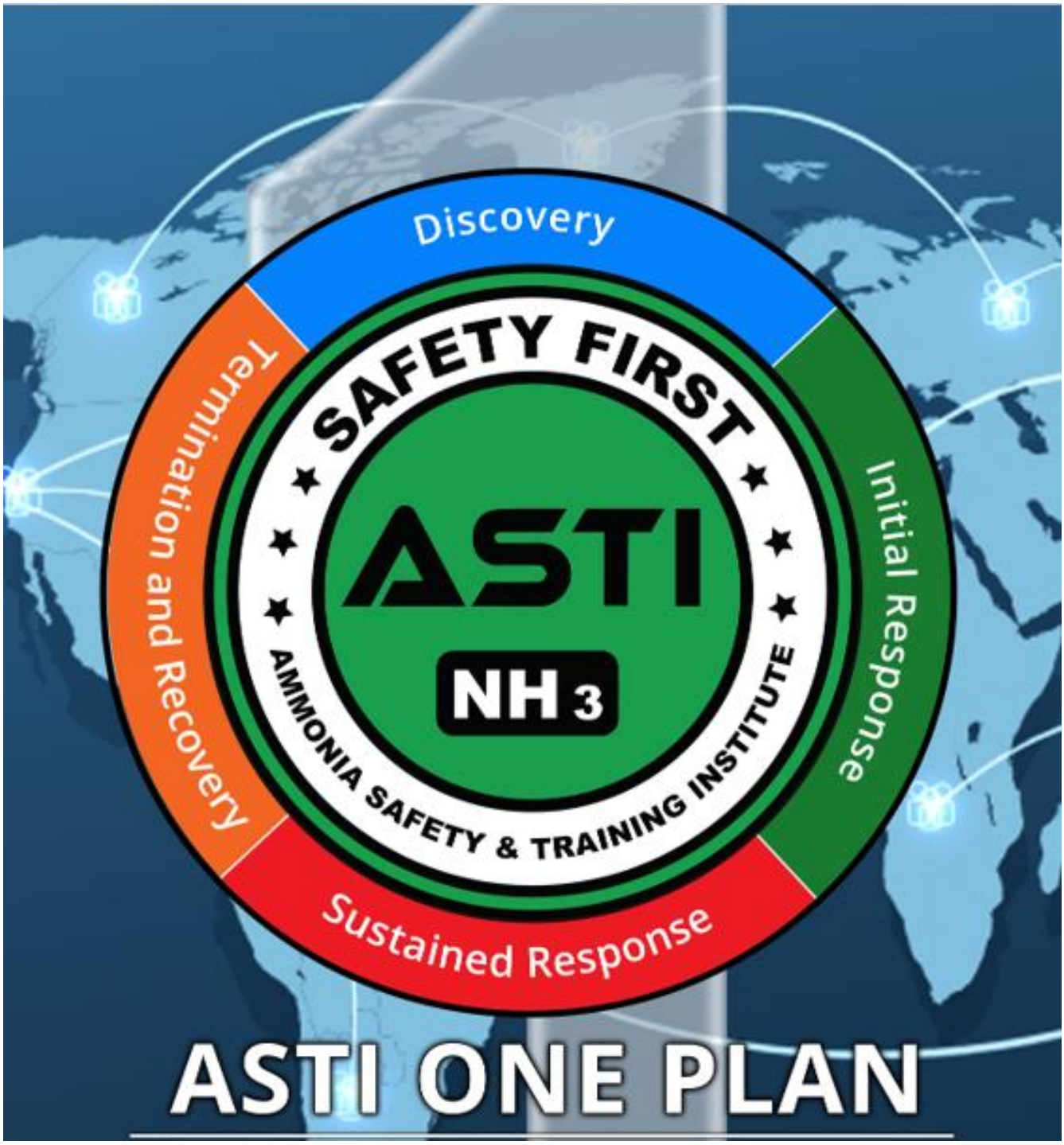


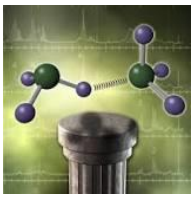
Part 1: ASTI One Plan Ammonia Response CONOPS Template

Use the federal One Plan system to integrate the state and federal emergergency response frameworks into an Ammonia Response Concept of Operations (CONOPS) template that local Authorities Having Jurisdiction (AHJ) use to create a local ammonia CONOPS that is supported by Tripod leaders from industry, government and public safety.

Table of Contents

ASTI Ammonia Response Concept of Operations (CONOPS)

Guidelines for enaging a local CONOPS that meets the expectations of the Federal, State, and local Emergency Response Framework as applied by the local Authorities having Jurisdiction (AHJ)



At Pacific Northwest National Laboratory and the University of Southern California, scientists determined that ammonia clusters are held together by classical linear hydrogen bonds.

Guiding Principle: Keep it SIMPLE and build upon cooperation, commitment, and collaboration between Industry, Government, and Public Safety Tripod.

The Common benefit of collaboration is the ability to expose teams to new ideas that lead to:

- Increased productivity. ...
- More fun. ...
  - Varied perspectives. ...
  - Improved relationships. ...
  - Innovative solutions. ...
  - More effective problem-solving. ...
  - Increased knowledge.

https://www.indeed.com/career-advice/career-development/collaboration-benefits

COMPLIANT	WORTHY	ENGAGING
FEDERAL, STATE & AHJ	TRIPOD ACCEPTANCE	SIMPLE WITH DEPTH
ONE PLAN, SERC, AHJ & RAGAGEP	NEW ENLIGHTNING INFORMATION	CREATE OPERATIONAL SELF SUFFICIENCY

The One Plan Ammonia Response CONOPS establishes a clear, accurate, and easy to understand compilation of emergency management logic that strengthens collaboration between local industry, government, and public safety.

Preface – ASTI One Plan Ammonia Response CONOPS

The recommendations identified within this document is a compendium of emergency management insights gathered from industry, government, and public safety by Gary Smith, CEO/Executive Director for the Ammonia Safety and Training Institute (ASTI).

Gary has over 45 years of experience as a firefighter, fire marshal, fire chief, and Assistant City Manager for the City of Watsonville in California. The Watsonville Fire Dept. served 25 industrial ammonia cold storage facilities with a combined use of over one million pounds of anhydrous ammonia as an efficient industrial refrigerant.

Gary also formed a strong working relationship with Cal-OSHA, Region 9 EPA, the Refrigerating Engineers and Technicians association (RETA), and the International Institute of All-Natural Refrigerants (IIAR).

In 1987 Gary worked with Doug Hill (CEO/President of Hill Brothers Chemical Company in San Jose to form the Ammonia Safety and Training Institute (ASTI) that was incorporated by the California Secretary of State in 1991.

In 2010 Gary led efforts for ASTI to achieve an OSHA Susan Harward grant to initiate 15 free Ammonia Safety Day training sessions for industry, government, and public safety throughout the U.S. The ASTI team has continued to build upon the 15 U.S. Safety days in the U.S. and with international Safety Days in Canada and Australia.

The ASTI website www.ammonia-safety.com provides an excellent summary of today's service level and staffing and leadership. The ASTI Board of Directors are veteran professionals from industry, government, and public safety that give tremendous support to the ASTI team for the continued focus to achieve the ASTI mission, vision, and goals with emphasis on collaboration, coordination, and solid professional relations with industry, government and public safety. The ASTI focus on ammonia industrial refrigeration, ammonia transportation, and agriculture has now expanded to support the ammonia/hydrogen fuels associations with their priority need for safety and emergency response readiness as we transition the world from carbon producing fuels to clean air hydrogen fuel for power production, and all forms of transportation fuels (as well as the current high-volume uses of NH_3). By 2030 the world will experience a huge turn-around in the damage produced by carbon pollution that creates the disastrous impact of global warming. The transition to ammonia/hydrogen is an idea that works... "All the forces in the world are not so powerful as an idea whose time has come" by Victor Hugo.

"My 45 years' of experience encompassed the development and evolution of the hazardous materials, emergency management, and safety requirements associated with the use of anhydrous ammonia. The most powerful phenomena that I have experienced is the power of a healthy Tripod relationship between industry, government, and public safety. The ASTI One Plan Ammonia Response CONOPS reveals the power of the Tripod to address the hazards, risks, and threats of ammonia.

ASTI Vision and Board Member Code of Conduct

1.1. ASTI Mission: Eliminate ammonia related accidents and injuries by promoting Prevention, Protection, Preparedness, and the One Plan.

1.1.2 Vision: Recognized world-wide as the preeminent training organization and major contributor leading to making ammonia the most safely managed hazmat in the world.

1.1.3 Tripod Collaboration with industry, government, and public safety (Tripod) to make ammonia the safest managed chemical in the world.

1.1.4 Motto: "Prevent them all or stop them small."

1.1.4 Goal: To be recognized as the trusted source for issues of ammonia emergency events that can be shared to improve overall safety and emergency preparedness. Utilize the ASTI One Plan and Tripod support to manage hazards, mitigate risks, and prepare for threats of chemical exposure with the best possible outcomes.

1.1.5 ASTI Member Conduct and Ethics for Board members, Staff, Affiliates (high level connection), and Associates (approved users of ASTI materials).

I. Selection of ASTI staff, board members, affiliates, and associates are primarily focused on their devotion to the ASTI mission, vision, and demonstrated conduct and ethics.

II. Avoid making an ASTI related claim of Tripod member failures, mistakes, or positions without attaining a well-vetted ASTI interpretation of the facts of the matter.

III. Attain collaborative and factual Tripod feedback before making a critical judgement of any chemical risks and threats.

IV. Do NOT promote myths and misinformation. Actively share the ASTI Myth busters' videos and lessons learned from misinformation and outdated concepts and beliefs.

V. Confidentiality is paramount when handling feedback from trusted Tripod sources, especially when investigating emergency or accident events. ASTI will use information to solve problems and improve Tripod strength.

Introduction and Content Overview

The idea that formed the Ammonia Safety & Training Institute (ASTI) began out of several catastrophic ammonia events that occurred in 1984. Gary Smith was the newly appointed fire chief of the City of Watsonville. Gary had worked as a firefighter for the City of Davis, Fire Marshal for the City of Manteca that only had a few ammonia refrigeration facilities.

Generally speaking, prior to 1984 the fire service was flying by the seat of their pants when responding to ammonia emergency events. This is true for all hazardous materials because the real perils of chemical use had not daylighted as a significant governmental need until the Bhopal disastrous chemical accident on the night of 2nd in December 1984 at the Union Carbide plant in India released

methyl Isocyanate pesticide that killed 3,800 people. This was followed by the Love Canal disaster that involved underground tank releases that created significant human and environmental health threats.

Within 6 months of my 25 years as a fire chief we faced a fire in a cold storage facility that was caused by an arc-flash. We couldn't stop the arc flashing that was occurring within the compressor room circuit breaker panel and as we stood by waiting for the power shut-down the main transformer did the same.

In the end we put the fire out but none of us (industry, government, and public safety) knew how to handle ammonia emergency events.

One week after the arc-flash fire I read an article in the Fire Engineering magazine that described how an ammonia cloud in a cold storage warehouse in Shreveport, Louisiana resulted in the death of Capt. Persey Johnson and caused seriously 3rd degree burns to his partner, Captain Pat Johnson. Percy and Pat were wearing Level A fully enclosed hazmat suits that were butyl rubber that immediately ignited when the flash fire occurred.

This sad and horrible accident was as a big surprise to industry, government, and public safety. The facts about the flammability of ammonia was not a part of the hazard threats that emergency managers and emergency responders considered as a concern.

In 1984 The Monterey Bay Chapter of the Refrigerating Engineers & Technicians Association www.RETA.com decided to have Chief Smith to daylight the ammonia flammability and aerosol/dense gas ammonia release hazard and risks threaten their national membership.

Douglas Hill, CEO biased information chemical Company and Watsonville Fire Chief Gary Smith decided to create the Ammonia Safety Training Institute as a non-profit corporation that is an unbiased and staffed with technical expertise that properly advocates for safety and emergency response effectiveness that is helpful to industry, government, and public safety. ASTI was incorporated in 1991 and has developed a global recognition as being a reliable and well educated to meet the challenges of their Mission and goals.

The evolution of ASTI over the last 40 years is in the Ammonia Response CONOPS

The ASTI One Plan Ammonia Response Concept of Operations is dedicated to the memory of the ASTI team members who have passed away after tireless commitment and heart-felt dedication to the ASTI mission, goals, and professional ethics. They are the leaders that worked hard work and used their professional wisdom and ethics to make ASTI a great and well-trusted organization. They are the originators that empowered the ASTI team to facilitate Tripod collaboration, coordination, and commitment to make ammonia the safest managed hazmat in the world!

Please see our website at www.ammonia-safety.com for the memorial summary the following ASTI contributors: Doug Hill, Jim Ennis, Anders Lindborg, Troy Baker, Tom Alt, Pat Johnson, and Percy Johnson who paid the ultimate price for the rest of us to improve our CONOPS intelligence, team believe and support the ASTI motto:

"Prevent Ammonia Emergencies or Go Early and Go Big to Stop them Small"

The ASTI CONOPS support is divided into a three-Part series of documents. The Part 1 is the lead document that is published for your use. Part 2 and 3 of the CONOPS will be available as on-line downloads available to you at the ASTI website www.ammonia-safety.com

Part 1: ASTI One Plan Ammonia Response CONOPS

Part 1 Provides a template that guides the local Authority's Having Jurisdiction (AHJ) to create a local Ammonia Response Concept of Operations (CONOPS) asupported by federal, state, and local Tripod leaders (industry, government and public safety).

Part 2: ASTI One Plan Ammonia Response CONOPS

Part 2 provides a Cemical Research and Development Agreement (CRADA) Report that detailed description of the emergency planning information that ASTI provides Tripod Leaders and AHJ Organizations support when Engaging the CONOPS.

Part 3: ASTI One Plan Ammonia Response CONOPS

Part 3 provides details about One Plan Playbooks and the instructional materials that support local Authorities Having Jurisdiction (AHJ) and Tripod (industry, government, and public safety organizations.

Definition of Commonly Used Terms within this Document

Note: The definitions are aligned with the way the terms are used to describe the CONOPS emergency management information provided herein. The terms may take on a slightly different definition for other types of documents.

ALOHA Plume Model: https://www.epa.gov/cameo/aloha-software The Computer-Aided Management of Emergency Operations (CAMEO®) software suite is a system of software applications designed to help communities plan for and respond to emergencies. It also supports regulatory compliance by helping users meet chemical inventory reporting requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as Title III of the Superfund Amendments and Reauthorization Act (SARA Title III).

ASTI One Plan Ammonia Response CONOPS: The One Plan CONOPS template is based upon the **"Prevent them all or stop them small"** strategy. The facility employer's team of trained and equipped operators, command team members, and emergency responders (facility and public safety) use One Plan standards of operation and industry best practices to safely and quickly by engage when an early warning detection system alerts operators of high pressure, odor of ammonia, or a deviation from normal operations occur. Trained and equipped operators use Past Signals safeguards to safely stabilize the ammonia Event. The following stages of response require a "**think smart, go early, big, and prepare to quickly contain and control an ammonia emergency event. It all starts with quick notification of local (regional),, state, and federal notifications services that are likely to be needed within 30 minutes**.

If the Event is not stopped during the **Discovery** stage the command team will utilize Emerging Signal mitigation safeguards to address Top Event initial response stage. The first-due Facility and public safety-first responders are usually hazmat trained at the "Operations Level" qualified. During the **Initial Response** they need the support of the facility command team and system operators to understand how to proceed with the response.

The public safety incident Commander may engage a **Sustained Response** and request a hazmat Tech-level command team of responders who are trained and equipped to enter an ammonia hot zone to accomplish and Incident Action Plan to control and contain an ammonia release.

The One Plan **Termination and Recovery** stage will be declared by the Public Safety Incident Commander when the incident is stabilized and ready transferred to the facility command team leader.

Every loss of containment Event or Top Event Emergency should be debriefed and the emergency plan and the prevention, mitigation, and preparation lagging and Emerging Signalss are updated for future emergency plan and operations improvements.

Authority Having Jurisdiction (AHJ): A term defined to mean the organization, political subdivision, office or individual charged with the responsibility for administering and enforcing the provisions that relate to the contents of the Ammonia Response CONOPS.

Bow Tie: The bow tie process safety methodology is a diagram that shows how a loss of hazard containment triggers a threat-line event that can be operationally controlled by pre-set safety measures, located on the left side of the bow tie. If the safety measures are not successful the right side of the diagram shows pre-set risk control mitigations that serve to minimize the threats and eventually contain and control the event.

CERCLA - EPA's on-scene coordinators (OSCs): are the first-line workforce responsible for implementing the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and for overseeing on-site emergency response and removal actions at hazardous waste sites. They are environmental engineers or scientists who apply their professional knowledge to response and removal actions that are consistent with the requirements of **CERCLA** and the National Contingency Plan. OSCs are required to coordinate, review, monitor, and direct the work at sites—from site discovery to completion of the time-critical removal action or emergency response activities to cost recovery activity. They provide coordination and support to local, state, and federal partners during responses via assessment, monitoring, evaluation, and response assistance.

ChemResponder: Accessible from any device. Access ChemResponder through the Web and through the ChemResponder app on smartphones, and tablets. Rapid data collection and sharing. Rapidly collect and share chemical data, gas meter readings, calorimetric results, observations, and situation reports (SITREPs) to support faster, more accurate incident characteristics. https://www.fema.gov/sites/default/files/2020-07/fema_cbrn_chemresponder_fact-sheet.pdf

Concept of Operations (CONOPS): explains in broad terms the intent of the Emergency Operations Plan (EOP). The CONOPS begins with a clear picture of the sequence of actions for first responders during the **Discovery** and **Initial Response** stages (direction and control activities, alert and warning processes, and a continuity of operations that can expand to meet the challenges of a **Sustained Response** with planned emergency response actions that manage complex emergency events as defined in the National Incident Management System (NIMS). https://www.fema.gov/emergency-managers/nims The Public Safety command team must be capable to properly utilize their authority to engage a division of responsibilities and a sequence of actions (before, during, and after the incident) to order resources from those who can fulfill the request (based upon mutual aid, unified command. Incidents that become proclaimed as local, state, and/or federal disaster events must follow the State and Federal framework of response.

CRADA: A Cooperative Research and Development Agreement (CRADA) establishes a cooperative relationship between a federal laboratory and its collaborator(s) for the purpose of advancing research and development and generating new intellectual property (IP).

EPCRA: Emergency Planning and Community Right To Know Act: https://www.epa.gov/epcra

Essential Support Functions: Emergency Support Functions (ESFs) provide the structure for coordinating Federal interagency support for a Federal response to an incident. They are a way to group

functions that provide federal support to states and federal-to-federal support, both for Stafford Act declared disasters and emergencies and for non-Stafford Act incidents. https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response

Hazard Zone Event: (the green, left side of the Bow Tie) is something within a Hazard Zone such as the ammonia system upset e.g., leak or overpressure, or other operational hazards that **present a risk** of injury, exposure, property or environmental damage. The system operators should be trained and equipped to accomplish system controls that would stabilize the negative Event **impact if control barriers failed to immediately contain and control the Event.**

Interagency Modeling and Atmospheric Assessment Center (IMAAC): The IMAAC serves as the single point for coordinating, producing, and disseminating atmospheric dispersion and water modeling prediction products representing the federal government during an actual or potential incident. https://www.fema.gov/sites/default/files/documents/fema_imaac_fact-sheet.pdf

IPAWS: An Alerting Authority that applies for authorization to use the Integrated Public Alert and Warning System (IPAWS) to send emergency alerts and warnings to the public, is designated as a Collaborative Operating Group or "COG." There are currently numerous types of COGs affiliated with IPAWS varying in size, structure and governance styles. https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/public-safety-officials/sign-up/registration

RETA Certified operator: RETA certification requires meeting eligibility criteria and demonstrating knowledge of industrial refrigeration concepts, principles and practices. RETA certification exams and other requirements assess competencies in the realm of industrial refrigeration operation. RETA training materials provide the fundamental knowledge needed to understand these concepts and operating principles. https://reta.com/page/certification

Tripod Leaders from Industry, Government, and Public Safety: The success of the Ammonia Response CONOPS depends on coordination, collaboration, and joint respect for the authorities that manage industrial operations, governmental oversight, and public safety capability to meet the command and control for ammonia emergency top events.

Leading and Past Signalss: Understanding the distinction between leading and Past Signals is essential for achieving the Bow Tie response by effectively employing control and recovery barriers based upon experience and training will strengthen the lagging (left side of the bow tie) and Emerging Signalss that identify mitigations on the right side of the bow tie.

Loss of Primary Containment: begins the bow tie threat line that may continue through the preventative safeguards to become an emergency event that requires the command team to consider emerging signals for an Incident Action Plan that will contain, control, and mitigate emerging impacts.

NIMS training program: information is detailed at https://www.fema.gov/national-incident-management-system ASTI recommends that all command team members take the free on-line ICS 100

and ICS 300 course. This is the baseline knowledge needed to work effectively with the public safety command team members. The ICS 800 course is very appropriate for a corporate emergency manager.

Frequently Asked Course and Training Questions

NIMS Core Curriculum Courses are comprised of ICS, NIMS, and All-Hazards Position Specific (AHPS) courses detailed below:

ICS and NIMS Courses – click on the ICS course title for access to the training.

- ICS-100: Introduction to the Incident Command System
- ICS-200: ICS for Single Resources and Initial Action Incidents
- ICS-300: Intermediate ICS for Expanding Incidents
- ICS-400: Advanced ICS for Command and General Staff
- IS-700: National Incident Management System, An Introduction
- IS-703: NIMS Resource Management
- IS-706: NIMS Intrastate Mutual Aid – An Introduction
- IS-800: National Response Framework, An Introduction
- G-191: Incident Command System/ Emergency Operations Center Interface
- G-402 Incident Command System (ICS) Overview for Executives/Senior Officials
- E/L/G-2300 Intermediate Emergency Operations Center Functions

NFPA – National Fire Protection Association: See Appendix II for modes of operation.

