



KETCHIKAN AMMONIA TRAINING PROJECT FINAL REPORT

September 2007

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Section I: Introduction, Purpose and Scope of the Project

A. Background

Recent hazards analyses conducted for the Alaska Department of Environmental Conservation (ADEC) have clearly identified communities at risk from extremely hazardous substances (EHS) such as chlorine and ammonia. These two principal chemicals are the commonly targeted EHS for hazardous material (HazMat) release prevention and response planning, primarily because of their prevalence in Alaskan communities at seafood processors and water and wastewater facilities.

Recent Level A/B HazMat response capability assessments have also indicated that most Alaskan communities do not possess an offensive HazMat response capability. This continuing project is intended to provide at-risk communities (such as those in the Southeast Alaska communities) with the training and knowledge they need to prevent and respond defensively to an EHS release.

The ADEC sponsored the initial pilot project (March 1999) at Petersburg, which included ammonia/chlorine training, non-regulatory technical assistance visits to EHS facilities, and a tabletop exercise. A follow-on project was sponsored in Kodiak, Alaska in November 1999, and included ammonia training, non-regulatory technical assistance visits, Incident Command System (ICS) training, a tabletop exercise, and a functional exercise (including the actual deployment of the Anchorage and Fairbanks Level A HazMat Teams). Other projects were held in Unalaska (April 2000), Bristol Bay (May 2001), and Valdez (2004) and featured ammonia and chlorine training, non-regulatory technical assistance visits, ICS training, and either tabletop or functional exercises.

The Ketchikan Ammonia Training Project is a cooperative effort involving ADEC and the City of Ketchikan. Aware Consulting (Rick Warren and John Coston) was contracted by the City of Ketchikan and provided academic and practical training, along with the functional exercise to focus on proper emergency response procedures to anhydrous ammonia releases.

B. Purpose of Project, Goals, and Objectives

The overall purpose of this project is as follows:

- Improve the HazMat response capability in the City of Ketchikan and at other communities in Southeast Alaska, through increased awareness of the hazards posed by anhydrous ammonia. Provide classroom training on the hazards, handling, management and response to ammonia releases.
- Update current information on existing EHS hazards in the communities.
- Conduct a functional exercise aimed at improving the local HazMat response capability by jointly exercising the local emergency response teams in response to a simulated chemical release at the Alaska General Seafoods facility in Ketchikan.

C. Executive Summary

The Alaska Department of Environmental Conservation (ADEC) Prevention and Emergency Response Program sponsored the "Preparedness, Safe Handling and Emergency Response to Ammonia" training course in Ketchikan on September 11-13, 2007. The event was hosted by the Ketchikan Fire Department and featured classroom instruction, a live release demonstration, and a functional exercise involving response to a simulated ammonia release at the Alaska General Seafoods facility.

Approximately 45 personnel attended the training event including staff from ADEC, the Ketchikan Fire Department, Capital City Fire and Rescue (Juneau), Wrangell Volunteer Fire Department, North Tongass Volunteer Fire Department, Ketchikan Gateway Borough, City of Ketchikan Public Utilities, Ketchikan International Airport, NOAA, Alaska General Seafoods, Norquest/Trident Seafoods, and the E.C. Phillips seafood facility. For a complete list of attendees, see Appendix A.

The training was very well received as reflected in the course evaluation summary (see Appendix B). The final report was prepared and distributed by ADEC staff, in coordination with the Ketchikan Fire Department, and Aware Consulting.

The event was held at the Ted Ferry Civic Center and began with classroom and academic instruction on September 11th. Academic instruction continued on September 12th and included a live ammonia release demonstration at the Ketchikan Landfill. The third day of the training (September 13th) featured a functional exercise. The scenario involved a simulated anhydrous ammonia release at the Alaska General Seafoods facility. Six individuals acted out the part of victims to test the emergency medical treatment and protocols of the on-scene emergency medical teams.

A detailed outline of the entire training course is provided at Appendix D of this report.

Section II: Ammonia Training Course

The “Preparedness, Safe Handling and Emergency Response to Ammonia” course was held at the Ted Ferry Civic Center on September 11-12, 2007.

A detailed outline of the course agenda is included at Appendix D.

During the second day of the course, a live ammonia release demonstration was staged at the Ketchikan Landfill. The Ketchikan Hazmat Team suited out in Level A personal protective equipment and controlled the release of ammonia. Several Hazmat team members also monitored the air immediately downwind of the release to determine concentration levels. Team members and equipment were also decontaminated prior to exiting the area.

Mr. John Webby (Norquest/Trident Seafoods) graciously donated the ammonia used for the live ammonia release demonstration.

Several lessons learned were offered to improve the overall academic portion of the course (live ammonia release demonstration comments are included).

- Wind direction changes caused a delay at the start of the live release demonstration. In actuality, this was a great lesson in how weather conditions can be a risk factor to consider in response. The rock pit area used for this demonstration was a good location but is lower in elevation than the surrounding area. Morning conditions and warming were factors causing the change in wind directions. In the future when choosing a remote area a higher and larger level elevation should be chosen.
- In general, improved planning and rehearsing prior to the live release demonstration with the people that are involved in the demo will lend to better coordination when performing it. This planning function will be scheduled specifically in future projects.
- The use of DVD cuts needs to be integrated more smoothly into the presentation material.

Participants were also asked what would be desirable in terms of future training topics. Refer to Appendix A: #4 on page A 19



Live ammonia release demonstration at Ketchikan landfill.



Decon of Hazmat team members with positive pressure ventilation fans, with air monitors checking for ammonia vapors.

Section III: Functional Exercise Summary and Lessons Learned

The functional exercise was held on September 13, 2007. Rick Warren and John Coston served as the primary controllers for the exercise. Allen Serwat (Alaska General Seafoods) provided access to his facility for the emergency responders. Two smoke generators were used to simulate the ammonia release. Six simulated victims were also included in the scenario to test on-scene emergency medical treatment.

Basic Scenario:

Toward the end of night shift (this morning at 8:45 AM), during an ammonia transfer operation “liquid hammer” occurred in the HP Receiver. As a result of the liquid hammer a Sight Glass on the level column began to leak at the bottom of the HP Receiver.

The refrigeration technician first attempted to isolate the leaking Sight Glass. The technician was quickly overcome by the Ammonia and left the area because of discomfort even though he was using respiratory protection.

When the Ammonia release occurred, a fixed Ammonia air monitor sounded an audible alarm. The Liquid Ammonia leak is ongoing.

Refrigeration people ran into the fish processing area to report the leak and clear the area after they sounded the facility evacuation alarm. During the resulting evacuation of the building, several people were overcome by Ammonia.

This scenario was planned using the emergency response planning and modeling program – Aloha v5.4

Weather conditions used were: wind 5.5 mph - 56 F temp. - 87% RH

The chemical release was an Ammonia leak rate of 60 lbs/min for a total of 3600 lbs.

This quantity of ammonia released is realistic based on the quantities of the refrigeration systems in Ketchikan (see section IV General Findings.) An estimate of 2 to 3 times as many victims could be injured if this quantity of ammonia is released in an actual incident.

