and equipment	Part 8
Confined spaces	Part 9
De-energization and lockout (particularly isolation)	Part 10 particularly 10.2 to 10.5
Fall protection	Part 11
Tools, machinery, and equipment — including safeguarding requirements (e.g., Is there effective guarding of V-belts on compressor, both sides?) and safeguarding hazards of power transmission parts	Part 12 particularly 12.2, 2.13, and 2.14

Applicable agencies and jurisdictions

Depending on the nature of work done at your workplace, multiple agencies may have regulatory oversight over your equipment, operations, dealings with workers, etc. The following provides a basic outline of the agencies and jurisdictions that typically apply in B.C.:

- Technical Safety BC regulates equipment.
- The Canadian Ministry of Environment and Climate Change regulates manufacture and use of toxic substances, as well as the import and export of hazardous wastes and materials. They require notification if sufficient amounts of toxic process gases are on site.
- The B.C. Ministry of Environment regulates spills of toxic process gases.
- Transport Canada regulates vehicles such as cargo vessels, rail cars, and commercial trucks.
- Local health authorities regulate protection of the public.
- Local municipalities (e.g., local fire and rescue operations) regulate the BC Fire Code.
- WorkSafeBC regulates the health and safety of workers.

Note that this is general information and is not to be considered definitive regarding any specific operation.

Use the table below as a starting point to document the parties you need to contact if an emergency occurs.

Party	Contact info	Who will call	Backup caller
General emergency	911		
Designated first responder			
Technical Safety BC	1.866.566.7233 (select option 1)		
WorkSafeBC	1.888.621.7233 (1.888.621.SAFE)		
BC Ministry of Environment	1.800.663.3456		
Local health authority			
Adjacent workplaces and residences			

Sources of additional information

WorkSafeBC sources

- Web page — Ammonia
worksafebc.com/en/health-safety/hazards-exposures/ammonia
- Risk advisory — Ammonia exposure during storage or use
worksafebc.com/en/resources/health-safety/risk-advisory/ammonia-exposure-during-storage-or-use
- Book — Ammonia in Refrigeration Systems
worksafebc.com/en/resources/health-safety/books-guides/ammonia-in-refrigeration-systems
- Occupational Health and Safety Regulation
worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation
- OHS Guideline G5.99 — Risk Assessment
worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-05#SectionNumber:G5.99

Other Canadian sources

- Canadian Centre for Occupational Health — OSH Answers Fact Sheets — Ammonia
cchoh.ca/oshanswers/chemicals/chem_profiles/ammonia.html
- Agri-Facts (Alberta) — Ammonia Emissions and Safety
[www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex8271/\\$file/086-6.pdf](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8271/$file/086-6.pdf)

U.S. sources

- Ammonia Safety Posters for download — Global Cold Chain Alliance
gcca.org/resources/industry-topics/employee-safety/gcca-osh-alliance-employee-safety-resources/
- US Centers for Disease Control — National Institute for Occupational Safety and Health (NIOSH) — Anhydrous Ammonia Resources
cdc.gov/niosh/topics/ammonia/default.html
- US Centers for Disease Control — Emergency Preparedness and Response
emergency.cdc.gov/agent/ammonia/
- US Department of Labor Occupational Safety & Health Administration (OSHA) — Ammonia Refrigeration
osha.gov/SLTC/ammoniarefrigeration/
- OSHA — Ammonia Safety References
osha.gov/safeandsoundweek/docs/Ammonia_Safety_and_Training_Institute_June_2017.pdf
- OSHA — Storage of Ammonia in Vessels
osha.gov/SLTC/etools/ammonia_refrigeration/receiving/storage.html