NRT – National Response Team: https://www.epa.gov/emergency-response/nrt-1-hazardous-materials-planning-guide

NFPA 470: Hazardous Materials/Weapons of Mass Destruction (WMD) Standard for Responders

OPP: One Plan Playbooks (click on the picture below and a video will appear) **response** logic that assures

operator and responder readiness is to engage the four stages of response: **Discovery, Initial response in the first 30 minutes** of a LOPC Event and **Sustained Response and Termination stages:** that count on emergency responders Technician skills to safely engage command wisdom and tech-responder skills to implement Incident Action Plan objectives to containment and control emergency Events.

Past Signals (lessons learned) and Current Emerging Signals: Understanding the distinction between Past Signals (lessons learned) and Current Emerging Signals is essential for achieving effective bowtie response to Events and Top Events. Employing Preventative Safeguards based upon experience and training will strengthen the ability to utilize Emerging Signals to contain and control threats.

PMPRR: – One Plan tool kit: Prevention, Mitigation, Preparedness, Response, and Recovery

System Upset: An ASTI term that best described an ammonia release Event that can be safely contained and controlled by a trained and properly equipped Operator (preferably a RETA certified Operator) who will use prescribed system control measures to stabilize the ammonia release.

Response and Termination stages that count on emergency responders Technician skills to safely engage command wisdom and tech-responder skills to implement Incident Action Plan objectives to containment and control emergency Top Events.

Task Book: The position task books are a key component of the qualification process for facility emergency response team positions e.g. Emergency Event Supervisor, Lead Responder, Notification Unit Leader, and Evacuation Group Supervisor. The Task book provides an observable, measurable, and standardized means to evaluate and document trainee proficiency; similar to the National Wildfire Coordinating Group Position Task Book system: https://www.nwcg.gov/training/nwcg-position-task-books-catalog

Tenet: A tenet is a principle or belief honored by a person or, more often, a group of people.

https://www.vocabulary.com/dictionary/tenet#:~:text=A%20tenet%20is%20a%20principle,often%2C%20a%20group%20of%20people. **The One Plan Ammonia Response CONOPS Appendix II provides 18 Tenet Topics** that will be linked to doctrine and training materials that support the decision of the AUJ Tripod participants as they consider adoption of the proposed Tenet topic. **Appendix II** provides a summary of the Tenet topics that are supported with key questions and summary thoughts that would support the AHJ when making the final decision regarding local response protocol.

U.S. Department of Homeland Security: Federal Emergency Management Agency, available at https://emilms.fema.gov/IS0363/groups/15.html . To provide a coordinated framework for organizing the development and delivery of these activities, the 32 core capabilities are grouped into five mission areas. Grouping capabilities into mission areas ensures that related activities are integrated and provides efficiencies when planning, organizing, equipping, training, and exercising critical tasks, as illustrated by Figure 3. The five missions outlined in the National Preparedness Goal are:

- **Prevention**—prevent, avoid, or stop an imminent, threatened, or actual act of terrorism.
- **Protection**—protect U.S. citizens, residents, visitors, and assets against the greatest threats and hazards in a manner that allows national interests, aspirations, and way of life to thrive.
- **Mitigation**—reduce the loss of life and property by lessening the impact of future disasters.
- **Response**—respond quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of a catastrophic incident; and
- **Recovery**—recover through a focus on the timely restoration, strengthening and revitalization of infrastructure, housing, and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of our communities affected by a catastrophic incident.

CONOPS Engagement requires Tripod (industry, government and Public safety) commitment

Note: The ASTI One Plan Ammonia Response CONOPS information is available electronically if you contact asti@ammonia-safety.com , 831-761-2935, or www.ammonia-safety.com .

Summary Expectations of the One Plan Ammonia Response CONOPS.

Plan

Train to your Plan

- One Plan four stages of Response.
- Facility Action and Emergency plans
- Public safety Area Plan
- State and Federal Framework
- OSHA Safety and emergency response
- IIAR Critical task readiness
- Process Safety & Risk Management Plans
- FEMA five levels of Complexity and ChemResponder situation status.
- EPA One Plan and CAMEO - ALOHA plume modeling
- CCPS/AIChE Bow Tie.
- NFPA - Modes of Ops.

Do

Tripod Collaboration

- Set the facility command team for clipboard readiness to dispatch and engage facility and Public Safety first response to FEMA complexity Level 5, 4, ad 3 events.
- Critical task readiness for the first 30 minutes readiness during Discovery and Inital Response
- Go smart, go early and go big to operational stabilize the primary loss of ammonia containment
- Use Bow Tie diagram to set preventative and mitigative safeguards
- Hazard Zone response readiness with ICS 215a Hazard Assessment.

Act

Tripod Cooperation

- The Authorities Having Jurisdiction need to work with local Tripod leaders to Set up a local area Ammonia Response CONOPS by working.
- Notification procedures need to be clear and timely in order for local public safety support.
- Level 3-2-and 1 Complexity requires advanced knowledge, e.g. ASTI One Plan Playbooks.
- Set up year-round training plans that strengthen the on-going AHJ CONOPS.
- Perform Tripod tabletop exercises.
- Address all 20 Tenets in the Appendix II

TENET 1. Understand the 5 links between the AHJ and State/ Federal CONOPS Framework.

Federal Emergency Plan

Complexity Level 1 - 2 - 3

Note: See Page 35 for the FEMA five (5) Complexity Levels.

LOCAL AHJ CONOPS

Complexity Levels 3 – 4 - 5

I.C. and local Emergency Manager request the Mayor or County Administrator to declare a local Disaster Response.

3

Notify state and federal response early and go Big to address Complexity Level 1, 2, and 3 Top Events with One Plan Response.

Local AHJ Area Plan, Regional, State, SERC Federal ESF 10, and FEMA's IPAWs & ChemResponder support.

5

Local Public Safety AHJ/LEPC/SERC

Working Group for FEMA Complexity Levels 2 and 1 Response utilizing the One Plan Integrated Contingency Plan Response Logic e.g.

2

State & Federal Support

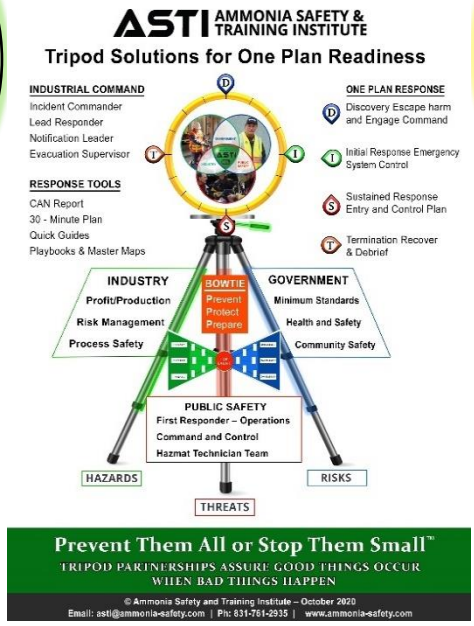
Complexity Levels 5-4-3

EPA - CAMEO Aloha

FEMA - NIMS &IMAAC ChemResponder,

IPAWS - HYSPLIT

DHS - Priority Telecommunications



Public Safety I.C. Requests Regional mutual aid Unified Command with on-scene coordinators.

Ammonia Emergency CONOPS Based Upon Area Plan & One Plan.

4

National Response Framework - LEPC, SERC, FEMA/EPA Complexity Levels 1 thru 3 Top Events Begins and ends with thePublic Safety Authority Having Jurisdiction (AHJ) Prevent, Perpare, Respond, Recover and Debrief

PROTECTING

COMMUNITY,

WORKERS

RESPONDERS

ENVIRONMENT

& PROPERTY

1

Local & Regional Events

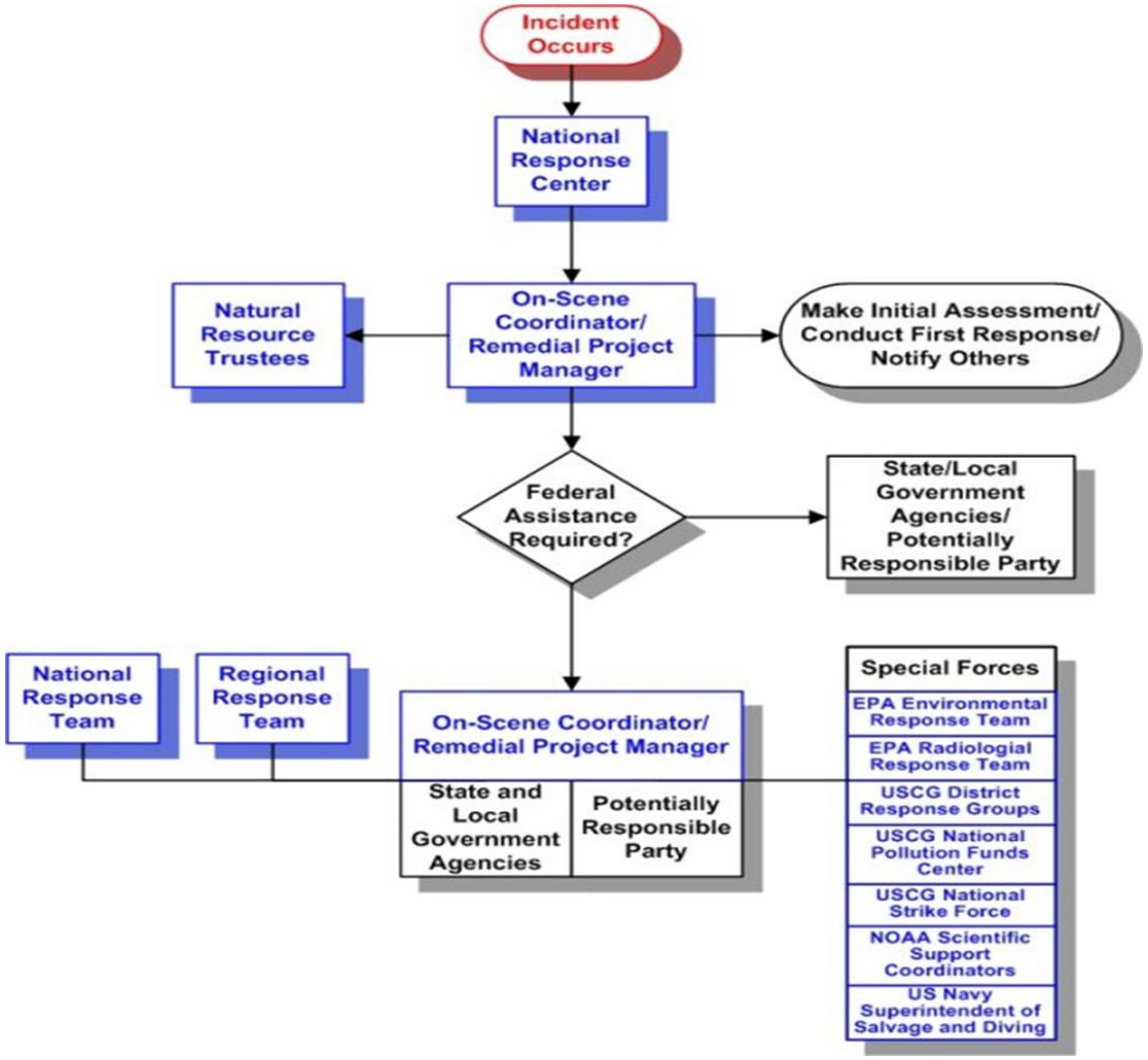
Prevent all or Stop Small

Notification to local AHJ, state, and potential federal federal ESF resources.

Dispatch using FEMA 5 & 4 Complexity Event levels

State and Federal Framework

Local Authority Having Jurisdiction



CONOPS Diagram (next page): ASTI Training Guidance, Response Plans, and Column and Response Framework.

Left Column 1: ASTI's 40 Years of ammonia training and emergency planning is now supporting ASTI private sector Associates with state-of-the-art training information. ASTI is working on reducing the time impact of compliance training with a Year-Around training plan that builds Tripod capability with innovative tabletop and training plans that comply with the latest RMP requirements.

Middle Column 2: The One Plan based Playbooks provide the local facility with an on-line and paper version readiness to address Discovery, Initial Response, Sustained Response and Termination stages of response. The Tripod is that center of the CONOPS puzzle because it serves to bring industry, government, and public safety to a jointly supported system of ammonia emergency response. The local training plan and dispatch system is supported with the FEMA five levels of complexity.

Right Column 3: The Ammonia Response CONOPS is designed to be compliant with the federal and state **framework** expected from the local response readiness of ammonia emergencies

ASTI Mission Based Products and Services Offered to the Tripod

Colum n1

Associate Compliance Training for Ammonia Technician and Operations Training for Ammonia System Operators and Responders

Initial 24 Hour certification and 8 hour Refresher

Colum n 2

One Plan Playbooks designed for a facility to address the four stages of response – Discovery, Initial Response, Sustained Response and Termination/Recovery as guided by within their local CONOPS.

Column 3

ASTI's Recommended Ammonia Response Concept of Operations creates an opportunity for the Local Authority Having Jurisdiction (AHJ) to address the key elements of risk management and emergency response that is based upon the federal, state, and local AHJ

Emphasis on local **Tripod coordination and communication** with Regional EPA, OSHA, AHJ, SERC & LEPC for **operations** and **emergency response** options.

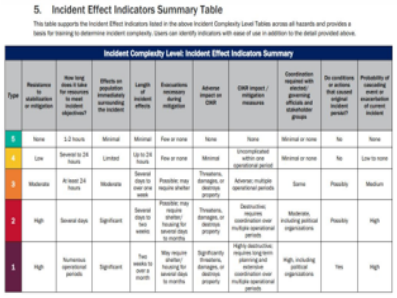
ASTI Training: TTX, Safety Days, 32 Hour, Ammonia Energy, Train the Trainer – Global delivery.

Year around training plan

Advanced PPT that links to instructor skill to engage the class with support rather dependence on

ASTI Tripod Diagram reveals the value of collaboration and coordination when addressing safety and emergency response readiness.

Strengthening the Tripod logic yields results that link to the core values, mission, and goals of ASTI.



Homeland Security DHS, CSAC), CRADA. Report and FEMA, ICS , IMP and IPAWS support.

EPA RMP, PSM, and EPCRA support

OSHA safety and IIAR & RETA SOPs

ASTI Ammonia Response Concept of Operations

CONOPS Tenet 1, 2, and 3

T-1: Power of the AHJ	**T-2: Sustained Response**	**Tenet 3: How to Start**
CONOPS Pages 1-18	**CONOPS Pages 19-22**	**CONOPS Pages 22-24**
Do you know the power of the local Tripod of Authority's Having Jurisdiction (**AHJ**) and the **LEPC**? **How is a local Tripod approved Ammonia Response CONOPS valuable** for local and regional Tripod Response?	**What steps should you take to engage an Ammonia Response CONOPS** with the local Authorities? Having Jurisdiction (AHJ). ASTI and our Associates can help: **If your efforts do not first succeed work harder and dig deeper to attain a Tripod agreement.**	**Why is PMPRR** important? **Understand how ASTI and our Associates** can help you with **training, and emergency planning advice.** **We recommend Year-around training - monthly** small bites to build and sustain the CONOPS?

30 Min Plan – First 30 Minutes

AHJ CONOPS CHALLENGE TENET 1- The Power of the Tripod AHJ CONOPS - Understand how the 5 FEMA Complexity Levels (page 35) link to the the local, state, and federal emergency response framework.

- **local Tripod AHJ CONOP, Local Emergency Response Committee. (LEPC)** https://www.epa.gov/epcra/local-emergency-planning-committees
- **The State Emergency Response Commission / Federal CONOPS Framework.** https://www.epa.gov/epcra/state-emergency-response-commissions
- **The National Response Team Framework.** https://www.nrt.org/

AHJ CONOPS Discussion: **Address the T-1 Power of the AHJ questions on page 17.** conditions are exceeding the "operating window" and threatening to enter the "design window" (see page 19 for more details).

AHJ Comments:

Page 10: **Concept of Operations (CONOPS):** **Discuss** the "system operators" role as the emergency response challenges to stabilize system and hazard zone preventative safeguards as a pre-event (day-to-day) chore. Also discuss hoe the operator's ability to safely engage system controls will reduce the life safety risks and threats during the Discovery and Initial Response stages of response.

AHJ Comments:

Discuss the value of a Conditions – Actions- Needs situation status report, and the on-going connection with facility operational coordination with the public safety response team.

Page 8: Discuss How the Plan-Do-Act process yields an effective Concept of Operations when you "Train to your Plan", Use Tripod collaboration and coordination, and when the Tripod relationship is cooperative and responsive to actions that fall within the AHJ CONOPS.

AHJ Comments:

Page 15 Review the five links between local (AHJ) authority and the response.

Does your understanding improve the value of the Tripod local, state, and federal response expectations?

AHJ Comments:

TENET 2. AHJ recommended method to adopt the One Plan Emergency Response CONOPS.

CONOPS Pages 19-22

What steps should you take to engage an Ammonia Response CONOPS with the local Authorities? Having Jurisdiction (AHJ).
ASTI and our Associates can help:
If your efforts do not first succeed work harder and dig deeper to attain a Tripod agreement.

Note: Go to Appendix III for more information on how to deal with the challenges of implementing the Tenets Goals Your questions and feedback to the ASTI AHJ team that should be considered when developing their local Ammonia Response CONOPS.

The Federal and State **frameworks acknowledge that the local Authority Having Jurisdiction (AHJ)** will address the local safety and emergency response readiness CONOPS.

Planning to Deliver Capabilities: The coordination of preparedness activities is set forth by the National Planning Frameworks (NPFs). These documents provide a methodology for engaging the whole community and synchronizing preparedness efforts. There is an NPF for each mission area: prevention, protection, mitigation, response, and recovery. Each describes the strategy and doctrine for delivering core capabilities. The **National Prevention Framework** details how individuals and government agencies at the state, local, tribal, territorial, and federal levels should respond to information about imminent threats to the homeland. **The framework offers guidance** on how to interrupt, deter, avert, or otherwise prevent an act of terrorism by: **describing the core capabilities** needed to prevent an imminent act of terrorism; **aligning key roles and responsibilities** to deliver prevention capabilities in time-sensitive situations; **describing coordinating structures** that enable all stakeholders to work together; and laying the foundation for operational coordination and planning that will synchronize prevention efforts with the **whole community**.

STEP 1: **Review the local Hazardous Materials Area Plan** adopted by the public safety local Authorities Having Jurisdiction (AHJ). **Contact your city and/or County local emergency manager to join the AHJ** Tripod team. They will help the team understand the local and/or regional hazmat status. Investigate the value of building an Ammonia Response CONOPS with the LEPC, and/or State Emergency Response Commission (SERC). Open the following web-link https://www.epa.gov/epcra/what-epcra for details about how to find your SERC and LEPC.

The Tripod team should develop a **summary of their findings** and then **set a meeting with the local authorities having local, state, and federal** (EPA Regional office) jurisdiction. **The AHJ meeting agenda** explain how AHJ can adopt a local Ammonia Response Concept of Operations.

CONOPS Goal: Set up an AHJ CONOPS development team: The AHJ should select at least one leader from industry, government, and public safety to work as a Tripod team to initiate the **following four steps to engage a local CONOPS**.

The AHJ Tripod team should establish a training plan that shows how the federal, state, and local leaders from industry, government, and public safety work together with a nationally recognized template for an Ammonia Response CONOPS. The CONOPS guidance is designed to motivate local Tripod cooperation, collaboration, and on-going communications to engage their local version of an Ammonia Response.

1. Train to your Plan for compliance that focuses on the local CONOPS emergency Plans

2. First 30 Minutes Emergency Action Plan that empowers Operators to stabilize the system for responder safe engagement.

3.Command & OPS Task Books that cover the Awareness, Operations, Technician, and Incident Command.

4. Clarity and compliance to RMP, PSM, & EPCRA training requirements e.g., TTX, Notification drills.

5. facility self-sufficiency is the goal of Compliance traing and Tripod strength. ASTI and Associates engage and certify facility One Plan & Tripod success

CONOPS (Part 1)

Ammonia Response CONOPS: Tripod use of the FEMA levels of complexity guided by Authorities Having Jurisdiction (AHJ)

Link to the State and Federal One Plan response Framework to local AHJ and facility CONOPS.

CRADA (Part 2)

Coperative Research and Development Agreement between DHS Chemical Security Assessment Center and ASTI.

ASTI Ammonia CRADA Report that supports the Federal, State, and Local CONOPS.

PLAYBOOKS (Part 3)

ASTI One Plan Web-App sets up the EPA One Plan four stages of response for each Hazard Zone in their facility

Set facility hazard zone(s) to address risks, threats, and containment and Control Options.

The AHJ should consider meeting with their local area LEPC and SERC to ensure that the local CONOPS is in sync with regional, state, and federal hazmat expectations.

STEP 2:

Contact ASTI at www.ammonia-safety.com or call 831-761-2935 for support in developing a local Ammonia Response CONOPS. ASTI is a non-profit organization that provides ammonia training with industrial ammonia users, governmental agencies, and public safety responders. ASTI performs Safety Days and Tabletop exercises throughout the U.S. and Canada that reveal the critical information associated with Ammonia Response CONOPS that complies with the new Risk Management emergency Tabletop training and notification requirements.

Tenet Comments:

STEP 3:

A Tenet is a principle, belief, or doctrine generally held to be true; especially one held in common by members of an organization - https://www.merriam-webster.com/dictionary/tenet# The following Tenet summaries are designed for AHJ consideration to accept, edit, or substitute for a better Tenet option. Each TENET will also have one or more goals that should be considered by the AHJ when adopting their version of the TENET.

AHJ CONOPS CHALLENGE TENET 2

Question: Is there a way that the AHJ could better utilize State and Federal resources to enhance the Complexity 3 event so that the need for a Complexity 2 or 1 hazmat challenge is reduced?

