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Appendix 3: ICS 208 Site Safety Plan

ICS 208-NH3 Site Safety and Control Plan	1. Incident Name:	2. Date Prepared:	3. Operational Period:	Time: am/pm

Section I. Site Information

4. Incident Location:

Section II. Organization

5. Incident Commander:	6. HM Group Supervisor:	7. Tech. Specialist-HM Reference:
8. Safety Officer:	9. Entry Leader:	10. Site Access Control Leader:
11. Asst. Safety Officer-HM:	12. Decontamination Leader:	13. Safe Refuge Area Mgr:
14. Environmental Health:	15.	16.

17. Entry Team: (Buddy System) Name:	PPE Level:	18. HM Group Supervisor; decontamination Element: Name:	PPE Level:
Entry 1		decon 1	
Entry 2		decon 2	
Entry 3		decon 3	

Section III. Hazard/Risk Analysis

Comment: **See ICS 215a, Safety Plan Checklist, and the Emergency System Control Plan is located in the left column of the first page of each Playbook. Add location of any additional Safety information for the ICS 208 in this location.** See back page for summary of hazards, risks, threats, and response recommendations. Dalton's law of partial pressure establishes that an aerosol release can create temperatures as low as -80°F. The vapor expansion rate from liquid to vapor: 840:1 at standard temperature and pressure (STP) conditions of 32°F/0°C and 1 atmosphere; Approximate absorption rate of vapor to water = 1300:1. For Acute Exposure Guide Level (AEGL) - See Box 28 "Medical Monitoring." NH_3 released from a refrigeration system could include combustible compressor oil that can lower the LEL to 8% or 80,000 PPM.

Section IV. Hazard Monitoring

20. LEL Instrument(s):	21. O_2 Instrument(s):
22. Toxicity/PPM Instrument(s):	23. Radiological Instrument(s):

Comment: Monitor ammonia vapor to set limits for the protective action zone, PPE requirements, evacuation movement, and personnel accountability. Safety Plan should include reference to entry team checklist, safety checklist, decontamination, rehab, and the Technical Specialist - Planning checklist. Flammability concern starts at 1/4 of LEL (20,000 to 40,000 PPM) when the ammonia vapor is contained within a room or confined area where sources of ignition are present.

Section V. Decontamination Procedures

24. Standard decontamination Procedures: YES: ◯ NO: ◯

Comment: Vapor exposure can be removed with an exhaust fan (monitor for signs of residual ammonia within clothing). Gross decontamination using water is required when the victim or responder has liquid or aerosol stream exposure that has absorbed into clothing. Use water to thaw potentially frozen clothing (could be frozen to skin tissue). If freezing is not an issue, remove clothing immediately and then flush with water for 15 to 30 minutes (depending on the depth of skin tissue burn). Eye exposure will require support to open eyelids while performing water flush. Caution: flushing with unheated tap water may cause the victim extreme discomfort and potential thermal health risk. Move the victim to a warm (60°F to 70°F) shower unit when possible and be prepared to treat for thermal shock or cardiac risk.

Section VI. Site Communications

25. Command Frequency: 26. Tactical Frequency: 27. Entry Frequency:

Section VII. Medical Assistance

28. Medical Monitoring: YES: ◯ NO: ◯ 29. Medical Treatment and Transport In Place: YES: ◯ NO: ◯

Comment: See Box 24 regarding thermal and cardiac threat; Utilize ICS 206 Medical Plan and Entry Checklist for emergency medical and responder medical information support. Chemtrec - 800-424-9300; also see SDS or poison control at 800-222-1222.	

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General Description of a Release: Ammonia contained in storage vessels is made up of both liquid and gaseous forms of ammonia. The gaseous ammonia collects in the top of the tank and builds pressure in accordance with the temperature of the liquid (see vapor pressure table below). Usually, only the gaseous form is withdrawn for industrial purposes. Industrial refrigeration systems circulate liquid NH_3 to absorb heat.

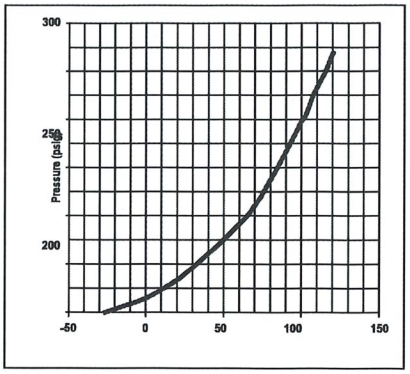
The liquid flashes to vapor to absorb heat in the evaporator and returns to the compressor as a vapor to become a high pressure gas. This gas transitions back to a high pressure liquid in the condenser, returning to the receiver to be pumped to the cold room evaporator. When the release point involves liquid under pressure, a sub-zero temperature aerosol that changes to a heavier-than-air dense gas cloud will roll along at ground level until ambient air thins it out and vaporizes it to the atmosphere. Ammonia is caustic and will create a high pH when mixed with water.