General Timeline of Events:

- 9:35 am 1st 911 call to the Ketchikan Dispatch was made from Alaska General Seafood. “Hey this is the Alaska General Seafood (AGS). We have Ammonia Leaking. I don’t know how bad it is we could not stop it. People may be hurt.”
- 9:37 am 1st KFD response crew assessing the scene.
- 9:38 am KFD on scene with six rigs.
- 9:39 am 2nd 911 call to the Ketchikan Dispatch “Many evacuated employees are coughing violently. All employees are outside the facility milling around. There are many people affected by the release.
- 9:40 am NH3 air monitoring of the immediate area is initiated

- 9:42 am Incident Commander (Fire Chief) on scene and is shown the initial ammonia cloud model depicting the area of IDLH atmospheres and cloud of ammonia at South Tongass highway.
- Note: Traffic Control was not in play.
- 9:43 am Initial contact of AGS refrigeration tech. is made by the Safety Officer.
- 9:44 am AGS refrigeration tech. reports evacuation personnel accounting is not complete.
- 9:45 am 1st two of six victims is revealed to responders. Symptoms are:
 “My nose and sinuses are hurting, it won’t stop. My throat felt like it closed off and I could not breathe. I can’t quit coughing. I am coughing up a lot of “cloudy discharge.” I try to take some breaths now and I don’t feel like I am getting enough oxygen. I vomited a few times and my stomach hurts now. I can’t keep my eyes open for long they just keep burning. I feel like I could pass out.”
- 9:50 am Controller Input to Safety Officer – Graphic display of NH₃ cloud model indicating the permissible exposure limit of NH₃ (@ 50ppm) has reached ~ 0.5 miles downwind.
- 9:51 am First KFD contact with victims – contact is telling victims to “stay where they are help is coming.”
- 9:53 am 2nd two victims is revealed to responders. Symptoms are:
 “I could not keep my eyes open for long until I got outside. It smelled Terrible. Tears were running down my cheeks. My nose and throat had a warm feeling and burned until I took some breaths outside. I Vomited once. I was coughing a lot for awhile and still am a little. How are my friends doing ... some of them looked sick?”
- 9:56 am First KFD rescue contact with victims – initial assessment and prep to move victims to decon.
- 10:00 am The last two victims are revealed to responders. Symptoms are:
 “My nose and eyes were really stinging for awhile. I was coughing for awhile. That smell made me scared. I feel a little better now though.”
- 10:04 am Air Decon set for victims removal.
- 10:06 am Wind remains light and variable which poses problems for staging response equipment around the cramped area of South Tongass Highway.
- 10:06 am AGS refrigeration tech. reports evacuation personnel accounting – thinks all are accounted for with at least four injured and being treated by KFD. One is missing.
- 10:08 am Air Decon of six victims is conducted and then handoff to triage.
- 10:10 am HazMat Response Team setting up and dressing out in Level A gear.
- 10:12 am Controller Input to Incident Commander – Graphic display of NH₃ cloud model indicating the threat area of NH₃ (@ 25ppm) could reach ~ 1.1 miles downwind and 0.5 miles wide. At 0.125 miles downwind – [+ 750 ppm]
 At 0.25 miles downwind – [+ 150 ppm]

- 10:12 am AGS Refrig. Tech. provides input to the IC on the refrigeration system leak location and the equipment condition.
- 10:13 am Triage complete on six victims. Triage outcomes are 2 victims "red" - 2 victims "yellow" - 2 victims "green"
- 10:20 am Level A team receives a briefing on NH3 leak isolation procedure. AGS refrig. tech. uses hp receiver sketches and diagrams to brief level A team.
- 10:21 am Search and Rescue of AGS Facility is mounted. PPE used by rescue personnel is bunker gear/SCBA
- 10:23 am Decon is set up using two PPV Fans.
- 10:25 am NH3 leak isolation operation commences by level A team.
- 10:30 am One AGS missing person (canning line engineer) found and his helper is reported as "location known." He is handed of to triage, found to have no injuries and released at the scene.
- 10:35 am Level A team completes NH3 leak isolation and proceeds to air decon. NH3 Air Monitoring was used to determine when decon was complete.
- 10:38 am Air decon on level A team is complete and dress-down and rehab begins.
- 10:39 am Final survey/sweep of the facility is conducted which includes air monitoring.
- 10:50 am Exercise terminated and Demob. is completed at approximately 11:40 am.
- 12:15 pm Functional Exercise Debrief commences at the Ted Ferry Civic Center.



Simulated ammonia release at seafood processing facility.



Entry Team securing simulated ammonia leak.

Lessons Learned: (Also see Appendix C for a summary of comments by participants provided on the Exercise Evaluation form)

Things That Went Well:

- Good initial response and run time during busy AM traffic from the South/Saxman area.
- Adequate protective equipment (bunker gear/SCBA) was used first by KFD responders.
- Set up and dress-out of hazmat team was timely and complete.
- Tactics using an independent search/rescue team to find missing people.
- The incident mitigation was planned and executed well. This included the tools the team needed for isolation of the leak source.
- Positive Pressure Ventilation Fans (PPVF) were used which eliminated the need for water for decon. It is important to have water readily available for flushing of eyes and other tissue of any victim exposures. PPVF was also used for initial victim decon and “bending” the visible cloud from the leak source away from the highway and staging area.

Areas of Response Needing Improvement:

- Staging of response equipment was too close to the affected area. Traffic control was not an objective for this FX, therefore was not in play and was partly the reason that equipment needed to be on the AGS side of the highway. With the location of the fish processors on the Tongass Highway, this will pose a risk for residents and responders.
- Air monitoring needs to be established and completed quickly at the affected area (to start with) to determine operational zones, levels of protection for responders, ID dose levels of victims and help with risk assessment.
- Initial contact with ammonia exposed victims was delayed. When the assessment on the first victims (severe exposure) was done their airway (in an actual incident) would have been in need of immediate treatment.
- Air monitoring of the airborne cloud is needed to verify protective actions of downwind populations in the path of these types of hazards. This data gathering should begin early in the incident and continued in an effort to verify when protection measures can be lowered. Also important is the data being available for inquiries of anyone who claims to be exposed or was interested in potential doses.
- Any responder arriving on scene to begin ER operations needs to be in maximum respiratory protection (SCBA) until air monitoring is completed to verify a reduction in levels of protection.

- The back-up team for level A entry team should have the same level of protection as the entry team.
- Search teams were not familiar the layout of the facility and as such returned to the command post for additional information which resulted in a delay of removal of injured and missing people.