Hint: Use of FEMA ChemResponder and/or IPAWS (for Situation Status and community emergency information reports as requested by the local the Incident Commander approves. Also a pre-event agreement that engages "Special Forces" - See federal "Essential Support Functions" https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response

Tenet Comments:

Question: to ensure that you understand the opportunities and connections between the local AHJ resources and potential links to State and federal frameworks?

Do you have a link with your local LEPC and SERC leadership to ensure that your adopted CONOPS is in proper alignment with the State and Federal expectations?

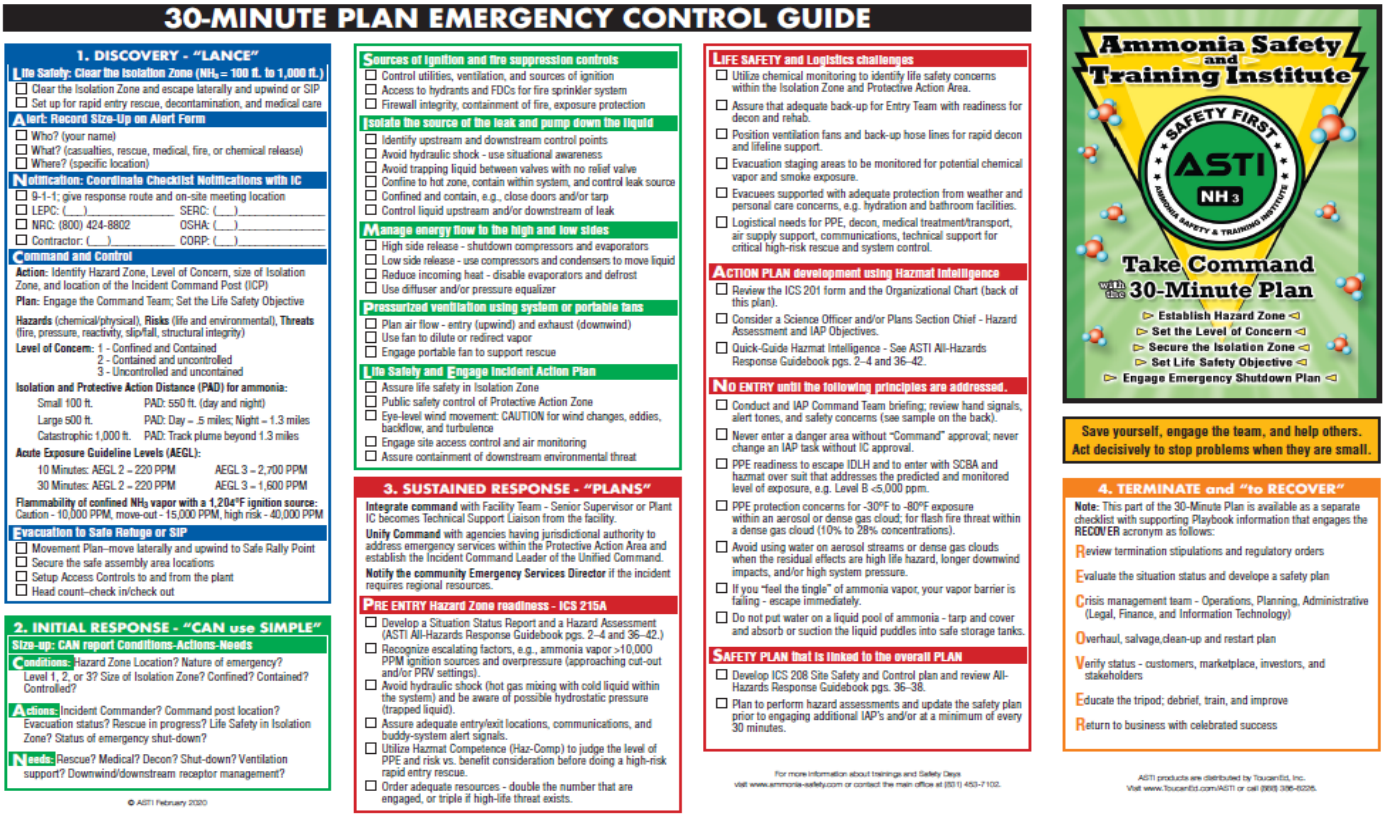
Tenet Comments:

TENET 3. One Plan Response Logic: "Prevent them all or stop them small" Strategy

The FEMA and EPA five – Point PMPRR response logic includes compliance regulatory support provided by CERCLA, RMP, NIMS/ICS, NFPA, CCPS, OSHA-PSM and HAZWOPER, EPA -EPCRA, NRT, State, and local hazmat area plans.

ASTI's 30 Minute Plan aligns with the facility One Plan four stages of response. The 30-Minute Plan Checklist can be operationally connected to the ASTI One Plan Playbooks that support operators and responders' ability to engage the four stages of emergency response for each Hazard Zone within their facility. The Blue and Playbooks align with 30 Minute plan Discovery checklist. The same checklist to Playbook logic applies to the **Green CAN report and Initial Response, Red Sustained Response, and Orange Termination/Recovery.**

https://one-plan.org/



Each Hazard Zone within a facility would have the four stages of One Plan Response support.

Go to the ASTI website store (Toucan Ed) for purchase 30 Minute Plans. https://toucaned.shop/collections/asti

Each One Plan stage of response has a 30 Minute Plan checklist items that are summarized with one sequential string of acronyms as follows: 30-Minute Plan **LANCE CAN do SIMPLE PLANS to RECOVER.**

Discovery: **Early Detection and Mitigation of loss of hazard containment events can** be set automatically e.g., pressure cut-outs, relief valves, ventilation system, and a computer system control logistics option that allows a trained operator to stop or significantly reduce the threat level of an ammonia Event.

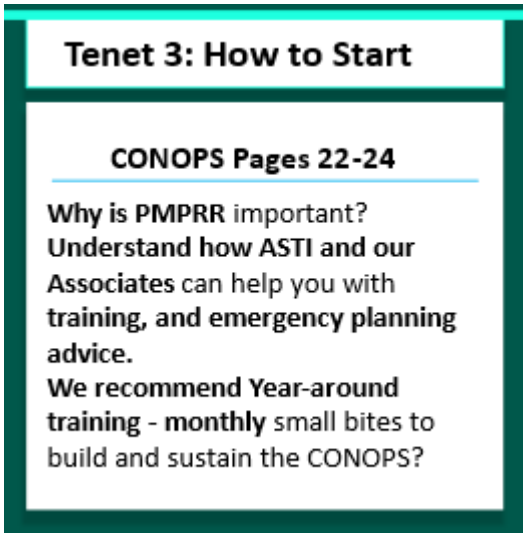
Some local and/or State governmental AHJ's require immediate notification of any ammonia release upset Event. The early report of an ammonia system upset to local 9-1-1 will likely dispatch a unit to be available to support the containment and control needed to stabilize a system upset event.

Initial Response **Top Event emergency** requires OSHA First Responder Operations certification for operators and responders who work outside of the incident hot zone to engage control mitigations that stabilize the system upset.

CONOPS Goal: The AHJ should decide the timing and extent of the notifications that must be accomplished for local, state (that state specific reporting terms for loss of ammonia containment) and federal requirements (loss of 100 pounds of ammonia over a 24-hour period of time).

The 30-Minute Plan continues during the Sustained Response Stage. The 30-minute logic would apply to each Incident Acton Plan (IAP) applied by the Incident Commander. The safety considerations for entry into a Hot Zone is to complete the IAP objective tasks and the retreat to decontamination and rehab within the 30-minute overall time frame. The I.C. and Safety Officer will establish the IAP safety objectives and may select a less than 30-minute entry plan.

One Plan Ammonia Response Tenet Challenges



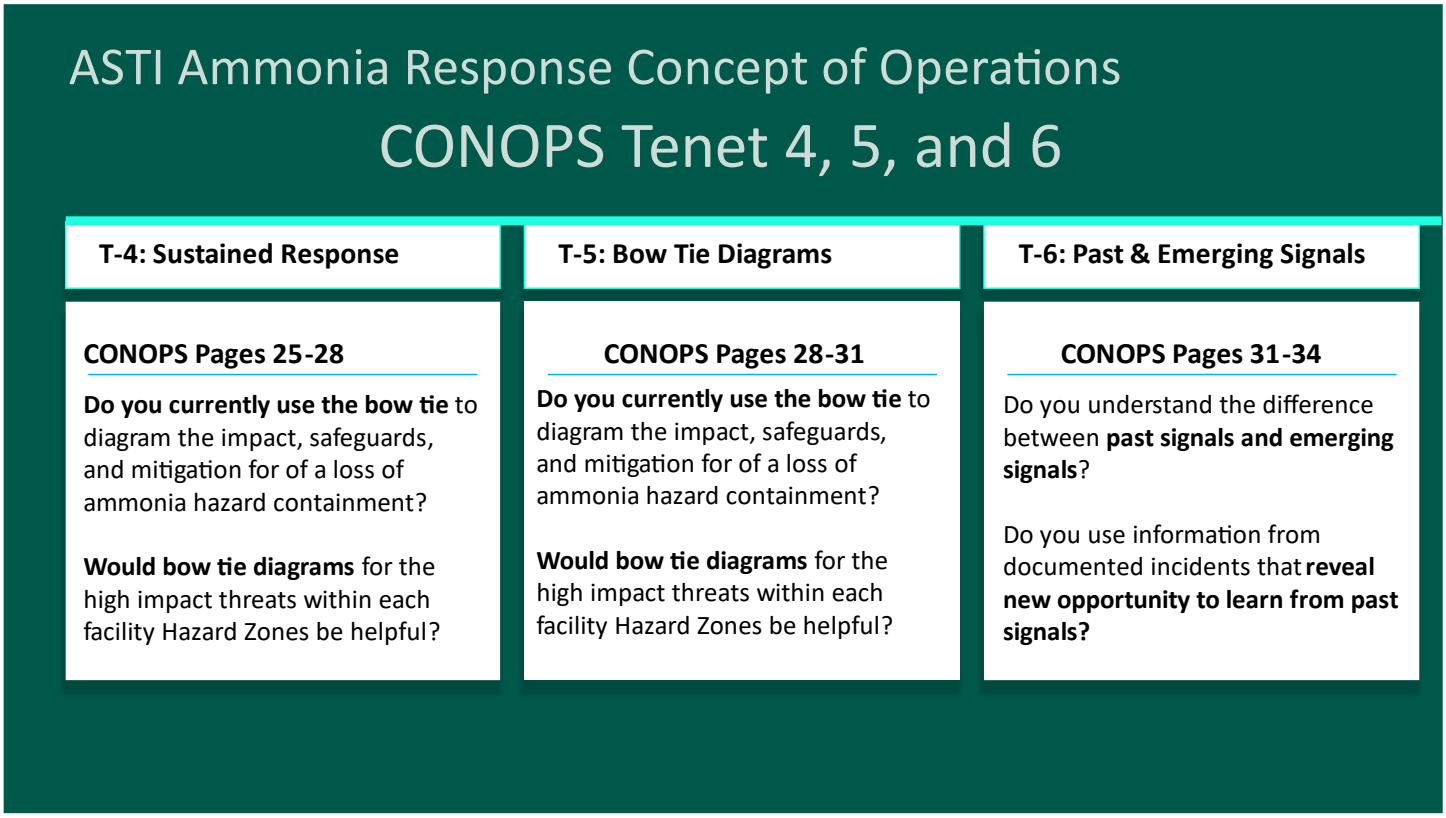
Question: Do you accept the PMPRR response logic that plays to the National Response Team's One Plan recommendations?

The 30 minute time frame would start with the Senior Supervisor taking charge and delivering the first CAN Report to the Lead Responder, Notification Unit Leader, and Evacuation Group Supervisor. The four command team will engage their assigned duties as per the facility emergency plan and the AHJ approved Area Plan. Operators and command team members shall work outside of the ammonia IDLH danger area unless trained and equipped with PPE and personal ammonia detectors that allow for working with levels of ammonia that do not exceed the IDLH (300 PPM).

The 30 minute time frame ends when the public safety incident commander takes charge and the first Incident Action Plan is completed for ensuring that the initial response stage is completed.

Do you agree with the goal to accomplish Discovery and Initial Response within the first 30 minutes after the emergency event is recognized?

Tenet Comments:

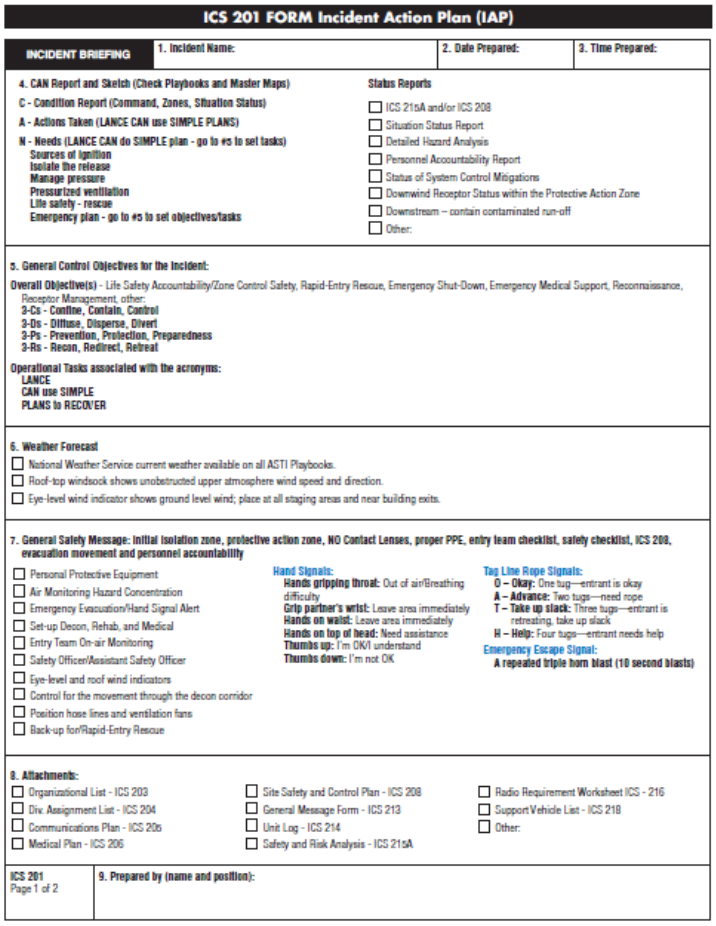


TENET 4. Sustained Response mode Top Event Requires an Emergency Response Plan

Sustained Response approaches **critical concern for life, environment, and/or property loss the aggressive notification of public safety resources allows Incident Commander (IC) to decide how to utilize the "Go Big Early" response strategy.** The **IC will judge the level of emergency response resources required based upon the risk and threat of the emergency. The sequence and timing of needed resources to arrive and set up must stay ahead of the life, environmental, and property threats that "Emerging Signals" reveal.**

The 30-Minute plan **Sustained Response** checklist would be **implemented by Public Safety IC** and supported by the facility Hazmat command and response team. The facility emergency response Commander and Lead Responder provide a Conditions-Actions-Needs report and situation status report to support the IC's ability to judge the resource needs to fulfill the incident action plan (IAP) objectives for the public safety responders on-scene and dispatched and in route to the scene.

The **Red box PLANS section checklist is on the front side of the 30 Minute Plan.** The back of the 30 Minute Plan has a sample IAP, ICS organization chart, and a control zone layout. The **One plan Playbooks provide a pictorial view of the Hazard Zone and the Tech-level operational support information.**



ICS 201 FORM Incident Action Plan (IAP)

INCIDENT BRIEFING | 1. Incident Name: | 2. Date Prepared: | 3. Time Prepared:

4. CAN Report and Sketch (Check Playbooks and Master Maps)
C - Condition Report (Command, Zones, Situation Status)
A - Actions Taken (LANCE CAN use SIMPLE PLANS)
N - Needs (LANCE CAN do SIMPLE plan - go to #s to set tasks)
Sources of ignition
Isolate the release
Manage pressure
Pressurized ventilation
Life safety - rescue
Emergency plan - go to #s to set objectives/tasks

Status Reports
- ☐ ICS 215A and/or ICS 208
- ☐ Situation Status Report
- ☐ Detailed Hazard Analysis
- ☐ Personnel Accountability Report
- ☐ Status of System Control Mitigations
- ☐ Downwind Receptor Status within the Protective Action Zone
- ☐ Downstream – contain contaminated run-off
- ☐ Other:

5. General Control Objectives for the Incident:
Overall Objective(s) - Life Safety Accountability/Zone Control Safety, Rapid-Entry Rescue, Emergency Shut-Down, Emergency Medical Support, Reconnaissance, Receptor Management, other:
3-Cs - Confine, Contain, Control
3-Ds - Diffuse, Disperse, Divert
3-Ps - Prevention, Protection, Preparedness
3-Rs - Recon, Redirect, Retreat
Operational Tasks associated with the acronyms:
LANCE
CAN use SIMPLE
PLANS to RECOVER

6. Weather Forecast
- ☐ National Weather Service current weather available on all ASTI Playbooks.
- ☐ Roof-top windsock shows unobstructed upper atmosphere wind speed and direction.
- ☐ Eye-level wind indicator shows ground level wind; place at all staging areas and near building exits.

7. General Safety Message: Initial isolation zone, protective action zone, NO Contact Lenses, proper PPE, entry team checklist, safety checklist, ICS 208, evacuation movement and personnel accountability
- ☐ Personal Protective Equipment
- ☐ Air Monitoring Hazard Concentration
- ☐ Emergency Evacuation/Hand Signal Alert
- ☐ Set-up Decon, Rehab, and Medical
- ☐ Entry Team On-air Monitoring
- ☐ Safety Officer/Assistant Safety Officer
- ☐ Eye-level and roof wind indicators
- ☐ Control for the movement through the decon corridor
- ☐ Position hose lines and ventilation fans
- ☐ Back-up for/Rapid-Entry Rescue

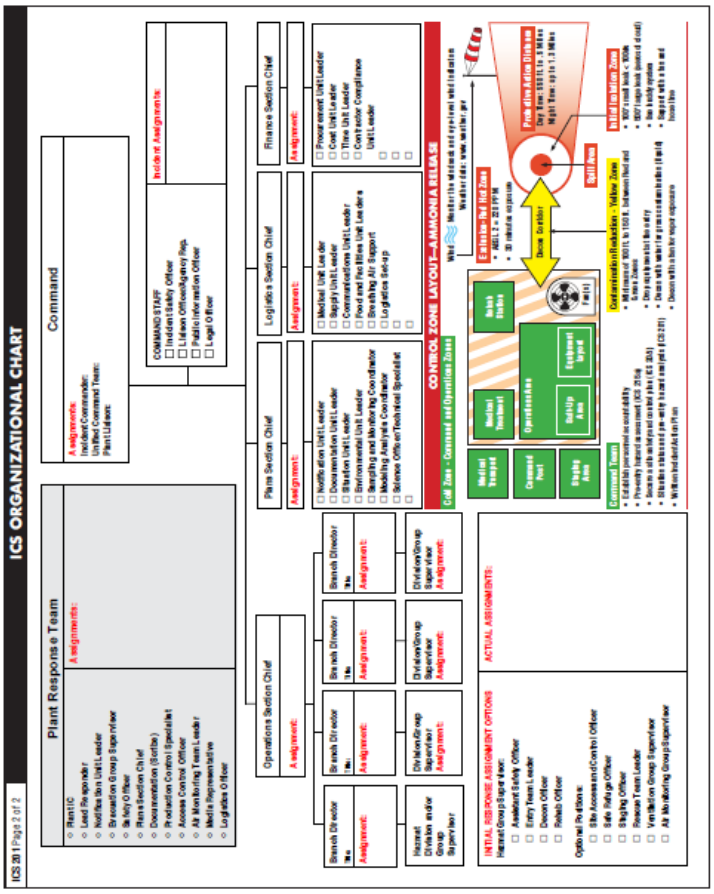
Hand Signals:
Hands gripping throat: Out of air/Breathing difficulty
Grip partner's wrist: Leave area immediately
Hands on waist: Leave area immediately
Hands on top of head: Need assistance
Thumbs up: I'm OK/I understand
Thumbs down: I'm not OK

Tag Line Rope Signals:
0 – Okay: One tug—entrant is okay
A – Advance: Two tugs—need rope
T – Take up slack: Three tugs—entrant is retreating, take up slack
H – Help: Four tugs—entrant needs help

Emergency Escape Signal:
A repeated triple horn blast (10 second blasts)

8. Attachments:
- ☐ Organizational List - ICS 203
- ☐ Div. Assignment List - ICS 204
- ☐ Communications Plan - ICS 205
- ☐ Medical Plan - ICS 206
- ☐ Site Safety and Control Plan - ICS 208
- ☐ General Message Form - ICS 213
- ☐ Unit Log - ICS 214
- ☐ Safety and Risk Analysis - ICS 215A
- ☐ Radio Requirement Worksheet ICS - 216
- ☐ Support Vehicle List - ICS 218
- ☐ Other:

ICS 201 Page 1 of 2 | 9. Prepared by (name and position):



The Bow Tie diagram can be used to show how hazards have distinctive "threat line" risks, and threats that that can be controlled with lag and lead indicators that are laid out on the Bow Tie as shown below. The Bow Tie is very useful for showing how the Tripod Responders can engage PMPRR while utilizing an effective hazard analysis system that allows for use during training, emergency planning, and during an emergency response Event or Top Event emergency.