A. Hazard Information: Pungent odor; aerosol and dense gas may look white because of condensation in the air

1. Ammonia vaporizes at room temperature. It boils at -28°F, has a liquid to vapor expansion rate of 1:870, and a vapor density of 0.06 (air =1). Aerosol streams and dense gas clouds are extremely cold and will lay low until heated with ambient air.
2. CAS Registry No. 7664-41-7 and UN# 1005
3. NH_3 produces a relatively violent reaction with fluorine, chlorine, bromine, and iodine, especially when liquid or dense gas mix.
4. Ammonia is a base that reacts exothermically when mixing in water and with all acids and has a 1:1300 water to vapor absorption rate.
5. Ammonia is soluble in water (generates heat), creating ammonium hydroxide. Aqua solutions of ammonia will kill fish due to O_2 depletion.

B. Risk: Life, Environment, Facility/Equipment

1. Toxic gas irritates the respiratory system and damages skin tissue. Emergency medical care includes oxygen therapy for respiratory injury and at least 15 minutes of flushing with water to reduce impact of eye injury and for skin damage exposure.
2. Contain contaminated solutions and do not allow entry into storm drain system or to a live body of water.



Toxic Inhalation Hazard (2008 DOT ERG)

Id# Material	SMALL SPILL			LARGE SPILL		
	First ISOLATE (Feet)	Protect downwind (miles)		First ISOLATE (Feet)	Protect downwind (miles)	
		day	Night		day	Night
1005 Ammonia	100	0.1	0.1	500	0.5	1.4
1017 Chlorine	200	0.3	1.0	2,000	2.2	5.0
1052 Hydrogen Fluoride	100	0.1	0.3	1,000	1.1	2.2
1079 Sulfur Dioxide	200	0.2	0.7	1,250	1.3	3.6
2188 Arsine	600	0.7	2.5	3,000	4.4	9.5

C. Threats: Fire, Overpressure, Release

1. Anhydrous ammonia contained within a room or confined area has flash fire potential when mixtures reach 15%-28%. Industrial refrigeration systems use compressor oil that may reduce the LEL significantly.
2. Cylinders may burst when exposed to elevated temperatures (partially full cylinders are higher risks than full or completely empty vessels). Minimum evacuation distances are 500 feet for a small cylinder (125#) to 2,000 feet for a large vessel (500 gallon).
3. Evacuees that are sheltered-in-place with controls on outdoor air ventilation are generally safer from the impact of dense gas and explosion than those who escape through dangerous levels (above AEGL 2) of vapor. ASTI recommends that flammability threat mitigation (control source of ignition and ventilate) begin at 40,000 when the ammonia cloud is contained within a room or confined area.

D. Response and Decontamination

Approach upwind with SCBA and appropriate PPE (fire turnouts Level B). Response threat increases (higher concern for skin damage) as the level of ammonia vapor exceeds 5,000 to 10,000 PPM. Always wear fully encapsulated entry suits (level A) when working in or near dense gas and aerosol releases. Cover or contain the release until the source can be controlled; reduce pressure, if possible, by venting gas (not aerosol or liquid). Avoid applying water to liquid or aerosol/dense gas release. Water can be used to contain vapor (ahead of the dense gas cloud) while protecting downwind escape. Ventilation fans help move and dissipate vapor and are helpful in decontaminating those who have been exposed to vapor. Flush with water for aerosol or liquid exposure, being cautious with frozen clothing attached to skin: thaw before removing clothing.

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Section VIII. Site Map	
30. Site Map: use Field Operations Guide for a reference. Diagram the release pattern: fanning (stable - warming on the rise), conning (normal slow cooling on the rise), looping (unstable - fast cooling on the rise) and the downwind pattern (isolation zone and protective action zone). High wind speed (>12 mph) causes faster diffusion of gas plume than low wind speed (<6 mph); cold and wet = low cloud and longer time for plume diffusion. Define the hot zone, initial isolation zone, command post location, staging area, control zones, evacuation gathering points, escape routes, etc.	

Section IX. Entry Objectives

31. Entry objectives:

Section X. SOPs and Safe Work Practices

32. Modifications to documented SOPs or work practices: ◯YES ◯NO

Comment:

Section XI. Emergency Procedures

33. Emergency Procedures:

Section XII. Safety Briefing

34. Asst. Safety Officer-Hazmat Signature: Safety Briefing Completion Time:

Comments:

35. Hazmat Group Supervisor Signature: Comments:	36. Incident Commander Signature: Comments:

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