Recommendations for Improvement:

- The Incident Command System for these types of chemical releases needs to go to Unified Command immediately. Minimum UC partners are: Facility manager, ADEC and KFD. The reason for this is that Ketchikan has high population densities that are transient, with very close proximities to fish processors combined with congested transportation corridors. In case of an ammonia release (particularly at the downtown facilities) Wide Area Notification, Ingress of Emergency Services, Traffic Control and Recall of Mutual Aid Partners are just the initial needs for this type of response.
- Ensure that easy to access and implement call lists are available/capable for mutual aid partners. Practice radio comms with these agencies by integrating the different channels into a capable “comms net” to avoid radio clutter. This will aid in coordination for these logistically difficult responses.
- Because of the “cramped/congested” locations of the fish processing areas more ammonia respiratory and other protective equipment is probably needed for Ketchikan mutual aid partners i.e. ADEC, Hospital, Harbor Master, USCG and Municipal agencies for use during tasks like: transport to an EOC or to ER location, wide area air monitoring, transiting the affected area, rescue, patient decon and initial treatment.
- The hospital emergency room needs to have specific treatment protocols for exposure to ammonia. Preplanning on these actions will allow safe and efficient handoff of patients and their treatment. Mass casualty exercises on chemical exposures will allow for education and assessment of capability.
- Marine traffic would need to be controlled carefully during an ammonia release. The harbor master needs to be educated on the risks and requirements of these incidents in preplanning.
- Work regularly in preplanning with facility Manager/Refrigeration Specialists. During incidents, facility people need to be part of the Unified Command. Acquire as much information as possible from these individuals in preplanning and response.
- Develop a handout outlining area notifications systems and protection measures. This would be used by hotel managers, cruise ships, and other businesses that are in contact with people during the tourist season to provide the public with emergency response actions in the event of an ammonia release. The handout needs to be carefully tempered to avoid alarming people, while also providing good guidance such as wide area notifications/sirens and procedures for sheltering in place.

- Consider the benefits of cloud modeling software such as CAMEO/ALOHA/Marplot for preplanning at a minimum. Once the planning model has been saved it can be used to guide “downwind” response actions during actual releases. Pre-planning should include both worst case and the more probable (like the FX scenario) ammonia releases, determining potential release volumes on prevailing winds and human impact data.

Notes on Emergency Plans

1. The Ketchikan Area Emergency Operations Plan needs a Hazardous Materials Annex. Within this annex any large quantity hazmat or any extremely hazardous substance (like anhydrous ammonia) needs to have specific response protocols. The easiest to use (in response) format is the checklist type by IC position.
2. Develop a traffic control plan for each of the two areas where fish processors are located in the Ketchikan Area Emergency Operations Plan (EOP.) Include this plan in exercises and drills.
3. The EOP should have a specific annex for chemical emergencies particular to ammonia.
4. A cooperative effort is needed between Fish Processors and the Ketchikan FD to coordinate and integrate their Emergency Operations Plans. Once plans have been revised to better utilize area resources, exercises and drills should be conducted to practice the plans. This will minimize lost time and aid in decision making if an actual emergency were to occur.
5. Evacuation and Sheltering-in-Place are key actions in the early stages of a response to EHS releases.
 - a. Each facility needs to review these components of their plans and revise them as employee populations and other staff changes occur throughout the season.
 - b. Review of evacuation routes should be done throughout the season to ensure that egress routes are clearly marked and not blocked with equipment or other materials.
 - c. Procedures for evacuation at facilities should be based on daily work rosters so that at a declaration of emergency an accounting is done as people check in with their supervisor, supervisors report their groups accounting to managers, and managers report to the Incident Commander as “all accounted” or any missing by name and last known location.
 - d. Evacuation and Sheltering education, training and reminders are needed at least two times/season for the fish processors and City of Ketchikan.

Additional Notes to Improve Response Capability

1. The function of atmospheric monitoring during actual incidents (as practiced during the FX) is to characterize the released ammonia's concentration and to study its downwind movement. Two direct reading instruments were used to quantify fugitive ammonia emissions; a MiniRAE using Photoionization Detector (PID) technology and a Manning Systems EC-P1 using electrochemical sensor technology for ammonia concentration detection.

Direct reading instruments require the user to understand the limitations and conditions that can affect performance and calibration, and also to understand the maintenance requirements and interpretative results. Measurement of gases and vapors can be adversely affected by interferences from other contaminants, environmental conditions such as temperature extremes, humidity, elevation relative to sea level, barometric pressure, and particulate concentrations. Additionally, electromagnetic fields can interfere with instrument performance and cause a wide variation of problems associated with instrument use.

Finding 1:

- a. During the ammonia release demonstration, the entry teams involved with measurement of ammonia concentrations were not familiar with the use, limitations and conditions of these instruments.
 - b. The readings from MiniRAE PID were affected whenever a radio was transmitting in the immediate vicinity. The Manning EC-P1 did not appear to be affected by the electromagnetic fields generated during radio transmissions.
 - c. There were some significant differences of measured ammonia concentrations when both instruments were essentially measuring the same source at the same location. When exposed to elevated concentrations of contaminants and other environmental conditions, results may be skewed due to the operational characteristics of the electrochemical sensors and photo ionization detectors.
2. During the ammonia release demonstration three teams dressed out in varying levels of personal protective equipment. Level A teams controlled the release while the level B team and responders dressed out in turnouts assisted.

Finding 2:

- a. Level A teams wore fully encapsulating suits with SCBA's providing air supply. While the level A team was performing tasks during the demonstration the low pressure alarm on both SCBA's were activated. The entry team was found to be wearing 30-minute SCBA's; typically level A responders should be equipped with one-hour SCBA's but be limited to work cycles less time than the limit of the SCBA air supply.

- b. The level B team wore chemical resistant suits but were not wearing any respiratory protection. Level B responders or responders doing air monitoring tasks should be equipped with supplied air respirators (maximum respiratory protection) as there is an elevated potential for exposure to hazardous airborne materials in unknown concentrations.



Unified Command discussing strategy at the scene.

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Section IV: Non-Regulatory Technical Assistance Visits to Fish Processing Facilities

Purpose and Conduct of Facility Inspections

On-site visits were offered to each of four facilities in Ketchikan. The visits were conducted as inspections of facility safety conditions for employees, protection of the local environment and condition and operation of the equipment, in particular the refrigeration equipment. These inspections are not intended to be binding regulatory audits. They are intended to identify priority areas of compliance and best practice related to these types of facilities. Inspection findings are discussed with facility people as they are identified according to regulations or best management practice. The inspections are intended to identify essential areas of compliance related to these types of facilities. It is the hope of Alaska Department of Environmental Conservation and the inspector to have managers use the findings of these inspections in practical application to promote safer work environments for employees and lower loss potentials for their business.

Three of the four facilities scheduled a non-regulatory technical assistance visit. Each visit took between 2.5 and 3.5 hours to complete. Most of this time was spent in the facility with the supervisor, refrigeration technicians, and/or management staff.

Electronic and hard copy templates of these inspection formats were offered to each facility. Further help is offered to facilities in developing their own internal inspection programs.

General Findings of Facility Inspections

Below is a list of the inspection findings as a result of this series of facility visits. General information precedes the comments on facility conditions with the intent to help Ketchikan Fire Department with follow-up visits to each facility.

Comments that begin with “+” denote a positive finding. Other notes are recommended improvements.

Two types of refrigerants are used: Anhydrous Ammonia (NH₃) and Chlorofluorocarbon based or Freon type. The largest quantities of Anhydrous Ammonia at these facilities ranged from 2,800 pounds to an (estimated) approximate 26,000 pounds.