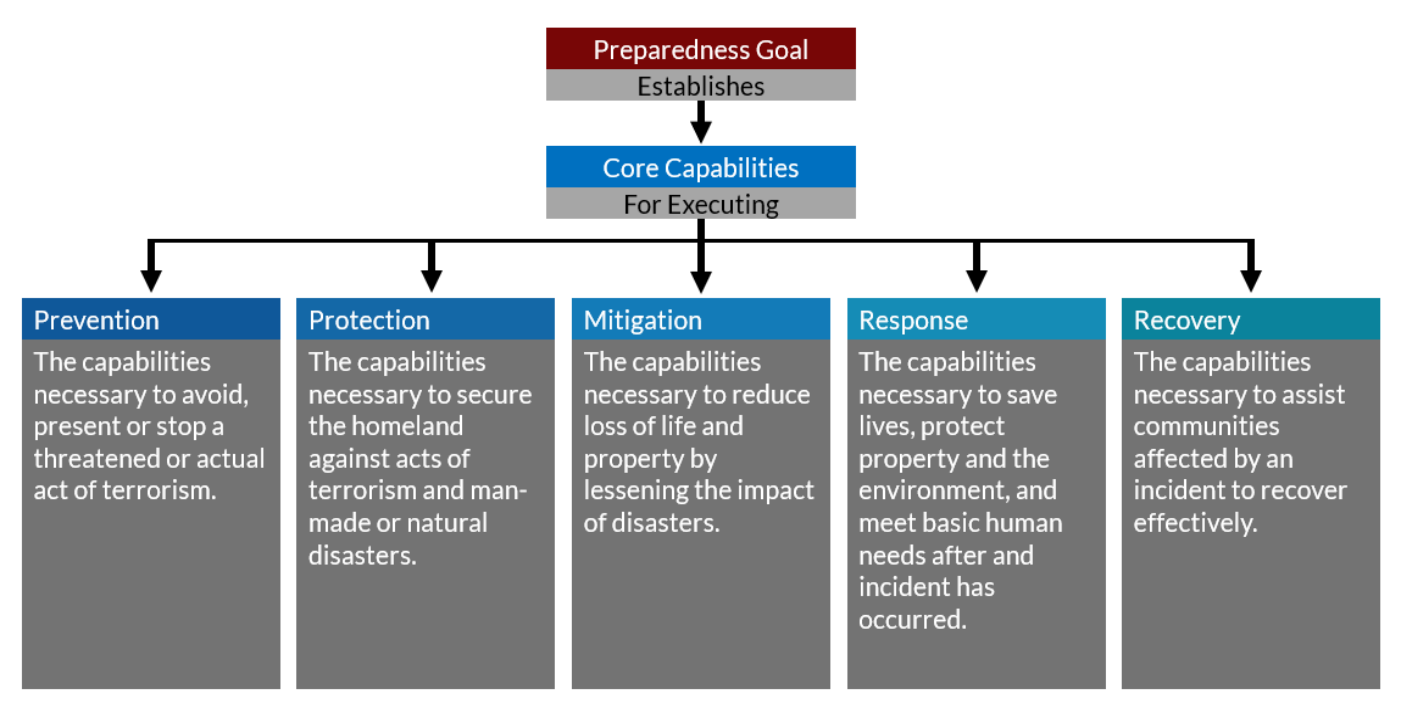
CONOPS Goal. The AHJ should confirm.

The AHJ should consider the recommendation that a Tripod Response team set a goal to complete the Discovery and Initial Response 30-Minute Plan checklist within 30 minutes of discovery.

The AHJ should acknowledge that the public safety emergency response incident commander has the OSHA regulatory authority to take command during the Discovery and Initial response stages of response. It is also understood that the command team leading a Hazmat Tech Team must also be Tech level certified as an Incident Commander.

AHJ Comments:

CONOPS Goal 4. Utilize the One Plan (Integrated Contingency Plan) emergency management recommendations to bring all emergency response plans under the One Plan system.



There are many versions of the Bow Tie diagrams in use throughout the world. The ASTI team has selected the latest version of the Bow Tie recommended by the Center for Chemical Process Safety (CCPS) which is a not-for-profit corporate membership organization within AIChE that identifies and addresses process safety needs in the chemical, pharmaceutical, and petroleum industries. https://www.aiche.org/ccps

The ASTI Tripod diagram defines how the three legs of the Tripod work together to engage PMPRR (see CONOPS Goal 1).

The white circle around the Bow Tie hazard assessment picture is the heart of the Tripod emergency response system.

The bottom of the **Tripod diagram** shows the Industry, Government, and Public Safety connection to the **Bow Tie hazard assessment.** The following is an explanation of the **three parts** of the Bow Tie.

1. Green side of the Bow Tie provides **Past Signalss (**based upon history and experience) that **support operators and first responders** with **preventative control measures and emergency control system options** that can address loss of ammonia hazard containment for "system upset **Events".**

30-Minute Plan Discovery Stage checklist triggers the need for the operator's evaluation for safe engagement of stabilizing mitigations for the Event. The command teams need to address a potential emergency Top Event.

The **facility's emergency response supervisor and Lead Responder** must be f**irst-responder Operations trained** and equipped to engage the 30-Minute Plan **green-box Initial Response checklist.**

CHALLENGE TENET 4 - AHJ Challenge: Sustained Response mode Top Event Requires an Emergency Response Plan

The AHJ and Tripod team should consider the value of developing a safety and emergency response plan strategy that addresses the following:

1. Sustained operator and command team diligence to provide early warning, safety training, and on-going preventative measures results in a successful, effective, and efficient organizational culture that saves corporate losses that could bankrupt operations. Please review the following video: https://davidburkus.com/2020/04/how-paul-oneill-fought-for-safety-at-alcoa/
2. A strong level of Tripod team readiness to engage **Discovery and Initial Response** stages during the first 30 Minutes of a loss of ammonia containment will significantly reduce the life safety risks for employees, visitors, and responders and provide for an effective transition to Sustained Response (if necessary)
3. The pre-event Tripod cooperation with trained First Responder operators and command team members will result in a timely and effective Incident Action Plan objectives and task assignments that will utilize key mitigative safeguards to sustain a safe and effective termination of the emergency event.

AHJ should clarify that the primary goal of the go early and go big notification requirements that address for Complexity level 4 and 3 events is not a trigger for a regulatory inspection as much as it is a need to prepare local, state, and federal agencies for a possible dispatch to support the local response effort.

See the back of the 30 Minute plan sample ICS 201 IAP and safety plan, ICS Org-chart, and Control Zones diagram appropriate for your jurisdiction.

Please contact ASTI@ammonia-safety.com if you find changes and/or additions to the 30-Minute Plan. ASTI has an All-Hazards Response Guidebook to help operators and responders to understand the details that spin-off the 30-Minute Plan checklists.

Review Goal 4: Review the five PMPRR rules of engagement provided by FEMA and engaged by EPA as the key Tenets of the One-Plan response logic.

TENET 5. Bow Tie Diagrams are used tools for visually displaying, analyzing, & communicating risk

T-5: Bow Tie Diagrams

CONOPS Pages 28-31

Do you currently use the bow tie to diagram the impact, safeguards, and mitigation for of a loss of ammonia hazard containment?

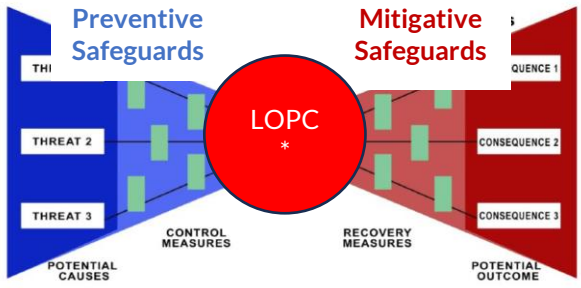
Would bow tie diagrams for the high impact threats within each facility Hazard Zones be helpful?

The exposures due to **Loss of Primary Containment** (**LOPC**) incidents involving hazardous chemicals such as ammonia create a threat line that require prevention and mitigation safeguards. The Bow Tie diagram shown below was produced by Jerry Jones, lead trainer for CCPS (Center for Chemical Process Safety) and chemical engineer working for AIChE. The **Preventive Safeguards located on the left side of the Bow Tie** is intended to **reduce the probability of the LOPC** from becoming an emergency event e.g., **"Prevent them all"**. The the **Mitigative Safeguards** on **the right side is intended to be used by emergency managers to reduce the consequences** of an emergency event, e.g., "**stop it small**".

Understanding the potential risk scenarios helps those responding to LOPC incidents to assess the situation e.g., **FEMA Level of Complexity**, to anticipate possible escalation of the incident and take actions to try to avoid such escalation or to protect those who are exposed or could be exposed.

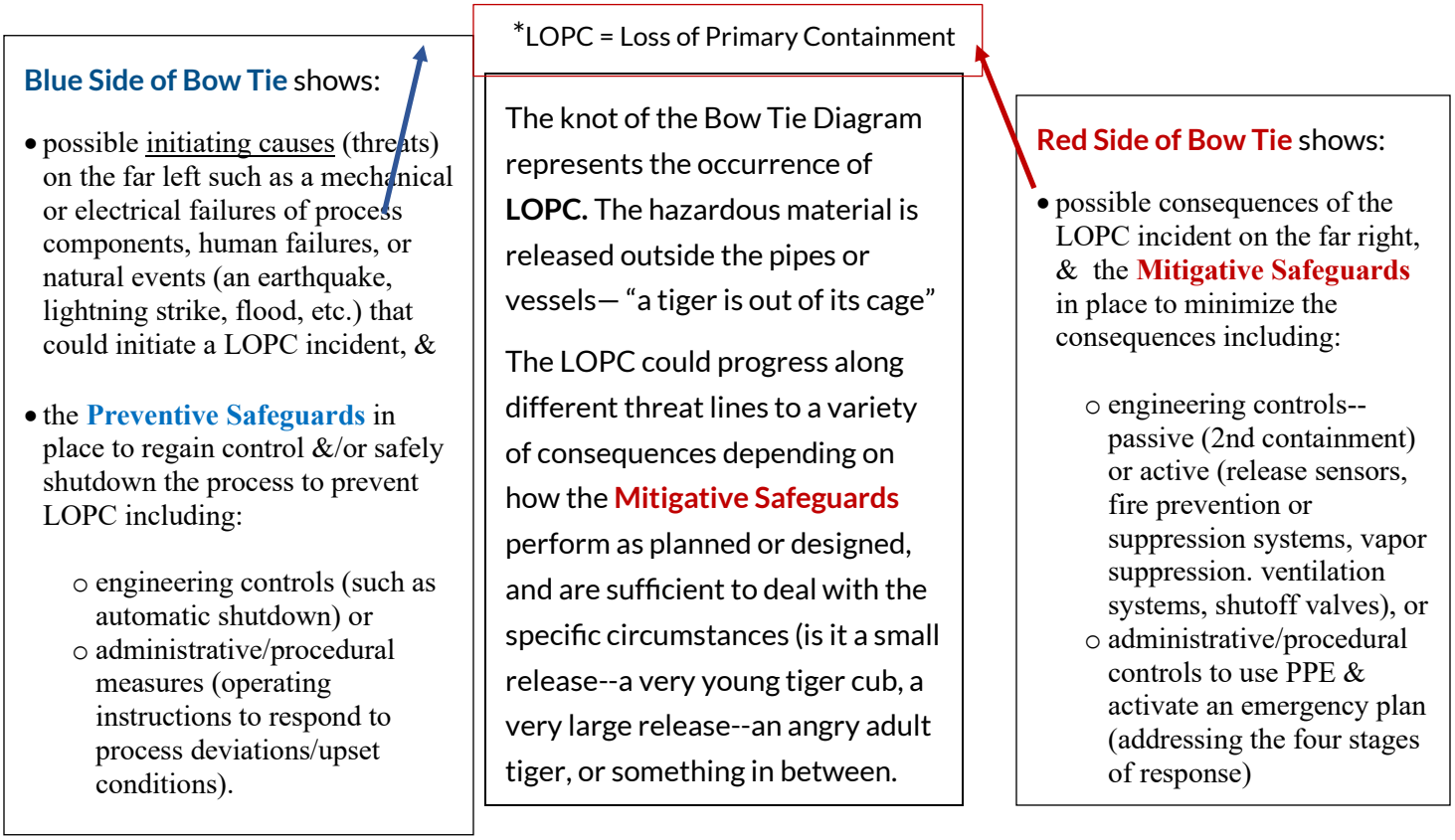
"Prevent Them All or Stop Them Small"

Hazardous substances present & safety contained within process piping & vessels.



Effectively managing LOPC* risks require understanding credible scenarios & putting in place reliable:

- **Preventive Safeguards** to lower LOPC* probability &
- **Mitigative Safeguards** to lower the consequences should LOPC* occur.



Use the Key Analytics for Defining Performance Requirements and Recommendations

ASTI offers a One Plan Clipboard that includes a master map, a fillable CAN Report, an ICS 215a Hazard Zone analysis, and a 30-Minute Plan to support operator and first responder team members. The facility's One Plan Playbook for the Hazard Zone.

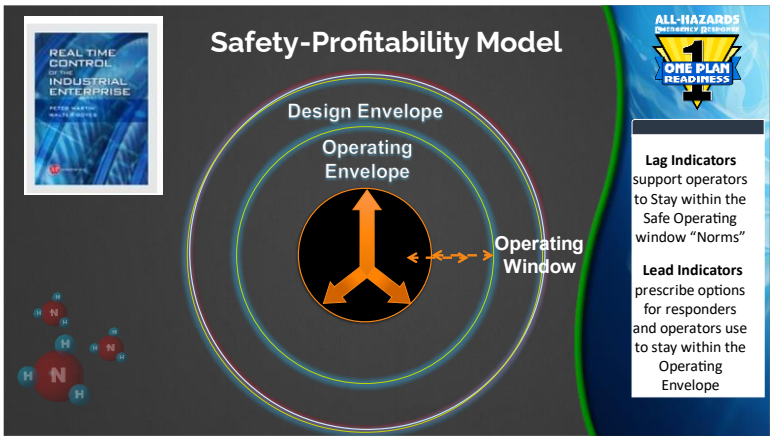
Confusion can occur when operators and responders engage in actions that stem from leading and Past Signalss that are not in sync with or understood by engineers and regulators. This is why the Tripod relationship between industry, government and public safety responders is so important.

https://www.merriam-webster.com/grammar/prescribe-vs-proscribe-usage-difference#:~:text=Prescribe%20means%20to%20instruct%20or,similar%2C%20means%20to%20forbid%20something.

Prescriptive is from the verb Prescribe are recommended **performance solutions** to cure or buffer the system steady state safety norms. it's a set of rules or directions for someone reading it to **perform**, like a label on a medicinal pack. Most process safety and Hazwoper requirements are prescriptive performance-based requirements.

Proscribe is to forbid or **lay down the law** with the intent to enforce the rule e.g., the Immediately Dangerous to Life and Health OSHA standard is 300 part-per-minute (ppm) that is not to be entered without prescribed purpose and use of safety measures such as proper personal protective equipment and personal ammonia monitoring. Harvard University Business School: https://online.hbs.edu/blog/post/prescriptive-analytics

Past Signalss reflect past performance to assess success and shape the long-term strategy with pre-event Bow Tie experiences that reveal prescriptive options that would be utilized to safely mitigate a loss of hazard containment that threatens to escape the operating window.



Profitable Real Time Safety is an award-winning method created by Dr. Peter Martin, retired vice president of marketing and innovations from Schnieder electric. Dr. Martin uses the Operating Window three-way symbol to show how the safe use of energy, materials, and production processes generate profitable and safe operations outcomes while working within safe operating envelop. The Safety Profitability Model centers on the need to NOT deviate from the safety norms so that productivity and process safety keeps is sustained by trained and equipped operators who immediately engage on Emerging Signals enter the Design Envelope. Operators will be prepared to utilize process safety procedures and command team alerts for a potential FEMA level 5 complexity response. If the operators are not able to buffer the safety threats and the event is entering the Design Envelope a FEMA level 4 complexity response is engaged. If Emerging Signals indicate that the event cannot be safely mitigated by operators and the safety of workers, employees, and the community is threatened the need to engage a Level 3 emergency event occurs and the emergency responders take charge of the event.

CHALLENGE TENET 5 Bow Tie Diagrams are used tools for visually displaying, analyzing, & communicating risk.

AHJ Challenge: **Explain how the Bow Tie diagram** adequately address the hazard assessment challenges that exist in each high risk operation within a Hazard Zone. Consider the value of collecting bow tie assessments for all near miss accidents, emergency event simulations, and during real event operational upsets or emergency events.

How does each leg of the Tripod strengthen when the facility defines hazards, risks, and threats of each Hazard Zone within their facility?

Tenet Comments:

The AHJ should review the difference between "Prescriptive" and "Performance" requirements.

Why is the OSHA HAZWOPER requirement considered to be more prescriptive while NFPA 470 id considered to be more performance based?

Question: Does the Safety-Profitability Model Do you accept the Peter Martin Safety-Profitability Model as a means of setting operational standards that should be controlled by operators on a day-to-day basis? Does your team understand the connection to the right and left sides of the bowtie?

Confirm that the goal of the left side of the bow tie is to use preventative safeguards to sustain system operations within the "Operating Window" and to give warning when system pressures, temperatures, leakage and other Past Signals show that the Loss Of Primary Containment (LOPC) is heading towards the operating window envelope.

Tenet Comments:

How well does the bow tie assessments and the content of your PSM and RMP content? In other words, do you have a reliable monitoring system for keeping your system within the "Operating Window" and is your lead operator giving adequate notice for making system improvements that insure that the peak period performance isn't entering the Design Envelope?

Is it reasonable to expect the facility and public safety-first responders set a goal to address the Discovery and Initial Response within the **first 30 minutes after arrival on the scene**?

Do you accept the bow tie diagram as a means of laying out lagging and Emerging Signals as a hazard assessment diagraming tool?

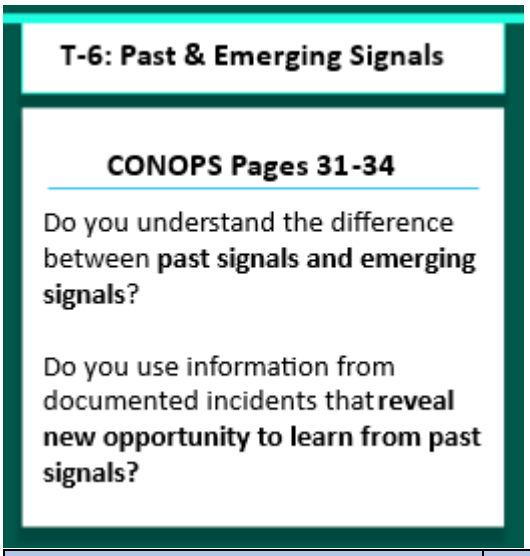
NOTE Before working on Tenet 6: As you move forward through the next Tenet discussions you will see the logic of how **operators and responders work together to engage steps to stabilize an ammonia system from a defensive standpoint** as well as **how emergency responders engage Initial Response and Sustained Response actions within the IDLH hot zone to contain and control an ammonia event**.

Please review Appendix IV for an excellent OSHA Interpretation Letter that was created in 1994. The following is the first paragraph of the letter.

You request clarification on HAZWOPER emergency response training requirements. It appears from your letter that your workers will only be trained to the First Responder Operations Level. **The function of the First Responder Operations Level is to take defensive action to contain an uncontrolled release, acting at a safe distance from the point of release. Defensive activities include placing of sorbent, shutting off valves outside the danger area, or activating emergency control systems. The standard does not allow Operations Level First Responders to actually enter the danger area to attempt to stop a release.** Therefore, if you choose not to train your people beyond the First Responder Operations Level, you must arrange in advance to call in an outside HAZMAT team in the event your employees are unable to control a release through the use of defensive action.

TENET 6. Past and Emerging signals to differentiate between Operational and Emergency Response actions.

CONOPS Goal 5: Allow trained and equipped operators to stabilize a "system upset" that occurs when the odor of ammonia is detected with an early warning; or, when a potential loss of hazard containment Event warning indicates that the normal "operating window" pressure and temperature control criteria is approaching the "system design window." that addresses excessive pressure and operating temperatures have reached a warning so that trained and equipped operators can ensure that the **Past Signals** engage pre-loaded preventative barriers and mitigations that trained and equipped operators will oversee when the Event can be stabilized before it becomes a "Emergency Event" emergency. If Past signals fail to materialize as operational safeguards the control and containment of the hazard threat line impact will transition to the need for Emerging Signals that hazmat trained and equipped emergency responders will receive in their Conditions-Actions-Needs (CAN) report and/ situation status reports from the facility command team. The bowtie threat line assessment will prepare operators and emergency responders to set control and containment objectives, safety plans, and Incident Action Plan objectives and tasks for the trained and equipped hazmat tech teams to recognize on and off site life safety, environmental, and property loss impacts.



The Quick Guide loss of hazard containment Events and Top Event emergencies

Quick Guide Description of Event and Top Event Threat-line Past Signals and Emerging Signals.

The following table is to be used as a starting point set of ideas for operators and responders to ponder when setting preventative barriers, mitigations, and preparation measures that relate to list of ammonia loss of hazard containment threats that exist for each "Hazard Zone" within the facility.

