Ammonia Safety References

Identifying and correcting hazards before someone gets hurt ensures workers go home to their families safe and sound after every shift. The information below can be used as a starting point for finding and fixing hazards in your company.

Top OSHA Citations
Ammonia Storage & Refrigeration

- ☐ Process safety management (PSM)
- ☐ Powered industrial trucks
- ☐ Hazardous waste operations and emergency response (HAZWOPER)
- ☐ Hazard communication (HAZCOM)
- ☐ Maintenance, design, construction, safeguards, and operational features for exit routes
- ☐ Respiratory protection
- ☐ Lockout/tagout
- ☐ Wiring methods, components, and equipment for general use (electrical)
- ☐ Personal protective equipment (PPE)

Source: OSHA Information System (OIS), 2011-2017, NAICS 493120 & 32531.

Top Injury Sources
Ammonia Refrigeration

- ☐ Overexertion and bodily reaction
- ☐ Contact with objects or equipment
  - ☐ Containers
  - ☐ Vehicles
- ☐ Slips, trips, and falls
- ☐ Transportation incidents
- ☐ Exposure to harmful substances or environments
  - ☐ Leaks from mechanical seals*
  - ☐ Improper training & maintenance procedures*
  - ☐ Corrosion*

*Source: U.S. Bureau of Labor Statistics, 2011-2015, NAICS 493120. *International Institute of Ammonia Refrigeration (IIAR).*

Resources on Controlling Hazards

OSHA offers multiple Safety and Health Topics pages for ammonia-related hazards:

- **Ammonia Refrigeration**
- **Process Safety Management**
- **Powered Industrial Truck**
- **HAZWOPER**
- **HAZCOM**
- **Respiratory Protection**
- **Lockout/Tagout**
- **Emergency Exit Routes**

Ammonia Safety & Training Institute (ASTI) is a non-profit organization dedicated to making ammonia the safest managed hazardous material in the world. Additionally, ASTI published:

- **Key Safety Measures (IIAR and EPA)**
- **Safety Day Information**

OSHA eTools are stand-alone, interactive, web-based training tools on occupational safety and health topics. They are highly illustrated and utilize graphical menus. Relevant eTools include:

- **Ammonia Refrigeration**
- **Powered Industrial Truck**
- **Respiratory Protection**

Hazard Communication. OSHA Fact Sheet. Outline the steps to an effective hazard communication program.

Electrical Training and Education. OSHA developed guidance to assist employers, workers, and others in understanding the requirements in OSHA's Design Safety Standards for Electrical Systems that are overlooked and may present serious hazards.

Certified PPE List Search. The National Institute for Occupational Safety and Health (NIOSH) maintains a list of certified PPE through the National Personal Protective Technology Laboratory (NPPTL).

Resources on Controlling Hazards (cont'd)

OSHA provides multiple **Process Safety Management (PSM) guidance publications**.

The Environmental Protection Agency (EPA) offers **free training for RMP compliance for agricultural ammonia users**. Additionally, EPA has published a wide range of ammonia safety-related publications, including:

- **Hazards of Ammonia Releases at Ammonia Refrigeration Facilities**
- **Accident Prevention and Response Manual for Anhydrous Ammonia Refrigeration System Operators**
- **Anhydrous Ammonia Theft**

Additional Ammonia Safety Resources:

IIAR International Institute of Ammonia Refrigeration

CGA Compressed Gas Association

GCCA Global Cold Chain Alliance

ASHRAE American Society of Heating, Refrigerating and Air-conditioning Engineers

RETA Refrigerating Engineers & Technicians Association

AIChE American Institute of Chemical Engineers

CSB U.S. Chemical Safety Board

Lessons Learned

Pre-Emergency Readiness: ASTI and IIAR reviewed the serious injuries and deaths that have occurred due to ammonia exposure concluding that operator use of a full-face respirator and muscle memory to escape to decontamination and medical care would have saved most victims. These are the skills that an on-scene command team must practice during ALL high-risk maintenance, repair, troubleshooting, and any other activities involving higher than normal levels of risk.

Incidental Response: Those who work on ammonia systems should be prepared with PPE and SOP understanding (e.g., Pre-Emergency Readiness). If an emergency event occurs during maintenance, the trained operator should engage pre-arranged actions (e.g. valve control) to slow or stop the event. This move is only performed when the operator and those exposed to the event can safely escape danger.

First Responder Readiness: The decisions made during the first 30 minutes of an emergency event are critical to protecting life and health safety, and to stop the emergency event when it's small. First responders should be equipped with PPE and hazmat first responder operations (FRO) training to engage the critical tasks listed in the Guidance Policy currently under review by industry, government, and public safety (see "Critical Tasks" PDF link below).

Video Links Showing the Value of Pre-Emergency Readiness and First Responder Readiness:

Chemical Safety Board: Wide range of lessons learned to recognize and prevent catastrophic events.

Luis Barragan: Luis explains how Operator readiness can safely stop a potential emergency event when it's small. The Scott Silva experience (next clip) created the motivation for Luis' readiness.

Scott Silva: Scott explains working on a lift replacing a valve bonnet nearly caused him serious injury or death. Pre-emergency readiness with PPE and a plan would have resolved this problem.

Real-Time Profitable Safety: Dr. Peter Martin explains how operators can utilize real-time monitoring to keep the system within the "operating window" where system weaknesses are quickly resolved.

Respiratory Protection: ASTI Instructor Mike Chapman demonstrates the proper way to don an air purifying respirator.

Los Angeles County Fire Protection District: Demonstrating first responder rescue and containment tasks.

Additional Links:

Tri-fold flyers: Three tri-fold documents that provide readiness information for **public safety**, **the worker**, and **community**.

Critical Tasks: Draft document out for public review and comment regarding first responder operations for critical tasks.