Types of refrigeration equipment observed at these facilities were: [LP side equipment] Blast, Tunnel Freezers and large capacity Cold Storage rooms – all with ammonia liquid cooled Evaporators, bulk Ice Makers, circulated Refrigerated Sea Water systems, [return or HP side equipment] reciprocating and screw type Compressors, air cooled and water/air cooled Condensers – at some facilities, condensers are roof mounted which made access difficult.

1. + Facilities had fixed NH₃ detection monitors in and around the compressors. Scheduled service of these systems is per manufacturer's recommendations. They each have controls that start ventilation fans and open outside air inlet louvers, actuate audible alarms and lights. Remember that if large quantity leaks occur, these ventilation systems may allow NH₃ to be emitted toward people at risk.

2. Chlorofluorocarbon based refrigerants are not odor detectable like NH₃. If a leak were to occur in a closed area, people could be overcome before they are able to escape.
3. NH₃ piping to and from cold rooms and freezers is in or directly adjacent to processing rooms with large numbers of people. Continually analyze operations like forklifts or other mechanical means of moving materials that could strike piping or any appurtenance that is conveying or storing HazMats.
4. + One facility has re-routed piping to and from freezers through an enclosed corridor that includes a ventilation system in case of a piping leak.
5. One facility has a risk of vehicle traffic, i.e. forklift or truck/van, and street traffic is directly adjacent to NH₃ piping to and from condenser units and HP receivers.
6. Also very near traffic lanes and structures are 500-gallon propane tanks used as filling stations for portable LPG tanks such as forklift fuel. + Two facilities with LPG fill stations had all tools and proper protective equipment for use by the operators.
7. + Most facilities have begun labeling their refrigeration system piping, usually in the compressor rooms. This positive program needs to be applied throughout the facility to and from the refrigeration users, on Boiler Systems and other hazardous systems that could injure people.
8. + General safety signage and placarding was good at most facilities. HazMat storage is separated from the production areas and nicely labeled.
9. Use proper engineering standards for pressure relieving devices (PRD) and piping headers each time revisions are made to refrigeration equipment, i.e. adding capacity or systems. At one facility, an open-ended PRD was observed on an operating compressor inside an upstairs area. Check systems for proper tail pipe routing away from any working surface and above it by a minimum of 10 feet.
10. Main isolation valves in the systems need to be labeled or tagged, i.e., King Valve and other liquid receivers or other major isolation valves that may be used to reduce the severity of a release. These valves need to appear on diagrams, be included in emergency plans and be reviewed with the fire department.
11. + Emergency “dump valve” boxes exist at three facilities.
 - a. They need to be labeled.
 - b. They need to be secured key-locked preferably with a “knox box” system for KFD access.
 - c. Valves and their operation need to be outlined in emergency plans.
 - d. The emergency plans need to be reviewed with the fire department.
 - e. Any vents to the air need to be routed away from people that could be in the general area.

- f. For dump system components that are designed to be vented to the open air or defused to sea water they need to be reviewed with the Alaska Department of Environmental Conservation.
12. NH₃ system valves need to be plugged when not in use as they could begin to leak when not attended. Many releases have occurred on oil draining components in this manner. A recommended valve for oil draining application is the “auto closing” style valve demonstrated in the classroom and live release demonstration.
13. + Some facilities use an “oil draining pump” system and procedure which makes oil draining a much safer operation.
14. Several damaged or not operable local and control panel instruments in the refrigeration systems were observed. In many systems there is no backup instrumentation; the only indication of system condition is a local temperature, pressure or flow indication. Therefore it is vital to have instrumentation in good condition.
15. + Central instrumentation panels for key operating parameter indications are an efficient means of data acquisition for technicians and operators. This is very important during high load and upset conditions.
16. + Ensure that proper standards are followed for using pressure rated blinds when temporary piping or system revisions are being done in conjunction with systems in operation or bearing HazMats.
17. + One facility has some key valves lock in there normal operation condition. Any valves or other system operating equipment needs to be secure from theft of NH₃ and unauthorized operation.
18. All facilities with time in service as long as these facilities have been operating need to have some level of mechanical integrity program in place for refrigeration and boiler equipment.
 - a. At a minimum, a piping and equipment “non destructive testing” program is in place to ensure that corrosion rates are within acceptable limits.
 - b. Pressure vessels are registered under the state owner user program.
 - c. Pressure relieving devices (PRD) are within the maximum 5-year service dates.
 - d. Any PRD’s with isolation valves need to have these valves lock open during operation.
 - e. Valves and other appurtenances are serviced according to manufacturer’s specs.
 - f. Proper system specifications are used when replacing system components.

19. Analyze boiler and canning retort areas for personnel burn hazards.
 - a. In some area piping insulation is missing.
 - b. In one facility, personnel could easily fall against canning retort. A protective railing or screen is needed.
 - c. Inspect for asbestos insulation and set up a remediation program.
20. + All process areas were well designed, clean and relatively hazard free. Ergonomics are considered in processing line design. Equipment guards are adequate and drive equipment emergency interlocks were observed at some facilities.
21. Respiratory equipment at facilities is varied. It is a regulatory requirement for employers that expect employees to use respiratory protection equipment have a written program according to OSHA 1910.134. Employees at these facilities should use the equipment they have for escape and emergency operation only, and not for emergency response.
22. Any flammables such as aerosol cans, paint and solvents need to be stored in a specifically designed storage cabinet.
23. + Every facility but one has sprinkler-type, fixed fire suppression systems. This is very important in dry storage areas and buildings whether they are normally occupied or not.
24. Forklift operators require specific training before work assignment and refresher training according to OSHA 1910.178. + One facility has a good training program for their operators which include LPG filling procedures.
25. Electrical panels at some facilities do not have enough clearance for access. A minimum of 36" clearance is required.
26. All facilities need to review the requirements of OSHA 1910.147 for electrical system isolation (lock out/tag out/try to verify electrical isolation) before work begins and as work on equipment progresses to completion.
27. + No Anhydrous Chlorine is used at these facilities. Cl₂ has been replaced with a stable lower risk 12.5% sodium hypochlorite solution.
28. + Aisle ways are kept clear and are adequately sized for safe passage in forklift and personnel areas. This was observed even as the season was winding down or off-season work had begun.
29. One facility has its dock cranes out of inspection. Service logs need to be maintained that indicate service and inspection intervals and load test dates. Reference OSHA 1910.179 for specific applications to your type of lift device.
30. +Material elevators are in good operating condition. All interlocks are in place and placards are properly displayed.

APPENDIX A: Course Evaluation Summary

The following is a summary of the comments received following the academic portion of this training project. All of the individual student critiques and comments are captured below and consequently, a number of comments are repeated.

Training Course Evaluation on Preparedness, Safe Handling and Emergency Response to Ammonia Ketchikan, Alaska

Instructor: Rick Warren **Dates Attended:** September 11-13, 2007 **Evaluation by:** Participants

A total of 41 students attended the class. The following summarizes the course evaluation of 29 students who took the time to submit a completed course critiques.