Hazard Description	Past Signals – Lessons Learned	Current – Emerging Signals
Pressure 1. System "operational window" indicator(s) triggers an alert warning. 2. System design window	**Prevent and Mitigate** 1. Operator(s) to stabilize the system to 2. Relief valves for high pressure liquid and gas	**Recognize developing threats** 1. Operations control measures for deviation from Normal Set Points 2. System operators are NOT to over-ride normal system operations without Lead

3. Hydrostatic Pressure trapped liquid with no vapor expansion space. 4. Release of high-pressure aerosol causing high downwind threat 5. Hazard analysis and safety audit to ensure that system prevention and mitigation barriers are adequate.	3. High pressure system cut-outs, gas and/or liquid pressure relief valves. 4. Operator warning system for system upsets that approach the system design window e.g., a checklist and system monitoring and warning when an inappropriate valve control process is being used by operators	Operator and/or facility Incident Commander. 3. Recognize the potential for a high risk/threat system failure that could cause a high-pressure aerosol life safety impact 4. Training, tabletop exercises, and near miss accident review that discovers system and operator challenges
Hazard Description	**Past Signals – Lessons Learned**	**Current – Emerging Signals**
Flammability 1. Dense gas 15% to 28% in an area with a source of ignition that exceeds 1204°F. 2. Puff cloud in an outside release that meets the flammability threat level. 3. Aerosol vapor from a water proximate release that meets the flammability threat level.	**Prevent and Mitigate** 1. Early detection, ventilation, and control of sources of ignition 2. Positive pressure ventilation plan for venting high vapor level. 3. Contain the aerosol release or divert and diffuse the aerosol to reduce the concentration that is approaching a source of ignition	**Recognize Developing Threats** 1. Avoid putting water on liquid ammonia. 2. Responders located near or within the hot zone should have flash protection under-clothing and turnouts or flame-resistant over-suit. 3. Recognize that the flammable limits of 20% to 30% aqueous ammonia is LFL 15.4% and UFL 33.6%
Hazard Topic	**Past Signals – Lessons Learned**	**Current – Emerging Signals**
Ammonia Aerosol and dense gas plume moving over land and over a body of water. **1.** The water creates attraction and connection with the aerosol; water is condensed and moves within the aerosol as it travels downwind. **2. Liquid Release into water** The reactive impact of warm	**Prevent and Mitigate** 1. Wind direction leading to a life safety threat. 2. Review a pre-event developed plume model. Utilize containment and pressure reduction options. 3. Most critical factor is the fast-moving dense gas/aerosol ammonia plume	**Recognize Developing Threats** 1. Pre-event readiness to ensure that an evacuation order is properly clarified with the use of inside shelter and proper escape (lateral and upwind of the dense gas cloud) 2. Set IPAWS warning for Protect-in-Place for 500 to

water and cold ammonia will create. 3. **Liquid Release under Water** surface level ammonia vapor is subject to the amount of water movement and spread to dilute the released ammonia.	above water. The plume can pick up water and present an alkaline pH factor as an aqueous ammonia impact that moves long distances from the source point of the plume.	1,000 feet downwind IDLH threat. 3. Engage shelter-in-place and a message to NOT evacuate into a greater risk circumstance such as an ammonia dense gas cloud.

Differentiating Between Operational and Emergency Response Modes

Operational Performance Mode	Emergency Response Defensive Mode
left side of the bow tie identifies Preventative Safeguards that can be engaged with an early alert of a minor loss of hazard containment e.g., **FEMA level 5 or 4 system upset event.** A RETA **C**ertified **I**ndustrial refrigeration operator (CIRO)... https://reta.com/page/certification equipped with proper PPE can engage **Operator control** as per employer adopted SOP to work outside of the IDLH atmosphere to stabilize and contain a level 5 or 4 system upset.	**If the RETA certified operator is trained as an OSHA "First Responder Operations level** responder he or she may work with public safety or contract First Responders and/or Tech Responders to implement **mitigating safeguards engage the "Defensive Mode"** while working outside of IDLH (300 ppm) and wearing personal protective equipment, personal NH_3 detection, and a NIOSH 14G Air Purifying Respirator https://wwwn.cdc.gov/niosh-cel/ .

See Appendix I for details about the OSHA training requirements for Operators and Responders.

You will find that the First Responder Operations Level training covers the following 6 training requirements. Keep in mind that your employer may consider your experience and other training certifications, such as the RETA Operator certifications, as a part of the following training requirements. The key need is that the employers annual training plan sustains the Operations level expectations.

1910.120(q)(6)(ii)(A) Knowledge of the basic hazard and risk assessment techniques. 1910.120(q)(6)(ii)(B) Know how to select and use proper personal protective equipment provided to the first responder operational level. (more on next page)

1910.120(q)(6)(ii)(C) An understanding of basic hazardous materials terms.

1910.120(q)(6)(ii)(D) Know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.

1910.120(q)(6)(ii)(E) Know how to implement basic decontamination procedures.

1910.120(q)(6)(ii)(F) An understanding of the relevant standard operating procedures and termination procedures.

AHJ Challenge: Review the "Note" coments at the end of CONOPS Tenet 6

The AHJ should discuss the difference of leading and Past Signals to the Tripod team operators and responders. Explain how facility First Responder Operational Skilled (as per OSHA 1910.20) are prepared to support Emergency Responder command team.

Question: Can the Operator that is OSHA certified as a"First Responder Operations" level responder and/or Hazarsous Materials Specialist certified personnel advise Tech-Responders who enter the IDLH "Hot Zone" about system control measures needed to contain and/or control the loss of ammonia containment?

How valuable are Past Signals based upon lessons learned experiences from operators and/or hazmat specialists' wisdom?

Remember that the bow tie hazard assessment is a great way to memorialize Past Signals for operator and responder use.

Past signals are especially valuable for facility operators and ammonia system supervisors because they point the way to higher preventative safeguard (left side of the bow tie) improvements.

Emerging Signals provide responders with options to foresee the growth of risk and threats of an event. The Emerging signals also provide insights for the Incident Commander's (IC) Incident Action Plans (IAP's) and safety plan for dealing with the next 30 minute operational period.

The IC is always focused on the next operational periods, while the Operations team is engaging the current IAP. Facility system operators can be a great help on identifying more insight about the future operational period Emerging Signals and IAP objectives and tasks.

Tenet Question: Why is the quarterback who engages the next play not used as the head coach? Relate your answer to the role of the facility Incident Commander and facility Lead Responder.

Hint: Would it be wise to ask the "Lead Responder" who operates the system to be responsible for the Incident Command requirements?

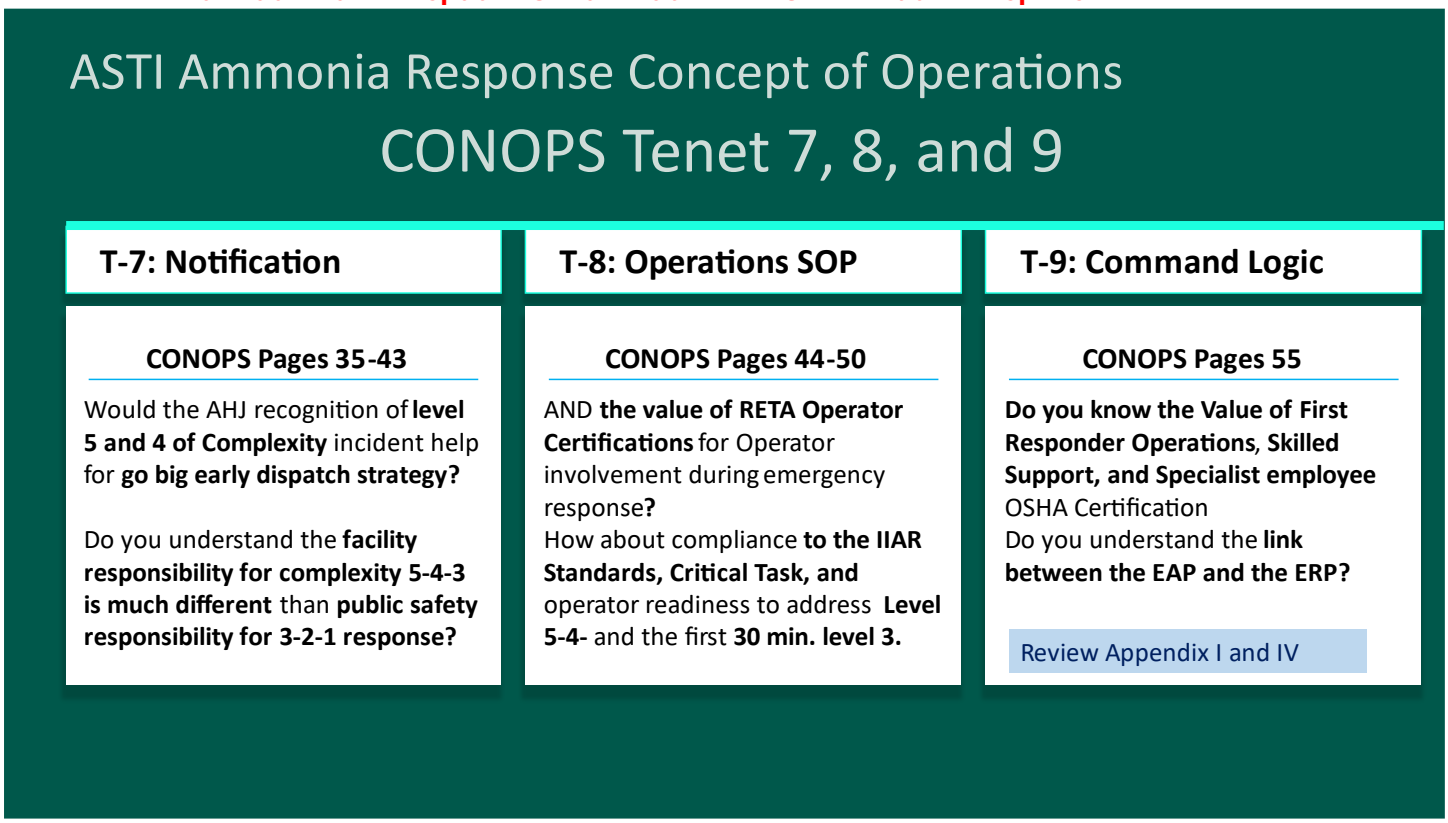
Review the Lagging and Emerging Signals (pages 20 to the top of 22) Discuss the value of facility operator and system engineer feedback on the containment and control measures for each of the facility's Hazard Zones.

. **Explain the value of the ASTI One Plan Playbooks** for supporting and organized and approach for building and using the bow tie assessments and lagging/Emerging Signals for each Hazard Zone

Tenet Comments:

THINK ABOUT IT: As you read the following Tenet information think about the biggest reason why the local AHJ, State, and EPA will levee costly fines to industrial ammonia users who fail to make mandatory notifications of ammonia releases as per federal, state and local requirements?

TENET 7. Notification and Dispatch Collaboration for Coordinated Response



The AHJ should consider the following strategies when setting up a notification and dispatch policy.

STEP 1: **Strategy 1: The employer should set up Hazard Zone locations within their Facility that are numbered in accordance with their risk and threat level.** For example, **Hazard Zone 1** would be a compressor room (High Side of the system) where low-pressure ammonia vapor is received from the evaporator coils and compressed into high pressure "hot gas" that is piped to ammonia condensers that cool and condense the hot gas into a high-pressure ammonia liquid.

The vapor pressure within the high side ammonia liquid receiver(s) is returned to the compressors so that low pressure ammonia liquid can be delivered to **Hazard Zone 2 - the cold storage room evaporators**.

5. Incident Effect Indicators Summary Table

This table supports the Incident Effect Indicators listed in the above Incident Complexity Level Tables across all hazards and provides a basis for training to determine incident complexity. Users can identify indicators with ease of use in addition to the detail provided above.

Incident Complexity Level: Incident Effect Indicators Summary										
Type	Resistance to stabilization or mitigation	How long does it take for resources to meet incident objectives?	Effects on population immediately surrounding the incident	Length of incident effects	Evacuations necessary during mitigation	Adverse impact on CIKR	CIKR impact / mitigation measures	Coordination required with elected/ governing officials and stakeholder groups	Do conditions or actions that caused original incident persist?	Probability of cascading event or exacerbation of current incident
5	None	1-2 hours	Minimal	Minimal	Few or none	None	None	Minimal or none	No	None
4	Low	Several to 24 hours	Limited	Up to 24 hours	Few or none	Minimal	Uncomplicated within one operational period	Minimal or none	No	Low to none
3	Moderate	At least 24 hours	Moderate	Several days to over one week	Possible; may require shelter	Threatens, damages, or destroys property	Adverse; multiple operational periods	Some	Possibly	Medium
2	High	Several days	Significant	Several days to two weeks	Possible; may require shelter/ housing for several days to months	Threatens, damages, or destroys property	Destructive; requires coordination over multiple operational periods	Moderate, including political organizations	Possibly	High
1	High	Numerous operational periods	Significant	Two weeks to over a month	May require shelter/ housing for several days to months	Significantly threatens, damages, or destroys property	Highly destructive; requires long-term planning and extensive coordination over multiple operational periods	High, including political organizations	Yes	High

STEP 2: **Pre-Event readiness to Go big with a well-planned and aggressive and strategic Incident Action Plan.** Develop an ICS 215a hazard assessment form for each Hazard Zone within the facility so that the command team and responders have the initial response risk assessment information needed to understand the risks and threats safety concerns (ICS 208) of an Incident Action Plan form (ICS 201) used to contain and control a Top Event within each Hazard Zone.

Additional Hazard Zones may include chemical storage rooms, LPG tanks, and smaller ammonia system locations such as loading dock evaporator coils and forklift repair and charging stations.

STEP 3:

Develop a Dispatch and Mandatory Notification Procedure: The first to discover a loss of hazard containment should use a **CAN report** (Conditions-Actions-Needs) size up. This will help the **supervisor** to take charge to deal with the immediate life threats while also reporting the incident immediately to the facility's **highest ranking emergency manager**. The **on-site command team** leader e.g. I.C. or facility

CONOPS Goal 6: The AHJ should adopt their version of the Notification and Dispatch procedures that aligns with the public safety dispatch procedures. The basis of the notification and dispatch protocol should follow the recommendations explained on the next pages.

Supervisor in charge of the emergency plan must decide the level of complexity and severity of the **loss of containment Event** (system upset). **The key question**: Is the Event controllable without threat to operators, employees, and/or the public? **If the answer is "no"** then **Top Event** (emergency) is declared.

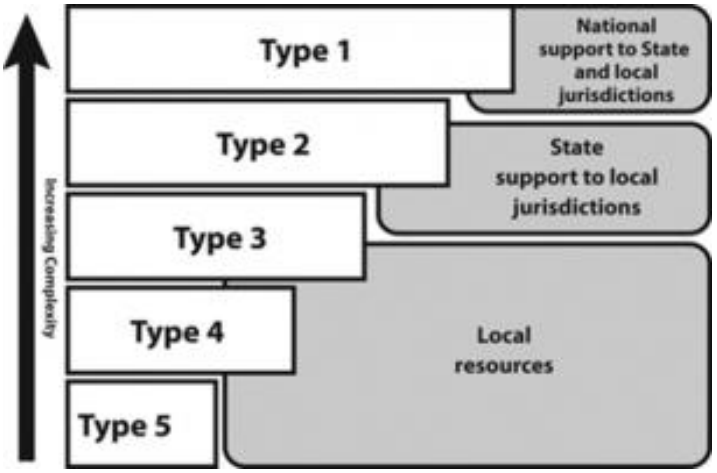
Federally mandated notification to the NRC is required if the release exceeds 100 pounds over a 24-hour period of time. State and local AHJ required notification procedures may be more restrictive.

of ammonia hazard containment "Event" that properly trained and equipped system operators can stabilize and control within a few hours. A complexity level 4 event is a low threat system upset that can be stabilized by trained and equipped operators, but repairs may take a week or two to complete. https://training.fema.gov/emiweb/is/icsresource/assets/incident%20complexity%20and%20type.pdf

FEMA developed the five levels of incident complexity system as follows.

Type 5 loss

Type 5 loss of ammonia hazard containment "Event" that properly trained and equipped system operators can stabilize and control within a few hours. **Type 4** Event is a low threat system upsets that can be stabilized by operators, but the repair may take about a week to complete.



Type 3 Top Event emergency may have started as a Level **4** and could grow to level **2**.

Type 1 and 2 Top Events can only be engaged by the local public safety Incident Commander.

The local Master Mutual Aid agreement will be used to engage regional support that may require a Unified Command method of command and control operations.

Type 1 and 2 Top events can only be initiated by the local public safety Incident Commander (I.C.).

Type 1 events are initially locally proclaimed disasters that, if not contained and controlled can grow to a State Proclaimed disaster by the Governor and if necessary a Presidentially proclaimed disaster by the President.

Type 2 events are regional that is engaged by the public safety I.C. a local Master Mutual Aid agreement will be used to engage regional support that may require a Unified Command method of command and control operations. **A Level 2 Top Event can be escalated to engage a national mutual aid agreement available through use of an Emergency Mutual Aid Compact)** https://www.emacweb.org/system that empowers support from neighboring States

Type 3 Events are emergency events that are initiated through the 9-1-1 dispatcher's information that he/she communicates to the first-due fire department engine company. The first responder engine officer will meet with the facility Senior response official and receive a Conditions-Actions-Needs (CAN) report.

Type 4 and 5 should be detected early as system upset incidents that can be contained and controlled by trained and equipped operators using employer approved SOP's (details to follow later in this document

AHJ dispatch Recommendations for Facility Notification of 9-1-1 Dispatch

Complexity 5	Complexity 4	Complexity 3
Low threat: is detected and controlled within 2 hours with no life safety threats present within the Isolation zone; and minimal effect to surrounding population.	**Contained Loss of ammonia - Low Threat: Controllable** with limited life safety threat to the surroundings. The control plan is not complicated & completed within 24Hrs.	**Moderate effect on surrounding population. Threat:** May require shelter; the Top Event may take several days to a week to terminate, investigate and stabilize on-site risks and threats.

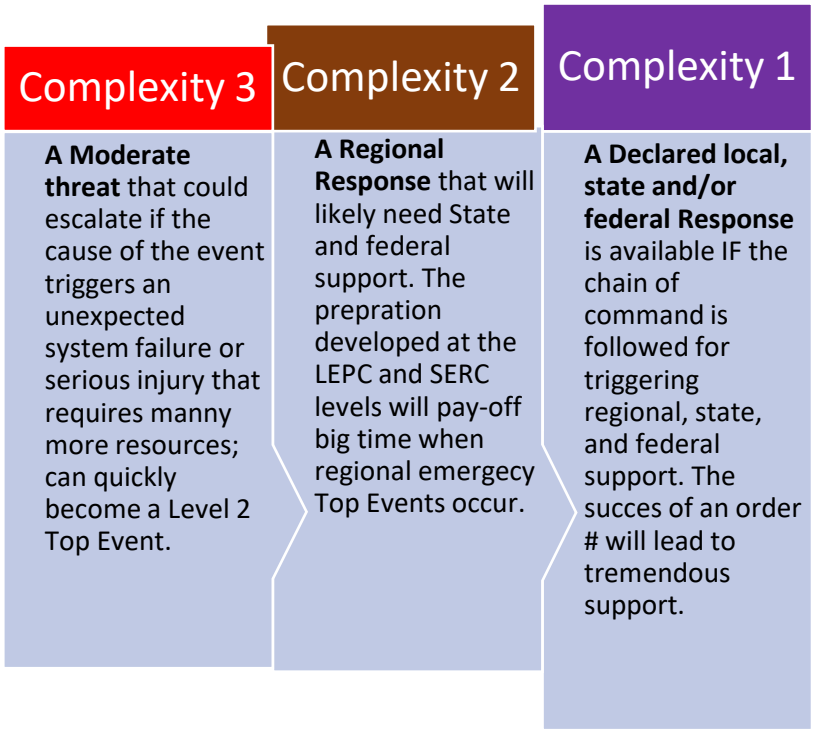
FEMA classification Level 5 Events are short time and low threat and controllable by RETA certified and equipped operators. **Recommended dispatch:** One fire unit e.g., fire engine, inspector or battalion chief Code 2 response for incident investigation purposes; just in case an unexpected risk occurs. The closest and most appropriate emergency response unit should be on standby for a potential need for a Complexity 4 or 3 hazmat incident response. **FEMA Complexity Level 4 is** Low to Moderate Risk & Threat - contained, controlled, and terminated within 24 hours and a moderate threat to community.

Recommended Dispatch: Single engine company and Level 5 hazmat response options Code 2. Level 3 dispatch if there is high potential for emergency threats. Consider a request that the local Emergency Manager **open a FEMA ChemResponder program** https://www.fema.gov/sites/default/files/2020-07/fema_cbrn_chemresponder_fact-sheet.pdf to begin the display of the situation status and potential plume model details.

The public safety first on scene Incident Commander (I.C.) will evaluate the Level 4 event and consider Emerging Signalss that could lead to higher risks and threat level of threat and complexity. The I.C. should request a plume model for the potential worst case release scenario.

The Incident Commander should alert the local Emergency Manager to formulate a **community IPAWS alert** https://www.ipaws.community.fema.gov/s/login/ **that could be used if a higher level of threat develops. The IPAWS message should be pre-set for details on protect-in-place alert for possible release should the Event become a higher threat complexity**. The message should include readiness to order a 1,000-foot shelter-in-place order until it is safe to evacuate to an upwind staging area. The **ChemResponder platform** will allow the emergency manager to update those selected to monitor the incident e.g. local AHJ, state and federal work to begin a situation status platform and plume modeling services. The Level

4 operations readiness should be focused on a possible Level 3 Top Event should worst case Level 3, 2 or 1 Top Event occur.

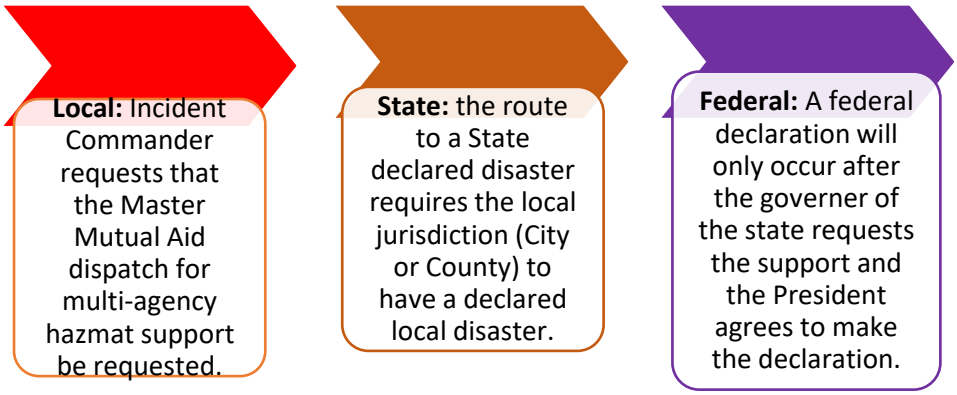


Note: All Level 3, 2, and/or 1 complexity events must be commanded by Public Safety in order to receive resources from local, state, and federal agencies. Most urban city and county jurisdictions have full-time Emergency Managers and Offices of Emergency Services that provide and coordinate resource requests from the on-scene Incident Commander's call for support. **FEMA Complexity Level 3** – a Moderate risk and threat that can quickly change to a more challenging regional response (24 hours or more to contain and control, terminate, and demobilize).

FEMA Complexity Level 3 to 2 – Moderate to high threat e.g., major fire or high impact explosion that may require a local disaster proclamation and state and federal support.

FEMA Complexity 2 to 1 – high risk and threat and significant impact to the community e.g., earthquake terrorist attack, flood or storm event can require local and State and national disaster proclamations.

CONOPS Goal 7: The AHJ should consider the NFPA Modes of Operation when setting the boundaries for Defensive and Offensive emergency response modes. See page 40 and Appendix II to consider how **Nonintervention** mode helps to set the boundary for when **Defensive** mode operational standards transitions to the **Emergency Response** mode and the five Complexity levels.



FEMA published a six-page **Guide to the Disaster Declaration Process** that should be required reading for all local emergency managers and command team members.

https://www.fema.gov/pdf/rrr/dec_proc.pdf

The general rule of engagement for regional, state, and federal first response may in many cases begin with a single resource, such as a state or federal On-Scene coordinator, or a chief officer that may agree to support a request for dispatch of a special needed resource requested from the jurisdiction needing the support that is not a part of the local master mutual aid agreement.

Unified Command and Multiagency Coordination System (MACS) offers important elements across multijurisdictional or multiagency incident management activities. They provide structures to enable agencies with different legal, jurisdictional, and functional responsibilities to coordinate, plan, and

CONOPS Goal 8: The AHJ should consider setting standing "Past and Emerging signals" to engage set-up details that the Incident Commander may call on if the emergency top event transitions to the next highest level of complexity e.g., ChemResponder and IPAWS are two free FEMA resources that is very helpful for front-loading the local incident management system.

interact effectively on the scene. The unified command allows all agencies with jurisdictional authority and/or functional responsibility for the incident to provide joint support through mutually developed incident objectives and strategies established at the command level.

Unified Command provides indispensable response activities and requires a clear understanding of the roles and responsibilities of each participating organization. Success requires unity of effort, which respects the chain of command of each participating organization while harnessing seamless coordination across jurisdictions in support of common objectives. Each participating agency maintains its own authority, responsibility, and accountability.

The National Incident Management System (NIMS) supports response through the following elements of unified command:

(1) developing a single set of objectives.

(2) using a collective, strategic approach.

(3) improving information flow and coordination.

(4) creating a common understanding of joint priorities and restrictions.

(5) ensuring that no agency's legal authorities are compromised or neglected; and

(6) optimizing the combined efforts of all agencies under a single plan.

FEMA National Watch Center provides around-the-clock situational awareness for FEMA.

by doing the following:

- Supporting the collection and distribution of pre-incident information to the National Operations Center for the development of the national common operating picture

- Providing analysis of collected information and national situational awareness of potential, developing, or ongoing situations that may require a Federal response

The National Response Coordination Center for FEMA disaster response is activated by the Director of Disaster Operations (DDO) in anticipation of, or in response to, an incident by activating the National Response Coordination Staff, which includes FEMA personnel, appropriate Emergency Support Function (ESF) representatives, and other personnel (including representatives of nongovernmental organizations [NGOs] and the private sector, when appropriate) to coordinate with the affected Region(s) and provide needed resources and policy guidance to support an incident.

Emergency Support Functions (ESFs) provide the structure for coordinating Federal interagency support for a Federal response to an incident. They are a way to group functions that provide federal support to states and federal-to-federal support, both for Stafford Act declared disasters and emergencies and for non-Stafford Act incidents.

ESF #1: Transportation; **ESF #2:** Communications; **ESF #3:** Public Works and Engineering; **ESF #4:** Firefighting ; **ESF #5:** Information and Planning; **ESF #6:** Mass Care, Emergency Assistance, Temporary Housing, and Human Services; **ESF #7:** Logistics; **ESF #8:** Public Health and Medical Services; **ESF #9:** Search and Rescue; **ESF #10:** Oil and Hazardous Materials Response; **ESF #11:** Agriculture and Natural Resources Annex; **ESF #12:** Energy; **ESF #13:** Public Safety and Security; **ESF #14:** Cross-Sector Business and Infrastructure; **ESF #15:** External Affairs ESF #15 Standard Operating Procedures (2019)

The dispatch event status will focus on the 9-1-1 callers' overall status report

Each piece of Lifeline status received by 9-1-1 dispatch represents a snapshot in time for an operational period and should be determined collaboratively with the facility and community emergency managers and continually assessed as incident circumstances evolve over the course of an emergency.

ASTI recommends the C-A-N Report as a quick and immediate summary of current status.

CHALLENGE TENET 7- **Bottom -page 22 to top of page 29. Notification and Dispatch Collaboration for Coordinated Response**

AHJ Challenge: The AHJ should review the top of page 22 (Operational and Emergency Response modes) to consider the definitions of **Operational and Emergency Response Parameters to assure clarity for 'Operational Performance" modes** that would allow Operators to support Responders. See Appendix III for definitions of nonintervention, defensive, and offensive mode of operations. qualifications to stabilize a system upset (FEMA Complexity 5 or 4 event and the support that **First Responder Operations support** that can be utilized to support public safety or contract emergency responders to operate system controls to stabilize a system problem while working within **their level of training, PPE, and ammonia detection capabilities**

Discuss the "Think About it" question about **why early and effective notifications of local, state, and federal response agencies is important.**

Review and consider local adoption of the three steps to setting up a notification procedure that reflects the FEMA five levels of complexity.

This will be a challenge that requires an initial collaboration with the AHJ Tripod team. The decision about the public safety dispatch policies will be discussed by the AHJ and the final decision will be decided by the public safety leadership.

By now you should understand why early notification of the local, state, and federal agencies is so important to the go early, big, and ready to prevent the loss of hazard containment from becoming a large and more threatening event.

The AHJ should focus on two concerns with the "go big early" notification requirements that the Tripod team MUST understand?

1) Calling early on a FEMA Complexity 5 or 4 event should be accepted as a positive move on the part of the facility command team.
2) A complexity 5 and 4 event is a facility operator challenge...the loss of primary containment is safeguarded with mitigations as repairs are being made. The courtesy of a code 2 (no lights or siren) by a single first responder Engine Company is a readiness effort that would support the safety of the operators and employees.
3) The Termination of the call should not be judged as a regulation violation, instead it should be touted as a successful "stop it small" tactic.

Tenet Comments:

Confirm that the transition from the "Operating Window" to the "Design Envelope" is a loss of primary containment emergency event that will require Emerging Signals mitigations to contain and control the emergency event to an operationally stabilizing status. Explain the distinction between the 'Operator"

Tenet Comments:

responsibilities and the "Emergency Responders responsibilities; and explain how the Operator advice and the information gathered during the first 30 minutes is helpful for the first Incident Action Plan for the tech responders that are addressing the LOPC.

AHJ Challenge The AHJ will review the CONOPS recommendations and give their thoughts about the dispatch details for public safety and all local, state, and federal mandated notifications. Dispatch of public safety resources will be decided by the local public safety leadership.

Page 26: AHJ to consider the Public Safety Responder use FEMA of ChemResponder and IPAWS

The Integrated Public Alert & Warning System (IPAWS) is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts with EPA for to enhance your response to complexity level 3, 2, and/or 1 modes of operation that has exceptional risk to life safety and environment that the EPA team would consider warranted for a special ESF support.

The AHJ should encourage the Tripod team to consider adding the ChemResponder and IPAW system to the ammonia response CONOPS. These tools provide a link to state and federal support for a level 3, 2, or for sure 1 complexity event. The local Emergency Manager should be a big player in helping to engage ChemResponder and IPAWS for the on-scene Incident Commander who is designated as the overall local Incident Command team leader.

TENET 8. Use a CAN report for the Dispatcher and First Responder Clipboard Readiness.

C-Conditions- What happened and where are you located? What is the current emergency event status?

A-Actions- are there any containment, control, rescue, evacuation, medical care actions taking place?

N- Needs- What specific needs do you need now...fire, law, medical, public works, utilities?

1) Disrupted with no solution identified,
2) Disrupted but a known time to resolution is identified, or
3) Stabilized either by first responder solutions and/or upgraded due to lifeline services needed for on-site and community members, and/or threats to environment and property.

Follow-up questions that could be asked when doing local and state emergency release notifications.

1) Your name, location, organization, telephone number, name/address of the party responsible for the incident or name of the carrier or vessel, the railcar/truck number, or other identifying information
2) Date and time and Location of the incident and weather conditions (wind) at the incident location; response route suggestions?
3) Status of the Personnel Accountability Report (PAR) and number and types of injuries or fatalities.

4) Has an evacuation or protect-in-place order, or movement plan to a shelter-in-place location been communicated to those on site?

5) Source and cause of the release or spill and the medium or media into which the release occurred.

6) Types of material(s) released or spilled into the environment. The chemical name or identity of any substance involved in the release and the danger or threat posed by the release or spill.

7) The time, duration, and quantity of materials released or spilled.

8) An indication of whether the substance is an extremely hazardous substance (anhydrous ammonia is considered by EPA an extremely hazardous substance. https://www.epa.gov/epcra/what-are-extremely-hazardous-substances-ehss

9) Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals.

10) Proper precautions to take as a result of the release, including evacuation (unless such information is readily available to the community emergency coordination pursuant to the emergency plan).

11) The names and telephone numbers of the person or persons to be contacted for further information.

12) Other agencies notified or about to be notified? Any other information that may help emergency personnel respond to the incident?

THINK ABOUT IT: Now that you have finished the review and hopeful AHJ use of the Tenet and the public safety dispatch options used to deal with the five levels of complexity you should see **why it is important for the need to notify the local AHJ, State, and EPA requirements**.

Can we expediently go early and big to stop the risks and threats of a level 3, 2, or 1 Top Event?

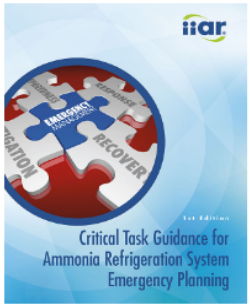
CONOPS Goal: The AHJ should utilize their CONOPS to define new prevention, mitigation, preparedness, response and recovery safeguards for operational Events and and Top Event emergencies. Consider the "go early and go big" strategy to stop the risks and threats of a level 3, 2, or 1 Top Event. Use notification and tabletop training (required by new EPA Risk Management Plan expectations) that utilize real-world learning experience especially helpful for operators, responders, and command team members.

13) The tabletop anticipates risks and threats challenges that can set new and approved future trends that assess past performance to enhance operational effectiveness and strategic alignment for operational upsets events.

Tripod Emergency managers combine their support to engage state and federal insights used to prevent, mitigate, and prepare for emergency events into "one plan". Process Safety Management/Risk Management Plan (PSM/RMP) Occupational Safety and Health Administration (OSHA), PSM Standard, 29 CFR 1910.119, and the United States Environmental Protection Agency (EPA), RMP Rule, Part 40 CFR

68 Solutions based upon the knowledge and experience from past Events and Top Events assist with reducing the Bow Tie threat line gaps should have PSM/RMP site program procedures and mechanical integrity programs e.g., Management of Change (MOC) Program Development and Implementation, Incident Investigation, Operating Procedures & Training threat line. performed by risk and safety managers from industry, government, and public safety.

The green side of the Bow Tie as a means of identifying hazard threat linework effectively facility Hazard Zone. The goal is for the system operators to stop a ammonia hazard **system upsets** before the loss of ammonia containment "**Event**" becomes a "**Top Event**" emergency. **System operators should be trained and equipped to** maintain preventative barriers, detection systems, system control mitigations e.g., relief valves, pressure cut-outs, and isolation valves that stand ready until Past Signalss trigger their operation. An early warning of a system upset can be safely controlled by a trained and equipped operator that uses stabilization protocols (SOPs) adopted by the employer that accomplishes the "stop them small" strategy BEFORE the Event threat line breaks through the Past Signalss **Top Event** emergency (beginning at the red Bow Tie knot). The Bow Tie **(blue)** right side provides emergency responders with mitigations and insights to stop the loss of containment "Top Event" (emergency) when it's small. The right side preparation and response recommendations will include personal protectice equipment (PPE) recommendations and advanced One Plan Sustained Response situation status information that include optional tools such as ALOHA https://www.epa.gov/cameo/aloha-software plume models, hazard assessment documentation (ICS 215a), ChemResponder https://www.fema.gov/sites/default/files/2020-07/fema_cbrn_chemresponder_fact-sheet.pdf The Emerging Signalss include the need for medical/health response readiness, traffic control, and on-going public information regarding the proper ways to protect-in-place or to safely move to a shelter-in-place location. Use the IPAWS to give Critical community messages. One Plan Playbooks https://ammonia-safety.com/the-one-plan for each hazard zone within the facilty.



IIAR Critical Task Guidance for Ammonia Refrigeration System Emergency Planning, 1st Edition

The *IIAR Critical Task Guidance for Ammonia Refrigeration System Emergency Planning, 1st Edition* was published to assist employers, government regulators, and public safety emergency responders in preparing emergency procedures to avoid and address ammonia incidents. The guideline was developed to increase safety when working in and around ammonia refrigeration systems and to mitigate the consequences of accidental releases. This document provides guidance for ensuring that existing emergency action and/or response plans include appropriate personal protective equipment selection, training, and emergency planning and communication associated with these critical tasks. **Click here for more information**

Utilize the Operator CONOPS for FEMA Complexity 5 and 4 Events.

IIAR: The International of all-Natural Refrigeration Institute of https://www.iiar.org/ provides standards and best practices for operating ammonia refrigeration systems and an excellent Critical Tasks Guidance document that provides sample S.O.P for first 30-minute life safety challenges.

ASTI: The Ammonia Safety and Training Institute www.ammonia-safety.com provides One Plan based emergency planning and response support for all users of ammonia. Open the ASTI store for emergency response information, posters, and https://toucaned.shop/collections/asti

GCCA: The Global Cold Chain Alliance provides training and emergency planning for cold storage warehouses throughout the world. https://www.gcca.org/legacy-system/Dealing-with-an-Ammonia-Spill-Final-Version-11-2016.pdf

In summary, the Bow Tie system sets up opportunities for trained and properly equipped operators and emergency responders to "Prevent Events and Top Events when they are small". This is why the notification and dispatch system should be set up by the AHJ to **"Go Early and Go Big** with resources needed to contain, control, and provide adequate medical, environmental, and property damage by safely engaging employer adopted SOP for engaging system control to stabilize a loss of ammonia threat Event before it becomes a "Top Event" emergency.

The right side (**blue circle**) of the Bow Tie is used to define the emergency preparation mitigations and command team ability to read conditions for current and future incident action plans and safety plans.

The top of the Tripod of the Bow Tie represents the command team focus on the One Plan stages of response: Discovery, Initial Response, Sustained Response and Termination/Recovery.

CONOPS Goal: If the system upset Event escapes Goal 1 containment and control the right side of the Bowtie symbolizes the need for prepatory readiness (PPE and emergency training) to mitigatigate and engage emergency system readiness plan with a Go Big, Go Early and Go prepared to Stop a "Top Event Emergency" before the consequences become a life threat or catastrophic loss to property and/or environment.

The Tripod is the center point for the Ammonia Response CONOPS. We described the power of the three legs of the Tripod when the hazards, risks, and threats are managed with the Bow Tie system.

The threshold planning quantity (TPQ) for anhydrous ammonia is 500 pounds, or approximately 91 gallons. The ammonia facility employer meeting or exceeding the TPQ must meet local, State, and federal emergency planning expectations.

EPA: Section 112(r)(1) of the Clean Air Act, also known as the General Duty Clause (GDC), makes the owners/operators of facilities with regulated hazardous substances responsible for managing chemicals safely. https://www.epa.gov/rmp/list-regulated-substances-under-risk-management-program

Ammonia users who store and/or use more than 10,000 pounds of anhydrous ammonia must submit a RMP and comply with OSHA Process Safety Management requirements (PSM).

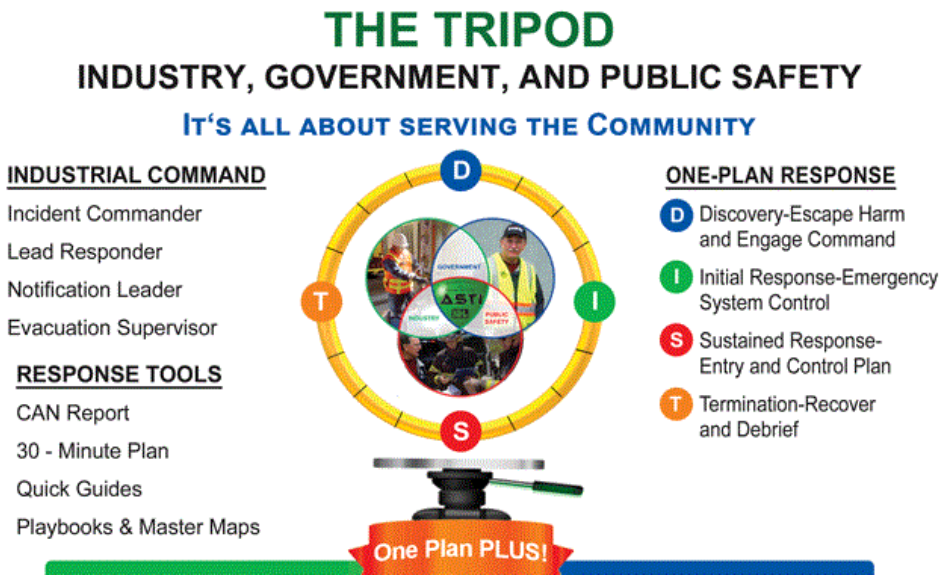
It's a General Duty that all ammonia that Employers can be cited for violation as follows: **OSHA and EPA enforce the General Duty Clause** if a recognized serious hazard exists in their workplace and the

employer does not take reasonable steps to prevent or abate the hazard. https://www.osha.gov/laws-regs/oshact/section5-duties

The Integrated Contingency Plan (ICP), also referred to as "One Plan" guidance, is a resource for consolidating numerous regulations and multiple emergency response plans concerning releases of oil and non-radiological hazardous substances into one functional plan.

The One Plan framework integrates with the OSHA, EPA, and local AHJ expectations

provided by of the One Plan, FEMA , OSHA, DHS. Thelocal AHJ Ammonia Response CONOPS should be submited to the LEPC, SERC, and Regional EPA for confirmation that the CONOPS is approriate for their expectations.



The top half (scope of the Tripod) **symbolizes the One Plan response logic** that sets up the One Plan four stages of response.

Utilize the 30-Minute Plan for training and for the initial engagement of the four stages of response as follows:

"Discovery - "LANCE" Begins with an early warning ("who,what, where") and immediate Isolaton Zone Life safety Alert to the facility commander of the details that will require his/her Notifications and Command and control critical tasks decisions that initially focus on movement of personnel to safe refuge as per the Evacuation Plan for the specific Hazard Zone.

"CAN use Lead Responder delivers a CAN report (Conditions-Actions-Needs) report to the command team leader so that the first incident action plan can be delivered to the command team.

SIMPLE-Initial Response is the point where operational ability to stop a loss of ammonia containment "upset" Event" begins it's transitions to an emergency "Top Event". This will be the operators last chance to safely engage the system stabilization moves while working with proper personal protective gear and ammonia detection outside of the 300 ppm Isolation Zone. **The operator will use system controls to mitigate the operational "upset"** with a SIMPLE control plan that addresses Sources of ignition, Isolation of the liquid feed, Manage energy flow, Positive Pressure ventilation, to support Life safety escape and rescue, and Engage the SIMPLE logic with a *CAN report* to the on-scene Incident Commander for his/her Sustained Response incident action plan.

ASTI'S Full Web-App Subscription offers an on-line web-application system that you can use to store critical checklists, pictures, video, and informational documents that supports your facility and local

AHJ Hazmat Area Plan. The system plays off the ASTI 30 Minute Plan checklists for Blue "Discovery" Playbook and a Green "Initial Response" Playbook. The clipboards and web-application information is used by first responders to engage life safety and ammonia system operational stabilization operational checklists for each Hazard Zone within your facility.

The "stop them small" strategy continues with critical information for Tech-Responders and operators that seamlessly take command after a CAN debriefing by the first responder senior supervisor or certified first responder Incident Commander (I.C.). The Tech-Responder I.C. will take charge and the command team will use the red Sustained Response Playbook to build a safely implement a incident action plan to contain and control the event so that it can be Terminated with a Recovery Orange Playbook for each Hazard Zone within your facility.

An ASTI Associate will set up a contract to engage a first year training plan that with ensure that the facility emergency management team correctly engages the One Plan Playbooks as per the local AHJ expectations.

The One Plan Playbooks full subscription version is available from the ASTI Associates at: https://ammonia-safety.com/the-one-plan

The ASTI Associate will lead-off the facility subscription with free access to Playbook information needed for the first 30-Minute Clipboard content that includes a CAN Report, notification and alert form, a Command Team daily status, and an ICS 215a Hazard Zone Safety Assessment form; located at the command post and each Hazard Zone.

The free access includes the need for the facility to pay the Associate hourly fees to lead the facility One Plan Champion (appointed by the employer) to install and set-up the Training Plan, Master Map, Command Team, Hazard Zones, command post locations, and other critical site plan information.

STEP 1: **Develop a year-around training Plan** that addresses your emergency planthat meets the AHJ, State and Federal emergency plan expectations.

STEP 2: **Design your plan to fit your employer's expectations.**The State and Federal emergency response framework gives the employer two strategic options to pick from. 1) Non-Response with an Emergency Action Plan or 2) Emergency Response Plan that allows trained and equipped responders to engage emergency system control options.

STEP 3: **The employer can set the limits of emergency response** e.g. "Our response team will only engage the Discovery and Initial Response Stages of an emergency event while working outside of Immediately Dangerous to Life and Health (IDLH) condtions.

STEP 4: **Set up an Anual QuarterlyTraining Plan** that is overseen by an Employer appointed senior supervisor who will ensure that the key elements of the Facility Plan align with the AHJ Area Plan expectations. Each Quarter should include

STEP 5:

The Employer MUST ensure that the Facility command team will achieve confidence and Self-Sufficiency when addressing the Emegency Action Plan AND the elements of the Emergency Response Plan that address the Discovery and Initial Response stages of the 30-Minute Plan.