1. List the topics you felt were most valuable to you in this course.

- Learning about the physical properties of ammonia and the reactivity of same.
- Properties and hazards of NH₃. Behavior of NH₃ releases.
- Properties of anhydrous ammonia, ammonia hazards, health effects and results of exposure
- Awareness of the wide variety of uses for ammonia.
- Ammonia release formations where firefighters will come across ammonia.
- Ammonia characteristics and how it moves when released; what the dangers are.
- The whole class was very informative. Good job!
- Exposures prevention and spill release actions.
- While we were made of ammonia's dangers, we also learned that with care we can deal with ammonia safely.
- NH₃ characteristics.
- What is ammonia; how ammonia is readily available. Types of ammonia releases.
- Characteristics of ammonia when it is released from its container.
- Properties of ammonia, EMS treatment.
- Chemical properties. Medical effects of NH₃. Containment measures.
- The makeup of ammonia; the phases of anhydrous ammonia, and how a release works, the effects upon a person.
- Information and things to do on the medical side as far as treating people exposed to ammonia.
- Chemical makeup.
- Total global view of properties of ammonia, hazards, use of monitoring equipment.
- Ammonia – re-condensation – eliminates cloud; decon without water, and problems associated with water use by firefighters.
- All topics were valuable to me whether I knew it already or not. It reinforces/adds knowledge for the betterment of/for me and our community.
- Live NH₃ releases.
- To understand anhydrous ammonia.
- Properties of ammonia.
- Understanding the chemical properties and how it is affected and behaves by its environment.
- How ammonia reacts with temperatures, rain, etc. Instruments, methods to sample.
- How ammonia is affected by weather, temp, and water conditions.

- Learned a lot about NH₃ and how it is affected by water, weather, wind, etc.
- PPM of the trace, dense, aerosol pooled, the health effects of NH₃ and the safety gear you should have.
- Emergency response hazard and risk assessment.

Least Valuable

- None.
- PPV fan demo.
- Actions of ammonia details.
- It was all valuable.
- Past project section.
- I seriously enjoyed it all.
- Horizontal ventilation; only because we in fire service are already very familiar with this procedure.
- Can't think of any.
- PPV demo.
- Positive pressure ventilation.
- In-depth scientific explanation of ammonia.
- Auto shut-off "spring-loaded" valve for refrigeration techs.
- Nothing for all.
- Well it's all valuable, but the thing that wouldn't apply to my work is stopping a tank/vessel release. Only because I do not work with ammonia or permitted to be in Level A or B gear.
- All of the course was valuable in some way.

2. In which ways will this course help you to carry out your responsibilities on the job?

- Knowledge of how to deal with spills.
- Prediction of NH₃ releases.
- We will be able to set up areas to help keep the responders at a safe level.
- Better awareness of hazards in the community and ability to safely deal with threats.
- More knowledge of what levels of NH₃ will affect us.
- To protect Wrangell during a release.
- Makes you aware of possible problems, fixes.
- Exposures and decon for patients in EMS services.
- Having a better understanding of how we can work with industry to keep our community safe.
- Have two NH₃ hazards in home town (response area).
- Awareness of ammonia release and cautious of the trace gases.
- Better understanding of the risks of ammonia.
- Better understanding of ammonia.
- Better understanding of planning a response.
- Help me better understand the signs and symptoms of a patient exposed to ammonia.
- If there is a serious ammonia exposure incident, I am more informed about what to expect.
- Further comfort level with the chemical.
- Increased confidence in responding to ammonia incidents, while considering various plans of action(s).
- Reinforced "Cooperation, Communications, Coordination"
- Better understanding of recognition and how to solve the issues at hand from start to finish. Building partners/resources/working relationships.

- Better understanding of NH3.
- The idea, we have control on hazards.
- Better idea of ammonia now and how to contain it or let it go. Better understanding of the “cloud”
- What not to do when you are on site. We can plan accordingly with environmental factors in mind. Setting up response zones.
- Identify and network with all operators that use ammonia, and to assess areas that would be impacted by a release and ways to respond in a safe manner.
- How we respond to a leak at plant facilities, what to do when arriving on scene.
- Help me understand how important it is to plan and exercise and revise as necessary.
- Better safety info for people I work with and me.
- This will help me recognize more on ammonia hazards and health effects as a result of exposure, and knowing more about PPE.

3. **How do you feel the instructor's use of materials contributed to the course in the following areas? Please Comment!**

The Presentations/Lectures

- Great.
- Very good, easy to understand, questions answered well.
- Both were good.
- Objectives met – occasional loose ends on lecture subjects ... sometimes wondered “what was I supposed to learn in the last half hour?”
- Presentations were great. Lectures need to move along faster.
- Very well done.
- Very good instructor. He knew all aspects of NH3.
- Good slides; need slides on clouds, better diagrams; temperatures should be present.
- He used slides, but expanded on them with his knowledge.
- Excellent.
- Very good. Would like to see more Powerpoints on the topics.
- Good info.
- Very good, easy to understand information.
- They were long with Powerpoint, but good information.
- Good – lots of information. Try to stay in the front of the class for the people in front.
- Way too much repeating of same information on the second day.
- Very good – included personal experience and related incidents to reinforce points.
- Informative.
- Presentation and lectures were good, but it was hard to hear the instructor at times.
- Very good.
- Shorter/Quicker.
- The workbook was very helpful in reinforcing what we were learning. The lectures and presentation materials were very well thought out.
- Perfect. The level of experience in his field made it clear in layman’s terms to understand the characteristics of ammonia between A to Z. It’s clear Rick has been involved with about every incident, or problem that could be experienced. John Coston is awesome too!
- Very well put in all lectures.
- Good length, very interesting.
- Very good.
- Good.

The Demonstrations

- Very informative.
- Very good. Physical principles driven home. Needed more hands-on of detection equipment.
- Nice demos.
- Demonstrations would be more interesting if there were more hands-on.
- Good.
- Very good.
- Great job.
- Demonstrations were well planned and effective.
- Excellent.
- I would like to see the demonstration to be on time and less standing around time.
- Class members involved in the demos missed part of the presentation.
- Good to see how ...
- Helpful to be able to see the way the release reacts and behaves.
- Were good for connecting information together.
- Good – very interesting to see some actual reactions in person.
- Too slow. Well planned but operationally took too long.
- Very good.
- Great to see/do.
- Excellent.
- Very good.
- The ammonia demo in the 1-liter bottle was pretty powerful in visually demonstrating how ammonia reacts with water.
- Very good. Easy to see what was covered in the classroom.
- Very well put together.
- Very well planned using ICS.
- Fun and very good.

The Presentation Materials and Visual Aids

- Well done.
- Okay. Slides good. I have poor hearing. Microphone would have been better.
- All okay.
- Clear and to the point.
- Excellent.
- Very good.
- Good.
- Appropriate.
- Excellent.
- Dark projector.
- Good.
- Good. Interesting to see some other major incidents that have happened.
- Use of Powerpoint; could have used pointer and remote control of slides. Too much on & off of video.
- Very good, but more recent photos, film clips of incidents (and training).
- Good, but would be nice to have videos of incidents before/during/after.
- Good.

- Very good.
- Good.
- Everything was good.
- Good/great – adequate –
- Good.
- Very good.
- Very good.
- Good.

The Handout Material

- Followed lectured fully.
- Okay. Needed diagram (see below)
- The handouts were well put together.
- Workbook nice, could use blank pages.
- Well written.
- Good.
- Very good.
- Good.
- Good, not overdone.
- Very good.
- Would like more handouts, re: MSDS on ammonia, more information on handouts.
- Good idea “filling in the blanks”
- Helpful.
- Very well rounded – lots of complete information.
- Good, well organized. I liked the workbook.
- Good.
- Useful.
- Excellent, easy to follow with student workbook.
- Very good.
- Good.
- The handout book was great. Might want to change Larry Iwamoto’s email address to larry.iwamoto@alaska.gov
- Very good. Enough information that I would need to have an understanding with the chemical.
- Good.
- Very good, Gave me ideas in how to present training at my place of work.
- Good.
- Good.

The Ammonia Functional Exercise

- Awesome.
- Okay (weather could have been better)
- The exercise was good. Safety was very well kept.
- Great learning experience.
- Excellent.
- Very good.
- Great. Get group more involved!
- Excellent. By incorporating ICS in the exercise and by using the expertise of industry, we

- learned much.
- Awesome.
 - Very good visual.
 - Excellent experience.
 - Interesting – wish we could see a bigger release.
 - Very good, learned how weather and terrain plus low air on monitors worked with safety systems.
 - Good use of tools/resources.
 - Excellent! Great hands-on.
 - Very good.
 - It was interesting to see how ammonia vapor cloud behaves and watching Ketchikan team in action.
 - Out at the landfill exercise was very interesting. The differences of temps, wind were very insightful. To watch the ammonia plume and its movement was good as well.
 - Need more hands-on for everybody.
 - Could have had a bigger release but it was good.
 - Very good.

The Facility Visits: This question was intended to weigh the benefit of the facility visits.

- Great.
- Good.
- Very good.
- Great.
- Good.
- Good. Always fun to go to the dump on a nice day.
- Always great to learn the areas that we respond to; risk vs. benefit.
- Very informative, nice to have personnel that are on-site.
- First time visit.
- We have not gone yet.
- Very good (from a seafood facility person).

4. What topics would you like training on in a future or follow-up session?

- Like to see more examples of containers.
- Chlorine, more EHS.
- Other common chemicals and their properties.
- LNG or LPG.
- EMS treatment for Fire Dept.
- Mitigation and decon; also monitoring.
- Chlorine, propane, cyanide, etc.
- Response to leaks.
- Chlorine.
- Other risks/hazards in Ketchikan and outlying communities that we may work with or respond to.
- More Hazmat.
- More hands-on.

5. Check boxes below for ratings that best describe this training course under each heading.

| | Training Materials | Training Facility | Demonstrations | Practicality | Instructor | Exercise | Overall |
|-----------------|--------------------|-------------------|----------------|--------------|------------|----------|---------|
| 4 = Excellent | 10 | 17 | 17 | 14 | 15 | 10 | 11 |
| 3 = Good | 15 | 7 | 7 | 11 | 10 | 13 | 13 |
| 2 = Fair | 1 | 1 | 2 | 1 | 1 | 2 | 2 |
| 1 = Poor | | | | | | | |
| Not rated | 3 | 4 | 3 | 3 | 3 | 3 | 3 |
| Overall Average | 3.4 | 3.6 | 3.6 | 3.5 | 3.5 | 3.0 | 3.3 |
| Overall Rating | Good+ | Good+ | Good+ | Good+ | Good+ | Good | Good+ |

More comments here if you have them please:

- Need a color handout of the most excellent release diagram posted on the wall.
- Consider your audience when presenting. Much of the material relating to the behavior of the HazMat is redundant.
- Outstanding class, I would recommend it highly.
- Well done! A very effective presentation bringing industry and emergency responders together!
- Rick is very sharp and knows his stuff. As the person responsible for my crew's safety, I would have liked it more if Rick would have allowed me more time to coordinate demonstrations. He focused on the problem but wasn't ready to listen to other issues related to the demonstrations. Not a big problem, but was an issue. Thank you!
- Thanks for the class, well done.



Classroom instruction at the Ted Ferry Civic Center.



Practical training with ammonia detection devices.

APPENDIX B: Participant List

The following is an alphabetical listing of the participants for this training event.

Approximately 45 personnel attended the training event including staff from ADEC, the Ketchikan Fire Department, Capital City Fire and Rescue (Juneau), Wrangell Volunteer Fire Department, North Tongass Volunteer Fire Department, Ketchikan Gateway Borough, City of Ketchikan Public Utilities, Ketchikan International Airport, NOAA, Alaska General Seafoods, Norquest/Trident Seafoods, and the E.C. Phillips seafood facility.

Final Participant List – Ketchikan Ammonia Training (September 11-13, 2007)

| Name | Organization/Mailing Address | Phone | Fax | Official Email Address |
|-------------------------|--|---------------------------|-----------------|--|
| Rodger Arriola | Ketchikan International Airport | 247-5636 | 225-2939 | |
| Jesse Austin | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-1131 | | |
| Dave Breitreutz | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | | | |
| Tim Bunes | City of Wrangell Fire Dept | | | |
| Nelzon Cadiante | Norquest/Trident Seafoods | 225-6664 | | ncadiante@trident.com |
| John Coston | Aware Consulting Group Kenai, AK 99611 | | | |
| Joel Curtis | NOAA/National Weather Service Juneau Forecast Office | 790-6803 | | Joel.curtis@noaa.gov |
| Frank Divelbiss | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-6414 | 225-9613 | |
| Bob Fultz | ADEC-Ketchikan 540 Water St, Suite 203 Ketchikan, AK | 225-6200 | 225-0620 | Bob.fultz@alaska.gov |
| Brian Gilson | City of Ketchikan, 334 Front Street Ketchikan, AK 99901 | 225-7726 | | |
| John Goucher | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | (503) 720-3624 | | |
| Young Ha | ADEC-Anchorage 555 Cordova Street Anchorage, AK 99501 | 269-7544 | 269-7648 | Young.Ha@alaska.gov |
| Paul Hamby | Capital City Fire and Rescue Juneau, AK | 321-8733 | | Paul.hamby@ci.juneau.ak.us |
| Rupert Henry | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-9341 | | |
| Scott Hildebrand | North Tongass Volunteer Fire Dept | 228-6710 | | |

Final Participant List – Ketchikan Ammonia Training (September 11-13, 2007)

| Name | Organization/Mailing Address | Phone | Fax | Official Email Address |
|-----------------|--|----------|----------|--|
| Jim Hill | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-5940 | 225-9613 | JimH@city.ketchikan.ak.us |
| Glen Hofmann | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-8815 | | |
| Larry Iwamoto | ADEC-Anchorage 555 Cordova Street Anchorage, AK 99501 | 269-7683 | 269-7648 | Larry.iwamoto@alaska.gov |
| Jeff Jones | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-6396 | | |
| Seth Krasnow | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-4732 | | |
| Rick Lamprecht | Norquest/Trident Seafoods | | | |
| Warren Lee | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | | | |
| Chris Lemerond | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-8095 | | |
| Randy Lowell | Ketchikan Gateway Borough | 225-3611 | | |
| Kayleigh Martin | North Tongass Volunteer Fire Dept | 228-6520 | | |
| Scott McAuliffe | Wrangell Volunteer Fire Dept 431 Limovia Highway | 874-3223 | | |
| Tracy Mettler | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-1080 | | |
| Mike Moyer | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-9616 | 225-9613 | michaelm@city.ketchikan.ak.us |
| Jim Nelson | Wrangell Volunteer Fire Dept | 305-0607 | | |
| Scott Otis | E. C. Phillips 1725 Tongass Ave, Ketchikan, AK | 254-0363 | | |