STEP 6:

Training Plan should cover each element of the facility plan as laid out in the next pages. **The AHJ should ensure that an annual training plan** covers the newly enacted Risk Management Plan requirements that include notification, evacuation, hazard assessment, decontamination and medical care relationship between the facility team and the local public safety responders. **See Appendix V for more information.**

CHALLENGE TENET 8. Use a CAN report for the Dispatcher and First Responder Clipboard Situation Status.

Goal: The AHJ should devise an Annual Training Plan that addresses 30-Minute Plan protocols.

The facility senior supervisor in charge of the command team should utilize the 30-Minute Plan and Clipboard response readiness for all five FEMA Levels of complexity.

CONOPS Goal: Control of FEMA complexity 5, and 4, loss of hazard containment Events

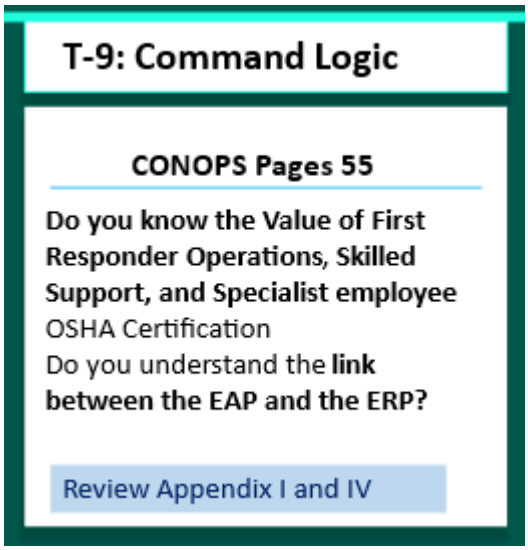
The level of operator collaboration emergency response command for Top Event emergencies requires training and certification. That is provided by the following non-profit organizations and their associate trainers and planners.

RETA: The Refrigerating Engineers and Technicians Association certifies operators to maintain and operate ammonia systems safely. https://reta.com/

Page 27 to the top of page 29: ONLY the public safety Incident Commander can engage local and regional response resources for a **FEMA Level 3 (emergency event),2 (regional mutual aid)** , and 1 (disaster proclamation). The AHJ should assure that the mutual Aid and Emergency Management understanding is correctly linked to the overall Emergency **Operations Center connection with the field commander (I.C.) who is in charge of the overall incident.** Consider developing an **ESF agreement.**

Tenet Comments: Review the original design and intent of the federally adopted One Plan process and see if the ASTI One Plan is consistent with the expectations of the National Response Team (NRT).
https://www.nrt.org/Main/Resources.aspx?ResourceType=Regulations&ResourceSection=1#:~:text=The%20Integrated%20Contingency%20Plan%20(ICP,substances%20into%20one%20functional%20plan.

TENET 9. System Operations and First Responder Emergency – Train to Your Plan



The Clipboard helps the first responding industrial and public safety responders to address the first 30-minute Discovery and Initial Response stages of One Plan response. The Clipboard contains **a CAN report Notification alert form, Master Map Clipboard, and a copy of the facility command team leaders. The protocol used for every system upset that requires Level 5 or 4 operator** stabilization and picked up by the emergency response team for Complexity 3 Top Event emergency incident loss of ammonia containment Top Event.

The AHJ may choose to require RETA certified ammonia system operators to safely engage emergency system control options (outside of the IDLH threat zone). The employer can ensure safe Operator engagement of Hazard Zones and system component mitigations that could significantly reduce the impact of the ammonia loss of containment Event. The EAP addresses the Discovery checklist and a CAN report to the senior supervisor in charge of the incident can chose to use Initial Response checklist options if the Employers Emergency plan addresses the key elements of the Emergency Response Plan as outlined below.

The following is a training plan that should link to the Employers Emergency Plan. The combination of EAP and ERP planning expectations must also meet the training requirements of those who participate in Operational control of system upsets and those who respond during the Initial Response stage. The Employer S.O.P.s for critical tasks during Discovery and Initial Response is published in the IIAR Critical Task Guidance document. **A well planned and coordinated evacuation plan** that considers "Protect-in-Place" and/or safe movement to a Master Map designated upwind evacuation staging areas.

ASTI NOTE: ASTI will work with private ASTI certified Emergency Response training contractors who want to work as ASTI Associates that utilize ASTI training resources to support the Employer's Annual Training plan. The ASTI team will provide a One Plan certificate for facilities that comply with the AHJ, state, and federal framework expectations.

ASTI will also provide "Task Book" training plans for key command team leaders that ASTI Associates will oversee and coordinate with the Employer and AHJ to ensure fulfill the Task Book training objectives that includes uses **competency testing** that meets an industrial certification expectation. The **ASTI One Plan Playbooks** provide the template for setting up the response protocol for the four stages of emergency response that will address each element of an EAP and ERP. Check out the following link: https://one-plan.org/ or call ASTI at 831-761-2935.

Review the content expectations for an Emergency Action Plan (EAP) as compared to an Emergency Response Plan (ERP) and you will see that EVERY industrial ammonia user would start the response to a a loss of ammonia hazard containment with with a well-developed EAP that addresses Discovery and Initial Response. The overall objective of an EAP is to discover Loss of Primary Containment (LOPC) as described in the bow tie diagram. The objective of the EAP is for the facility command team to engage early detection and notification (go early, big, and purposeful of on-site safe movement and accountability for all on-site personnel. The trained and equipped operators must follow employer Standards of Operation and also comply with the AHJ CONOPS expectations. Operators that are trained and equipped with proper PPE and personal ammonia detection may take steps to address the EAP critical tasks. **Notice how the 5 EAP items align and overlap with the 12 ERP items.**

Goal 13 Utilize the Guidance (listed below) for developing Operational and Emergency Response Tasks: The link between the FEMA levels of complexity work well for setting up expectations for trained system operators (defined in the next pages) and for first response operations will help the AHJ to document the local expectations for trained operators, first responders, and tech level responders.

Emergency Action Plan https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.38	Emergency Response Plan https://up.codes/s/elements-of-an-emergency-response-plan
1. Means of reporting fires and other emergencies 2. An employer must review the emergency action plan with each employee covered by the plan.	2. 1910.120(l)(2)(i) Pre-emergency planning. 3. 1910.120(l)(2)(iii) Emergency recognition and prevention. 4. 1910.120(l)(2)(ix) Emergency alerting and response procedures.

3. **An employer must train selected employees to assist in a safe and orderly evacuation.** 4. Evacuation procedures and emergency escape route assignments	5. 1910.120(l)(2)(iv) Safe distances and places of refuge. 6. 1910.120(l)(2)(vi) Evacuation routes and procedures. 7. https://www.osha.gov/etools/evacuation-plans-procedures
5. Procedures for employees who remain to operate critical plant operations before they evacuate	8. 1910.120(l)(2)(x) Critique of response and follow-up. 9. 1910.120(l)(2)(xi) PPE and emergency equipment.
6. Accounting for all employees after an emergency evacuation has been completed https://apxdata.com/personnel-accountability-report-par	10. 1910.120(l)(2)(v) Site security and control. 11. One of the first questions that a public safety I.C. will ask is "What's the PAR status for your employees and visitors?"
7. Rescue and medical duties for employees performing them	12. 1910.120(l)(2)(vii) Decontamination procedures which are not covered by the site safety and health plan. 13. 1910.120(l)(2)(viii) Emergency medical treatment and first aid.
8. Names or job titles of persons who can be contacted 9. When the plan is developed, or the employee is assigned initially to a job; 10. When the employee's responsibilities under the plan change; and when the plan is changed.	**1910.120(l)(2)(ii)** Personnel roles, lines of authority, training, and communication.

2023 EPA and OSHA update on "Non Response Mode (see Appendix IV for more details)

EPA understands that there is a wide spectrum of planning, preparedness, and response arrangements available to facilities and local communities, and that the two categories of "responding" and "non-responding" facilities do not fully capture this continuum. As explained above, there is some overlap between the obligations of non-responding and responding facilities. For example, both non-responding and responding facilities must have mechanisms or procedures in place to notify emergency responders about accidental releases, and both types of sources must conduct and document annual coordination activities with local responders. Because the outcome of these coordination activities may result in different types of response arrangements involving regulated facilities and communities, EPA understands that a facility's designation as "responding" or "non-responding" does not, by itself, explain all facets of emergency preparedness and response for the facility. https://www.osha.gov/laws-regs/standardinterpretations/1994-11-08#:~:text=The%20function%20of%20the%20First,or%20activating%20emergency%20control%20systems.

The following tables show the options for each of the FEMA five levels of Complexity and for each One Plan stage of Response. The AHJ will develop a level of training that aligns with the Level of Complexity and the emergency plan details that have been documented for the facility and for the AHJ Area Hazmat Plan. See Appendix I for more OSHA training requirements.

1910.120(q)(4) ***Skilled support personnel***. Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the employer's regular employees. However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

First responder awareness level.

First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release. First responders at the awareness level shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

1910.120(q)(6)(i)(A): An understanding of what hazardous substances are, and the risks associated with them in an incident.

1910.120(q)(6)(i)(B): An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.

1910.120(q)(6)(i)(C): The ability to recognize the presence of hazardous substances in an emergency.

1910.120(q)(6)(i)(D): The ability to identify hazardous substances, if possible.

1910.120(q)(6)(i)(E): An understanding of the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the U.S. Department of Transportation's Emergency Response Guidebook.

1910.120(q)(6)(i)(F):The ability to realize the need for additional resources, and to make appropriate notifications to the communication center.

1910.120(q)(6)(ii) provides Standards interpretations for all Hazwoper training requirements for responders and operators.

1910.120(q)(6)(ii) **First responder operations** level. First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:

1910.120(q)(6)(ii)(A) Knowledge of the basic hazard and risk assessment techniques. 1910.120(q)(6)(ii)(B) Know how to select and use proper personal protective equipment provided to the first responder operational level. (more on next page)

1910.120(q)(6)(ii)(C) An understanding of basic hazardous materials terms.

1910.120(q)(6)(ii)(D) Know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.

1910.120(q)(6)(ii)(E) Know how to implement basic decontamination procedures.

1910.120(q)(6)(ii)(F) An understanding of the relevant standard operating procedures and termination procedures.

1910.120(q)(5) ***Specialist employees.*** Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

RETA CARO, CIRO and CRST Certification https://reta.com/page/certification

CARO - Certified Assistant Refrigeration Operator

CARO is an entry-level credential that is designed to demonstrate that an operator has sufficient knowledge to work under supervision in industrial refrigeration. There is no minimum experience requirement for CARO. The exam assesses mastery of concepts and principles in RETA's Industrial Refrigeration I and the ammonia safety chapter in Industrial Refrigeration IV (chapter 7).

CARO includes 110 questions and allows three hours for completion.

CIRO - Certified Industrial Refrigeration Operator

CIRO requires documentation of at least two years of experience as an industrial refrigeration operator. It assesses more advanced concepts, principles and applications required to supervise

industrial refrigeration operations. CIRO measures mastery of applied refrigeration system operations and troubleshooting based on principles and knowledge addressed in RETA books: Industrial Refrigeration (IR) I · IR II (systems) IR IV (plant operation and safety) Basic Electricity (BE) I · Basic Electricity (BE) II (ladder diagrams).

The CIRO exam consists of 135 questions and allows three hours for completion.

CRST - Certified Refrigeration Service Technician

CRST was added in August 2018 and is designed for technicians and support personnel who troubleshoot and maintain industrial refrigeration plants and facilities. The credential addresses topics from advanced levels of plant safety and operations through the basics of ammonia refrigeration compliance and PSM requirements.

The CRST exam consists of 150 questions and allows three hours for completion. *A current RETA CARO or CIRO credential or 4 years of documented industrial refrigeration experience is required to take the CRST exam. Documentation must be submitted with the CRST exam application.*

Goal 15: The AHJ and facility employer should adopt a develop excellent Tripod training relations that is based upon how the facility emergency plan aligns with the OSHA level of training and certification and the EPA – EPCRA non-response and response mode emergency plan expectations.

CHALLENGE TENET 9. Top of page 35 to Top of page 41: Facility and Public Safety "Train to Your Plan" with One Plan CONOPS Training Matrix.

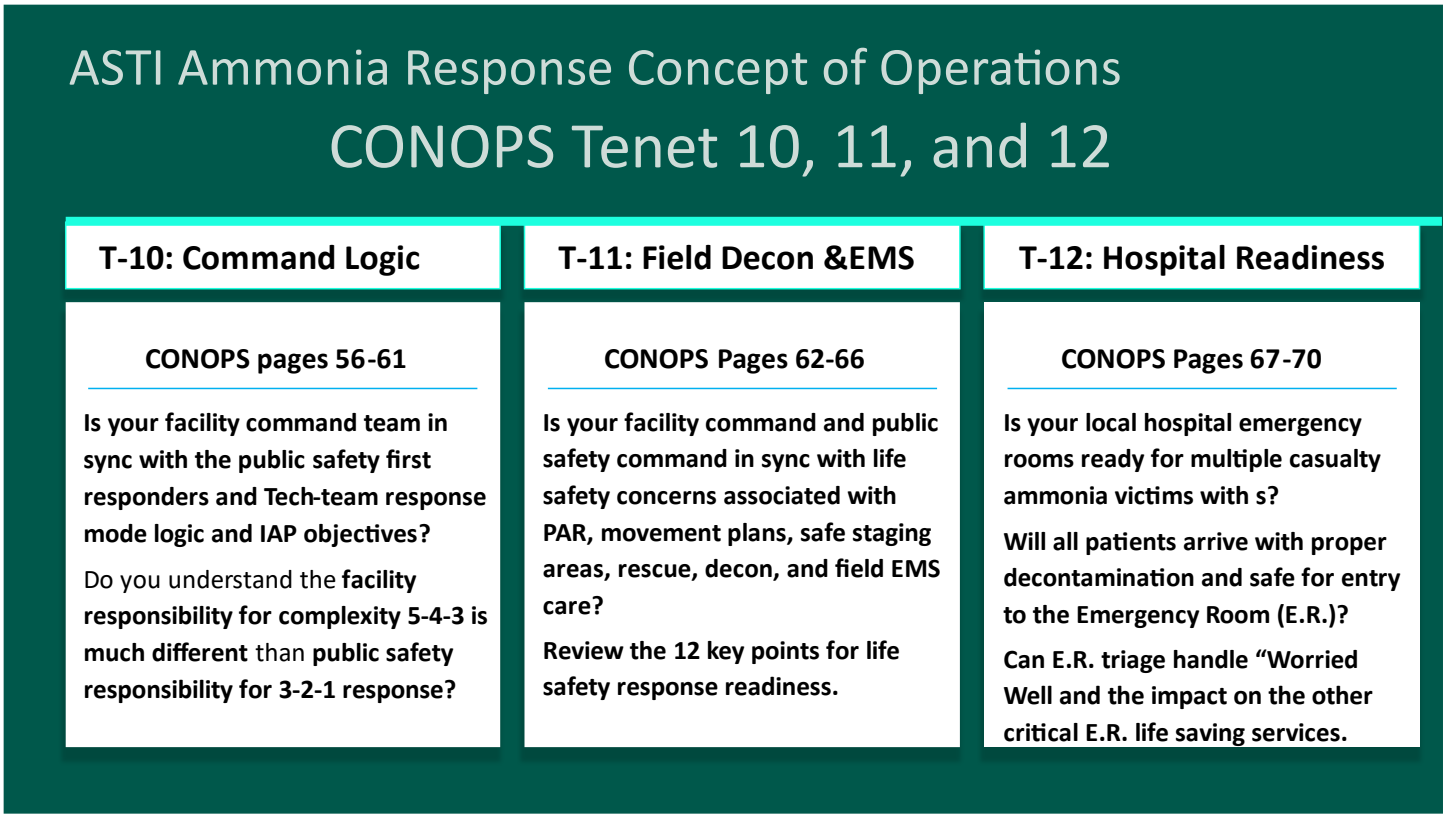
The AHJ Tripod team should read Tenet 9 and address Goals 12, 13, and 14 as a means to the creation of a training matrix that the AHJ Tripod team would agree to follow each year.

The training matrix would reflect operator and responder best practice and the will result in a link between the local training expectations as they link with state and federal governmental regulatory expectations.

The training matrix discussion includes a final goal in the **Conclusion and Summary Thoughts** that describes how the training matrix should be attained as an annual training plan that complies the all of the Tenets and applicable One Plan CONOPS governmental regulatory requirements.

Tenet Comments: What does this collaboration mean to you and your AHJ Tripod members?

TENET 10. Procedures for handling emergency responses Incident Command Requirements



Complexity 3-2-1 Responders – Incident Action Plan Begins with Operations CAN Report

1910.120(q)(3)(i) **The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS).** All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

Note to paragraph (q)(3)(i): The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established.

1910.120(q)(3)(ii) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies. **ASTI uses the ICS 215a Hazard Zone Safety Assessment process** - The purpose of the Incident Action Plan Safety Analysis (ICS 215A) is to aid the Safety Officer in completing an operational risk assessment to prioritize hazards, safety, and health issues, and to develop appropriate controls.

Tripod Support for local (AHJ), State, and Federal emergency response Framework. Value of Pre-Event Readiness, Discovery of loss of hazard containment, and Initial Response to contain and control a Top Event emergency.

FEMA Tenets are the core beliefs that FEMA Emergency Managers hold to be true.

The following information is copied from the FEMA Incident Management and Support Keystone document https://www.fema.gov/sites/default/files/2020-07/fema_incident_management_and_support_keystone-Jan2011.pdf . It is highly recommended that you review this document. It sets the stage for dealing with key issues and critical decisions. **Take note of the value of pre-training and planning so that the command team is ready to act...in most cases no decision is the worst case decision.**

FEMA Incident Management and Support Tenets

1. Engage the whole community.
2. Empower emergency managers to make decisions and take coordinated action.
3. Respond quickly with decisive initial actions.
4. Use outcome-based objectives.
5. Develop creative solutions and atypical resources.

These enduring principles frame the overall approach to conducting successful incident management and support operations and should be applied in all circumstances. Tenets describe the core basis for action during response and recovery. They are consistent with and expand on the key principles articulated in the National Response Framework (NRF)—which apply to the Nation as a whole by focusing on FEMA's role as a partner and provider. During a response to, and recovery from, any incident, the first decisions and actions that emergency managers and response personnel take set the stage for the success or failure of the response and affect how costly and timely the recovery will be. **Decisive effort must be exerted during the initial response. Emergency managers must operate with a bias towards vital action and sometimes assume risk by making decisions in an environment of insufficient information.** Emergency managers must constantly anticipate the worst-case scenario, determine which aspects of the incident are critical to success, and **not hesitate to act.** Incident Management and Support Keystone Emergency managers often confront problems that offer few attractive options. Speed, legality, cost,

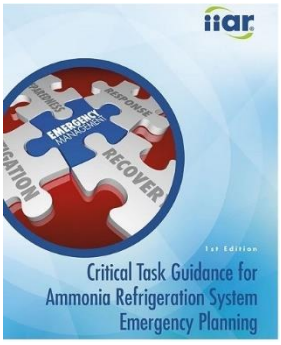
"THINK SMART. . . THINK BIG. . . GO BIG . . . GO FAST."

FEMA personnel must focus on responding aggressively to every incident. We must do the following:

- Always plan to support the communities, irrespective of the limitations that may inhibit us prior to an incident.
- Quickly bring all possible resources to bear against the effects of an incident. In incident response, it is better to *have* and not want, than to *want* and not have.
- Focus on stabilizing the incident during initial response, since effective response and recovery systems cannot be established without the requisite security.
- Use experience, training, expertise, and judgment to make timely decisions when the necessary information is not available.

cultural sensitivities, ensuring the safety of and improving the lives of survivors—all are criteria that must be weighed. Speed and taking care of survivors are the most important criteria and should carry the heaviest decision making weight. **A more deliberative decision-making process used in normal day-to-day operations may need to be put aside in order to save and sustain life and protect property. An imperfect action applied in time and based on professional training, experience, and judgement is better than a perfect solution applied too late.**

Goal 16:The depth and value of the Ammonia Response CONOPS Requires AHJ to strength to continue the cooperation and collaboration needed for the three legs of the Tripod. The training and emergency planning readiness must continuosly work to build self-sefficiency to carry out their Tripod roles. The local AHJ adopted CONOPS to prevent the loss of hazard containment and being ready to stop loss of ammonia containment when it's small. This is accomplished by engaging ongoing



Discovery and Initial Response stages first 30 minute action plan is the Critical Tasks Readiness threats stage that can be addressed by using the "Critical Task emergency Response Readiness protocols developed by ASTI and the International Institute All-Natural Refrigerants (IIAR)

https://www.iiar.org/IIAR/IIAR/IIAR_Publications/Books.aspx

The first 30 minutes of an emergency event have the highest risks and threats are often NOT prepared for command and control critical tasks emergency response.

ASTI worked with the International Institute of All-Natural Refrigerants (IIAR) to create an OSHA approved method of addressing emergency response critical task readiness to protect workers, responders, and the community from the life safety concerns during the first stages of an emergency (Discovery and Initial Response) that generally occur during the first 30 minutes of an emergency Top Event.