Final Participant List – Ketchikan Ammonia Training (September 11-13, 2007)

| Name | Organization/Mailing Address | Phone | Fax | Official Email Address |
|--------------------|---|----------------------|----------|--|
| Larry Parrot | City of Ketchikan Public Utilities, 334 Front Street Ketchikan, AK 99901 | 617-1609 | | |
| Bob Pelkey | 1705 Tongass Ave P.O. Box 6092 Ketchikan, AK | 225-6664 | 221-3891 | Bpelkey@norquest.com |
| Tony Perez | Trident Seafoods Ketchikan, AK | 225-4191 | | |
| Ed Quinto | Capital City Fire and Rescue Juneau, AK | 586-5322 | 586-8323 | Ed_Quinto@ci.juneau.ak.us |
| Terry Roberts | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 617-1998 | | |
| Allen Serwat | Alaska General Seafoods 980 Stedman St. Ketchikan, AK | 228-5124 | 225-2908 | Allen@akgen.com |
| Gretchen Skillings | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-7072 | | |
| John Taylor | Wrangell Volunteer Fire Dept | 305-0416 | 874-2117 | |
| Andy Tighe | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-7169 225-9616 | | andrewt@city.ketchikan.ak.us |
| Ken Truitt | City of Ketchikan Fire Dept, 334 Front Street Ketchikan, AK 99901 | 225-8404 | | |
| Rick Warren | Aware Consulting Group Kenai, AK 99611 | 776-3162 | 776-3213 | rwarren@awareconsulting.net |
| John Webby | Trident Seafoods, 5303 Shilshole Avenue NW Seattle, WA 98107 | (206) 331-0715 | | jwebby@tridentseafoods.com |
| Ivan Williams | Alaska General Seafoods 980 Stedman St. Ketchikan, AK | 225-6652 | | |

APPENDIX C: Exercise Evaluation Summary

Functional Exercise Participants Evaluation Form for Anhydrous Ammonia Exercise Alaska General Seafoods Processing Facility - Ketchikan, Alaska September 13, 2007

Note: A total of twelve respondents provided input on the exercise evaluation form. These individuals and the remainder of the group participated in the exercise debrief immediately following the exercise.

1. Do you feel you were adequately prepared to perform your tasks/job as described in your local ER Plan or Response Guides?

Yes - 11

No - 1

N/A - 0

If not, in what areas do you think you need more training or experience?

- Departments need to work together more.
 - Always can have more training in all areas.
 - More time with the gas monitors (ammonia).
2. What "tools" or other information do you need in advance of an incident like this one that would help you fulfill your ER responsibilities better?
 - Where are the tools and equipment stored on KFD equipment.
 - Continuing a commitment of working with our resources and updating tools and info for any incident to be passed along to all.
 - More toys!
 - Estimating quantity on the ground/in the air.
 - Ear phones so I can hear cell/radio. When in noisy equipment, it was impossible to hear. Should check with industry on what their standards are.
 - Pre-plan of buildings with walkthroughs by personnel.
 - Weather conditions – every 3 to 5 minutes, more personnel from around the island.
 - Better areas to stage.
 - Weather info.
 - Resources.
 - Time.
 - Having monitors going right at the beginning, before moving people.
 - Table talk probable scenarios.
 3. List three areas where you think your ER section, group or team performed well during this exercise:
 - Decon
 - Staging
 - Patient treatment
 - Teamwork.

- Communication.
 - Resource use.
 - Comms went well (for a change)
 - Hazmat group interacted well with facility people.
 - Manpower kept me informed as resources became available.
 - Coordination with all entities on scene. Cooperation went very well. IC had everyone's attention and respect. Great leadership.
 - Entry teams, medical, safety, backup, support all seemed to be staged properly and worked well together.
 - Tried to keep entities that needed to be enlightened of the event updated when time was permissible.
 - Personnel aware of jobs.
 - Command executed clear concise orders.
 - Good use of sunglasses on a nice day!
 - Communications
 - Incident Commander
 - Identify the problem, plan of attack.
 - Responded safely.
 - Quickly establishing a triage sector.
 - No tags available – but quickly verbally triaged all patients.
 - Quickly deconned and treated (voice) patients.
 - Hazmat team excelled.
 - Safety standards met.
 - Did as told.
 - Monitored victims.
 - Monitored entry team.
 - Air decon
 - Search and rescue.
4. List three priority areas where you think the ER section, group or team needs improvement before your next exercise:
- More exercises working together, we were from different departments.
 - Communication – always
 - All group/team/section areas addressed appropriately and setup/used even in a simulation/more drills/scenarios to work out areas of concern.
 - Unified Command.
 - More drills.
 - All incident management tools 100% ready at all times.
 - Never assume a “piece of equipment” is where to report.
 - Listen for instructions.
 - Ensure info is passed on to DEC by dispatch.
 - Pre-plan all facilities of ammonia systems.
 - Pipes, valves, ventilation, escape routes, etc.
 - Check out best way to deal with chemicals before and after. Meet with facility reps on a regular basis.
 - Use air monitors on a regular basis to be ready to use in a moment's notice. Remember to perform calibration when monitors have been in contaminated environments.
 - Personnel need to complete assigned tasks and immediately report to Manpower.

- More personnel, more 1-hour bottles. Note: it takes time to fill one bottle at a time.
 - Weather updates.
 - Zone identification location.
 - Better control of patients.
 - Decon sector.
 - Make sure medical team is properly protected prior to triaging patients.
 - More manpower to assist with treatment.
 - No obvious hot, warm, cold zones were established.
 - Realistic delegation and tasking by Incident Command.
 - Communications.
 - Why pre-plan if there is no effective system to utilize them?
 - Work with monitors and radios/sections(?)
 - More responders to take on duties such as monitors of plume, taping Hazmat suits, etc.
 - Check with facilities, their evacuation plans, etc.
5. Please describe, comment or suggest items that will make future exercises more fulfilling for you.
- I feel strongly that the things to improve on an actual event are the small things like comms, patient care and transport. These items are almost always simulated or time compressed in order to accomplish the global exercise. Bad idea they are always the issues we will stumble on.
 - All areas/aspects of working with ourselves and resources fulfill me completely. It completes me!
 - This was a great training opportunity – next time we could concentrate on operations inside a facility.
 - Not off hand. This exercise was relevant for Ketchikan. Worked perfectly well for me.
 - More hands-on for all personnel, that all personnel are playing.
 - Logistically speaking, more players. We were short-handed. In a real incident, there would likely be a better response.
 - Stick to principles of ICS. More personnel. Front line apparatus responded and were on scene first, but personnel aboard were reluctant to engage in operation. Better to pre-arrange others staffed appropriate to respond.
 - Get everyone involved, all fire departments, Coast Guard, KGH, KPD, AST, etc., that's going to play a role.
 - Not so much simulating. Do the least amount of simulating as possible, doing like the real thing.
 - What about fire?

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APPENDIX D: Training Course Agenda

Safe Handling and Emergency Response to Anhydrous Ammonia

**Ted Ferry Civic Center
September 11 – 13, 2007**

Overview of Scheduled Events

- September 8, 2007
 1. Arrive in Ketchikan at 12:30 PM
 2. Meet with Ketchikan Fire Dept.
 3. Initial Visit at Fish Processing Facilities

- September 9, 2007
 1. One Technical Assistance Visit Fish Processing Facility
 2. Meet with Fish Processing Facility to Plan FX

- September 10, 2007
 1. Technical Assistance Visits to Fish Processing Facilities
 2. Solid Waste Handling Facility (NH₃ Release Demo Site)
 3. Meet with Fire Dept. to Complete FX Planning
 4. Setup for Training at the Ted Ferry Center

- September 11, 2007 – Ammonia Training Session 1
 1. Classroom Training
 2. Demonstrations and Exercises

- September 12, 2007 – Ammonia Training Session 2
 1. Classroom Training
 2. Live Ammonia Release Demonstration at the Solid Waste Facility
 3. PPV Demonstration

- September 13, 2007 – Functional Exercise
 1. Orientation to FX
 2. Conduct FX
 3. Decontaminate and Demobilize the Exercise
 4. Debrief FX at the Ted Ferry Center directly after Demob

- September 14, 2007 – Depart Ketchikan

September 11, 2007

Session one – Good Morning-Welcome - Ammonia Class Room Training & Demonstrations

8:00 AM

Getting to know each other

ADEC representatives – Background of the Ammonia and Chlorine Safety Project

Fish processors – Who is Represented?

Cities represented (Ketchikan area, Southeast Alaska, and Others) – Who is represented?

USCG – Who is represented?

Other federal and state agencies – Who is represented?

8:25 AM

What we will do in the next 3.0 days

Classroom Instruction and Exercises

Field Demonstrations

Training Exercise/Drill

What do you need/want from this training?

Rules to guide us and Orientation to Ammonia Training Student Workbook

8:45 AM

Begin Classroom Instruction on Ammonia

Exercise – See Anything Wrong Here?

Objectives of Ammonia Training

Exercise – Name the Elements, Compound and Chemical

Uses of Ammonia – Past, Present, & Future

Exercise – Team Competition

Properties and Characteristics of Ammonia

The Useable Stuff ~ Numbers to Remember

How is Ammonia Made?

The Recipe – Minor Chemistry and Physics Lesson

Hazards of Ammonia

How Do We Know Where It Is?

9:55 AM - BREAK

10:10 AM

Health Effects of Ammonia

Can This Stuff Hurt Me? How?

Health Effects... First Aid/Treatment

Exercise – Start your Emergency Medical Plan

Personal Protective Equipment (PPE)

PPE for three different “Operations”

What to use when

11:10 AM Break

11:20 AM

Emergency Response Hazard and Risk Assessment
Always Consider Protecting These Three
Hazards and the Risks Associated with Them
Chemical - Physical
Decision Making Process

Make Good Emergency Response Decisions
Exercise – Find the Hazards and Risks

12:00 Noon - Lunch

12:50 PM

Demonstration – Bottle Exercise
Key Characteristics of Ammonia
Core Things to Remember
Demonstration - Review Ammonia's Properties and Characteristics
Exercise – Measure Air Concentrations of Ammonia
Use Your Air Monitoring Equipment

2:00 PM Break

2:15 PM

Introduction to “Reading Ammonia Releases” – Know what and why It Acts like It Does!
Ammonia Release Formations
Four Formations to Remember
Ammonia will Burn – Video

3:15 PM

Evolution of an Ammonia Release
How Does NH₃ Act when it is Released?
Ammonia Release Studies
Videos tell the Stories
Phillips 66 Pooled Releases

~ 4:30 PM End of the Day – Enjoy your Evening! See You Here Tomorrow at 8:00 AM

September 12, 2007

Session two – Good Morning! - Ammonia Class Room Training & Demonstrations

8:00 AM

Discussion on Yesterday's session

What impressed you?

What stuck in your memory about Anhydrous Ammonia?

8:45 AM

Set up for Ammonia Release Demonstration

Coordinated with Municipal Agencies and ADEC

Location Ketchikan Waste Handling Facility

9:00 AM - Let's go to the Ammonia Live Release demonstration site at the Waste Handling Facility

9:30 AM - Live Ammonia Release Demonstration

Demonstrations to be Conducted

1. Open Air Anhydrous Ammonia Releases
2. Anhydrous Ammonia Tarp and Cover Recondensation Demonstration
3. Open Air Forced Ventilation Demonstration

~ 11:00 AM – Back in the Classroom

Debrief the Ammonia Live Release Demonstration

11:20 AM

In Depth Study of “Reading Ammonia Releases”

Continue Ammonia Release Studies

Risk Assessment of Each Formation

Review Ammonia Release Formations by Video

You Identify What is Happening

Videos Clips From Some or All:

Lawrence Livermore

Mapco Pipeline Release

Desert Tortoise

12:00 Noon

We Will Eat Here – Enjoy Your Lunch!

1:45 PM

Ammonia Spill/Release Actions
What-Works-Best-When
“Recondensation of Ammonia Vapor Phase” Explained
Where did the Cloud go?

2:30 PM Break

2:45 PM

Actual Incident Findings –Two Incidents
Lessons Learned

3:30 PM

Positive Pressure Ventilation
Demonstration - PPV

Air Decontamination and Outside Forced Ventilation
Fixed Facility Ventilation
Environmental Impact
Remember Ammonia is everywhere!

~ 5:00 PM- END OF DAY – Enjoy your evening

***For People not Attending the Functional Exercise –
Will You Please Evaluate This Course Now?**

5:15 PM Optional Review

Review of Course
Question and Answer Session on Ammonia
Core Response Strategies and Tactics – Essentials for Ammonia

6:00 PM- End of Day Two – Enjoy Your Evening!

11/21/04 – FX Orientation at 8:00 AM Here at the Ted Ferry Center
Conduct FX Commencing at approximately 9:00 AM

September 13, 2007 – 8:00 AM Functional Exercise Prep Session 3 – Good Morning!

Conduct FX Commencing at approximately 9:00 AM

Location is the Alaska General Seafoods Fish Processing Facility

8:00 – 8:45 Orientation to the Functional Exercise Conduct

Location is Ted Ferry Civic Center

Discuss Objectives and Ground Rules

Depart to Functional Exercise Commencement Locations

Functional Exercise

9:00 AM – 12:00 PM

~ **9:00 AM – Commence Functional Exercise**

~ **12:00 Noon – Termination of FX**

Decon – Demob - Restore ER Equipment to Ready Condition

~ **1:30 PM - Debrief and Evaluation**

Location is Ted Ferry Civic Center

~ **3:00 PM**

Complete Debriefing of Functional Exercise

Will You Please **Evaluate** the Functional Exercise?

~ **4:30 PM End of Our Work Together on this Project**

September 14, 10:00 AM – RE Warren Departs the Area