The critical task policies that ASTI and IIAR have created include methods of escaping an ammonia releases, rapid entry rescue, emergency system control, and the training and personnel protective equipment (PPE) needed to support the need for escaping the hot zone and moving to safe refuge, as well as for workers who engage rescue and emergency system control critical tasks for all ammonia users. The critical tasks guidance document has been published by IIAR and is available at

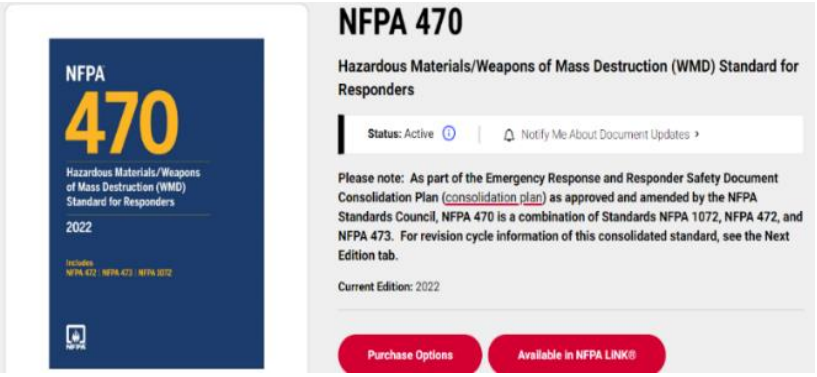
Critical Task emergency Response Readiness is vital during the first 30 minutes of an emergency event; when risks and threats are the highest and the on-scene emergency response is in most cases very weak.

ASTI worked with the International Institute of All-Natural Refrigerants (IIAR) to create an OSHA approved method of addressing emergency response critical task readiness to protect workers, responders, and the community from the life safety concerns during the first stages of an emergency

(Discovery and Initial Response) that generally occur during the first 30 minutes of an emergency Top Event. The critical task policies that ASTI and IIAR have created include methods of escaping an ammonia release, rapid entry rescue, emergency system control, and the training and personnel protective equipment (PPE) needed to support the need for escaping the hot zone and moving to safe refuge, as well as for workers who engage rescue and emergency system control critical tasks for all ammonia users. The critical tasks guidance document has been published by IIAR and is available at https://www.iiar.org/IIAR/IIAR/IIAR_Publications/Books.aspx

Tripod CONOPS emergency planning and training is most effective when they faciility team works with local public safety on specific tabletop exercises (TTX) that set up mock events (based on historical events). The TTX will reveal how the AHJ approved Ammonia Response CONOPS will link to the facility Emergency Action Plan, Emergency Response Plan, and/or the local public safety Hazmat Area Plan.

First 30 Minutes Response Readiness Support by the Local Fire Authority may require the AHJ to sort out the expectations for the first-due firefighters (first responders) to dawn their turnouts and self-contained breathing apparatus to enter and IDLH to achieve a rapid entry rescue of a live victim.



The National Fire Protection Association – NFPA 470 standard gives policy direction for first responders to hazardous materials and weapons of mass destruction (WMD) incidents. The standard's purpose is to ensure that first responders know their responsibilities by clearly defining their qualifications and requirements. OSHA does not enforce NFPA standards but they do use them as industrial best practices. **Please see Appendix II in this document for a summary of high point information from** NFPA 470. **The local AHJ should work with their local fire department to see a copy of NFPA or purchase one at the following website:** https://www.nfpa.org/codes-and-standards/nfpa-470-standard-development/470

Summary NFPA Finding that Support the Clarification of the Modes of Operations

ASTI's Summary findings explain how NFPA's public safety perspective relates to the expectations of "Defensive and Offensive Modes of mission-specific expectations for operational and emergency response CONOPS. **See Appendix II for the details associated with the following ASTI summary.**

Three Modes of Response: The following will clarify the public safety expectations for operational and emergency response plans. The key clarification message **centers on Defensive and Offensive modes**.

Nonintervention Mode: Risk to operators and/or responders is greater than the benefit of entry into the hot zone...response is focused only public protective actions allowing the release to "take it's natural course" (downwind/downstream impact)

Defensive Mode: Operating mode with medium risk to responders that have direct contact with ammonia while controlling or limiting the effects of the release.

Offensive Mode: Higher risk to responders that may have direct contact with the ammonia while taking aggressive actions to control the release.

THINK ABOUT IT: NFPA's predominant users are fire service first responders and technician hazmat responders. They understand and engage the three modes of response. The **command team may choose to engage the Nonintervention mode** that allows the command team to determine the risk vs. benefit of operators and responders to take actions (without going into the hot zone) to protect the public as the release while the ammonia release "takes its natural course". The **Defensive mode** allows Operator Responders to take "medium risk" to stabilize the ammonia system while working outside of the hot zone.

AHJ QUESTION: Shouldn't Operators that are OSHA "First Responder Operations" trained and equipped be able use the **Defensive mode** to take engage system control measures while working under medium risk outside of the hot zone?

Emergency Response Plan (ERP): Developed by the AHJ with ALL participating agencies and organizations who have entered into response agreements that provide goals, objectives and roles for engaging ammonia response strategies.

Incident Action Plan: Strategies and tactics considered for accomplishing incident objectives assigned tasks to operators and responders that favorably influence outcomes and increase safety for responders (including tech support) and the public.

Risk-Based Response. Systematic process, based on the facts, sciences, and circumstances of the incident, by which responders and operators with technical support information analyze an ammonia event to assess the hazards and consequences, develop an incident action plan (IAP) and evaluate the effectiveness of the plan.

3.3.80. Stabilization. The point in an incident when the adverse behavior of the ammonia event is controlled.

Operations Level Responders. The source of this definition is OSHA 29 CFR 1910-120, "Hazardous Waste Operation and Emergency Response." These responders can have additional competencies that are specific to their response mission, expected tasks, and equipment and training as determined by the authority having jurisdiction (AHJ).

Operations Level Responders who are expected to perform additional missions should work under the direction of a Hazardous Materials Technician, written emergency response plan or standard operating procedures, or an allied professional.

Operations Level Responders can respond either as an individual or as a member of a unit/team operating under the direction of a supervisor. Regardless of how Operations Level Responders respond to a hazardous materials (WMD) incident, the following tasks should be completed:

(1) Predict the likely behavior of a hazardous materials (WMD) and its container, including hazards associated with that behavior

(2) Estimate the potential outcomes at hand at a hazardous materials/WMD incident.

Goal 17:The depth and value of the Ammonia Response CONOPS Requires AHJ to strength to continue the Tripod cooperation and collaboration needed to clarify how training and emergency planning readiness addresses the transition from an EAP to an ERP. Provide AHJ clarity about how a trained and equipped operators will follow employer adopted EAP SOPs to stabilize the ammonia system and coordinate with emergency responders to engage the ERP mitgation safeguards to safely contain and control the loss of ammonia containment when it's small.

Evacuation Planning Must Consider Movement Planning, Protect-in-Place, and Shelter-in-Place

The community evacuation plan has many more community challenges that should include the support of the local community Emergency Manager, law enforcement, medical/health leadership support. The 2024 Emergency Response Guidebook has guidance on the importance of "Protect-in-Place while entrapped in a vehicle or building (white circle on the adjacent plume model) that has safer (more survivable) condition than to move out to a shelter-in-place location and/or an outside staging area the is lateral and upwind of the emergency event. the ASTI One Plan Playbooks provides critical life safety and control and containment options for each Hazard Zone within a facility that uses ammonia (or any other dangerous chemical threat).

Goal 18: The AHJ and facility employer should adopt a develop evacuation planning for on-site evacuation by using the OSHA e-Tool guidance for evacuation planning is an excellent resource the covers the general expectations needed for a safe, timely, and effective evacuation. Please open the link https://www.osha.gov/etools/evacuation-plans-procedures/eap/minimum-requirements

Utilize the DOT/PHMSA 2024 Emergency Response Guidebook For community evacuation insights.

https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg

CHALLENGE TENET 10. Procedures for handling emergency responses Incident Command Requirements.

AHJ Challenge: The AHJ Tripod team should read the content of Tenet 10 and address Goals 15, 16 and 17 and make sure to pay Special attention to the following key points of each of the Tenet 10 goals:

Goal 15: Once again, reflect on the value of building a strong first-responder approach that emphasizes the value of the operator's ability to stabilize the system and the collaboration needed to expediently address the on-site and off-site life safety and environmental and property protection needs.

Goal 16: Review the "THINK ABOUT IT" message on the top of page 45 and then address the need for the AHJ to adopt EAP language that allows trained and equipped operators to address system stabilization SOPs that they are trained and equipped to safely accomplish.

The AHJ Tripod should clarify the facility command/operations team link to the first responder public safety Initial Response plan to perform live safety safeguards and system control measures while working outside of the IDLH Hot Zone.

Goal 17: **The evacuation planning** must include pre-event readiness that provides the command team with knowledge about escape planning that relates to the best options:

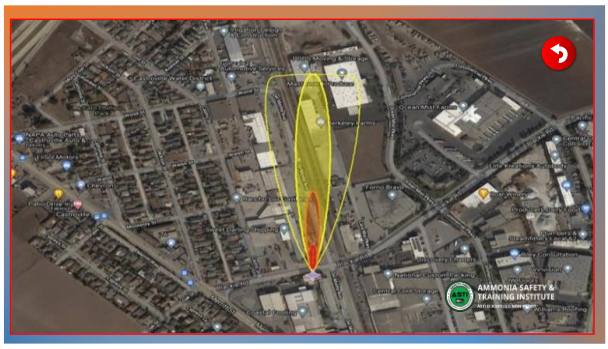
1) Shelter-in-Place,

2) Movement that is lateral and upwind of the downwind movement of ammonia vapor to a safe refuge,

3) Immediate Personnel Accountability Report (PAR) report that calls out the life safety concerns associated with the escape from the Hot Zone followed by a PAR status of all employees, contractors, and visitors.

Tenet Comments:

TENET 11. Decontamination & Medical Treatment and Key Points for Ammonia Injured Victims



Key Point 1. The short-term exposure (10 to 15 seconds) to the worst-case ammonia release (aerosol/dense gas cloud) can be escaped from without serious life threatening injury. This is mainly true because the aerosol/dense gas will be VERY cold (as low as -60°F to -60°F. The human body heat will deflect much of the dense gas impact on the victim as he/she escapes, although the severe coldness may freeze clothing and liquid ammonia aerosol may have absorbed int clothing that will cause severe burns if not immediately properly decontaminated.

T-11: Field Decon &EMS

CONOPS Pages 62-66

Is your facility command and public safety command in sync with life safety concerns associated with PAR, movement plans, safe staging areas, rescue, decon, and field EMS care?

Review the 12 key points for life safety response readiness.

Key Point 2. Victims of ammonia exposure must be moved to a safe treatment area for immediate respiratory, eye, and skin decontamination for ammonia skin exposure that occurs during a loss of ammonia hazard containment AND for exposure to decontamination aqueous solutions that migrate from washing down the upper body (the water mixes with ammonia contaminated clothing and skin and will move as an aqueous high alkaline pH solution that wills soak into all other clothing, including soaks and boots/shoes. Remove all clothing and shower for at least 15 to 30 minutes before drying off and putting on clean clothing.

Wet clothing that has aqueous ammonia will have a pH factor that will begin with an uncomfortable burning sensation (like diaper rash) and blister within hours after exposure. The only cure is a complete shower and fresh clothing.

Key Point 3. Evidence shows that victims that escape an aerosol dense gas cloud within 15 to 20 seconds have a good chance of surviving without serious long-term **injury if they go directly to a shower and decon as explained in Key Point 1**. If the victim is wearing an air purifying respirator or escape hood (preferably a 14G) the victim is likely not to have serous respiratory impact.

ASTI does live ammonia training at our Fort Ord training facilty to help firefighters understand how to approach and engage rapid entry rescue and back up support for operators working outside if IDLH (300 ppm) conditions to engage emergency system controls to help contain and control an ammonia leak.

Key Point 4. Case history that relates to the need for the Key Point 1-3 decontamination recommendations:

- Case 1: Jose Mata was suddenly impacted when a ammonia condenser failed due to trapped liquid pressure build-up. He was immediately knocked to the ground and fully covered in aerosol/dense gas. Jose escaped on his own mobility, but the decontamination plan was not fully engaged by the facility and fire service personnel. Jose's pants and boots were left on him as they sent him by ambulance to the hospital. The aqueous ammonia solution created life threatening third degree burns on his legs and feet.

  Jose Mata and his team could not find a shower because they were not trained (they were contractors that didn't work daily at the plant) …they used a hand wash station and their helmet to provide the water to do decontamination as Jose sat on a concrete barrier. His face and upper body came through the event fairly well (except for the cold skin scar). They did not remove his pants that were soaked with aqueous ammonia. Jose was transported to the hospital emergency

room (about 30 minutes had passed before they removed his pants, socks and boots. He had serious, painful scares on his lower legs and feet. The dead skin and infection had to be scrubbed while he was put unconscious for about 17 hours. The recovery was painful, and he had several near-death cardiac shock moments.

- Case 2: Pedro Aleman and five (5) of his employees were caught in an aerosol/dense gas cloud release. They had been ASTI trained and learned of the need to escape and immediately perform full decontamination with water. Only the valve operator that caused the release was injured with second degree burns on his back (which he recovered from within several weeks).

Key Point 5. The following are Emergency Action Plan critical tasks that relate to life safety concerns:

1) Formalize the roles of the Evacuation Group Supervisor and his/her team

2)Develop Hazard Zone (HZ) escape plans to move out of the high threat zones (Hot, Isolation, and Protective Action areas); move to a rally point, SIP location, and/or evacuation staging area.

3) Trained and equipped operators should be expected to accomplish the four points associated with handling a loss of hazard containment.

Key Point 6. A field decon experience may require an immediate decon (hasty decon) whereby highly contaminated clothing (wet and not frozen to the skin) is removed immediately. A water hose, bottled water, or bucket/pot of water may be used to remove clothing that is frozen (the clothing should be carefully pulled away from the body. Ensure that the clothing isn't connected to the skin. Jose Mata's clothing was removed without this caution, and he lost skin tissue on his arm (causing a deep scar).

Key Point 7. Eye contamination also needs immediate care. There are small vials of eye was solution that can be quickly applied to an immediately contaminated eye.

The Columbian's had the eyewash decon solution to use for the hasty decon. They went through five bottles before arriving at a shower/eyewash to finish the job. None of them had any eye related injury. None of them were wearing goggles but they did have safety glasses. The quick escape resulted in no serious eye impact…they could see their way out of the workshop that filled with dense gas aerosol.

Key Point 8. The decon process can be performed with due regard for the need for immediate underwear removal. Protect the victim's dignity by using appropriate protocol such as a human wall that blocks on-lookers from making the victim nervous and hard to deal with. The key is to continue the shower with the underwear being thoroughly rinsed and removed only when the victim has evidence of ammonia contamination injury to the groin; all clothing (including under wear) should be removed when finishing the decon and then provided with clean/dry clothing or a blanket.

Key Point 9. The shower water volume and pressure is designed to deluge with low pressure high volume water spray. The showers can be provided with in-line heaters that ensure tepid water and adequate protection from potential cold thermal conditions.

Key Point 10. The inspection and maintenance of the emergency showers and training on decontamination procedures is absolutely critical.

Ensure that decon stations are routinely serviced, and that all potential decon locations be posted with a map.

Key Point 11. The shower should also have a handheld decon nozzles that provide a low pressure/high volume water spray that works well for addressing the decon need on areas of concern such as the groin…constant flush will significantly reduce any blistering. ASTI instructors have participated in decontamination events where they saw several blisters began to fade and then disappear after about 20 minutes of decontamination. The victim felt fine and continued the day with no discomfort of skin damage.

The best decon stations include a standing pad that allows run-off to drain away from the shower location, a hand-held hose line, and a paddle operated eyewash.

Key Point 12. t's very important that decon training be performed that demonstrates all procedures including readiness for the cold thermal impact and the need for victim care…they will not want to stay bent over the eyewash for 15 to 30 minutes, even though it's the best opportunity to escape permanent injury. Most people tire within 3 to 5 minutes and need to be supported by their fellow workers or fire service and/or medical responders. Make sure to do a hazard assessment for the location of a shower/eyewash. The water spray will be a draw for escaping ammonia. Outside showers in cold climates may be frozen and/or too cold to use…so an alternative location will be vital.

One Plan Ammonia Response Tenet Challenges

CHALLENGE TENET 11. Mid-Page 45 to Mid-Page 47. Decontamination & Medical Treatment and Key Points for Ammonia Injured Victims.

AHJ Challenge: Review Key Points 1, 2, and 3. Define the highest life threat Hazard Zones (HZ) and their ALOHA red zone plume (bottom of page 44) for the **most likely high risk release of ammonia for each HZ**. The method of escaping each HZ threat zone and the nearest decontamination and medical treatment location should also be recorded on a Master Map. **See the ASTI One Plan Playbooks for a free sample of a Master Map that displays the critical life safety escape, decontamination, and treatment areas; and the Command Team set up needed to guide emergency response.**

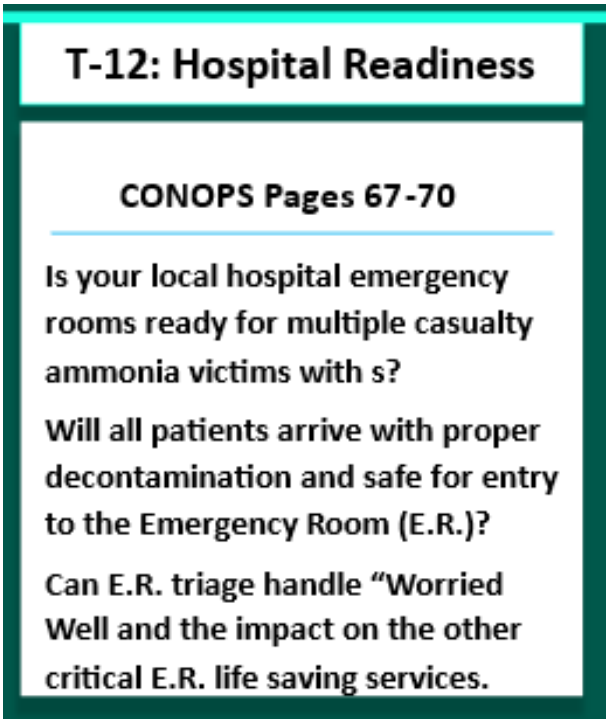
Key Point 4: Review the two case history stories (Pedro Aleman and Jose Mata). The ASTI Associate will provide training the explains the following:

1) Explain why a sudden aerosol dense gas release is the highest risk ammonia release event.

2) Explain why Jose Mata suffered life threatening injuries and life time of scars and reduced sensual capabilities (taste and smell), while Pedro and his team escaped without serious injury.
   Note: Pedro and his team were trained by ASTI instructor Rick Williams who explained the lessons learned about safe escape and decontamination about a year before their accident.
3) **Go back to your Key Point 1, 2, and 3 plans** to ensure you got all the Hazard Zone critical preparation plans in place.

Tenet Comments:

Key Point 6: through 12. Review the Key Points and then ensure that your local facility and public safety responders (fire, emergency medical, and law enforcement) has adequate medical CONOPS to address the escape, movement plan, and emergency medical care protocols in place. ASTI recommends that the AHJ Tripod team work with individual ammonia facilities to ensure that the life safety protocols identified within this CONOPS is adequately addressed.



TENET 12. Develop an Accurate and Timely Medical CONOPS between the Field Command, Local Emergency Manager, and the Hospital.

Triage, Treatment, and Transport to Hospital Medical Care Must be a Priority AHJ Consideration

In most cases the pre-curser to critical emergency medical care requires three steps for the emergency responders to get victims of ammonia exposure to the medical traeatment and transport zones. The three key points are: 1.Emergency system control. 2. Evacuation to safe refuge and 3. Rescue, decontamination, and emergency medical response readiness.

Preparedness and Early Response Med/Health Considerations

Preparedness support from ATSDR Agency for Toxic Substances and Disease Registry

- **Medical Management Guidelines for Ammonia:**
  https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=7&toxid=2
- **Toxicological Profile for Ammonia:**
  https://www.atsdr.cdc.gov/toxprofiles/tp126.pdf
- **One Page summary of Ammonia:**
  https://www.atsdr.cdc.gov/toxfaqs/tfacts126.pdf

- Safe response route (approaching from the upwind) and staging area for treatment and transport (located safely upwind and/or within an inside sheltered location.
- Medical liaison with the command team that is prepared e.g., with PPE and chemical training, to address all the Medical/Health Considerations.

First arriving command coordination between public safety and the facility response incoming medical and other dispatched support supervisors support for on-scene decontamination equipment and staff available?

- Gate entrance Access Control Officer to direct incoming ambulance and other dispatched resources to safe staging areas.
- Designation of medical triage, treatment, and transport staging areas.
- Location of decontamination showers and eyewash stations (inside and outside locations)
- Dry decon support: Fans for dry decon and vapor movement fans, blankets, debris bags, clean/dry clothing.
- Location of decontamination showers and eyewash stations (inside and outside locations)
- The best decontamination system is to have immediate access to an OSHA approved built-in decontamination shower and eyewash system. Use of utility water hoses and/or fire hose lines for decontamination should be a secondary decontamination option.

Dispatch notification to responding units to other calls, but still in the general area, that there is of a HazMat event also occurring.

- Methods of addressing life threatening medical emergency calls that are located within the Isolation or Protective Action zones.

Will the responding private ambulances need Fire/HazMat assistance with PPE?

1. Donning/Doffing and/or protocol for treating victims within the Protective Action Zone?
2. Hazmat rescue team protocol is to bring the victims to decon and then to triage/treatment areas.
3. The EMS team respiratory protection would need to be planned locally with AHJ consideration.
4. There should be adequate fire service support to participate in the decon and movement of victims to safe triage and treatment areas.

5. A fan could be used to clear the air of off-gas and/or fugitive ammonia gas. The levels of ammonia gas should be monitored by an assigned safety officer or ammonia monitoring team member.

JOINTLY ACCEPTED FIRST AID MEASURES, DECONTAMINATION

Training and equipment to sustain medical and decontamination challenges until public safety and emergency medical technicians can assume command and control of the victims.

Triage and treatment protocols for all types of ammonia related injuries. Special focus on respiratory, eyesight, and skin burns.

HOSPITAL READINESS FOR CHEMICAL EMERGENCIES:

- What role does Public Health play in the early response?
- How well do the hospitals coordinate with field response?
- Unified Command and or liaison would be the case for multi-casualty command team approach.

Question: Do local hospitals utilize Hospital ICS (HICS)?

- Does the hospital exercise/train with Fire/Law/EMS regularly in increase effectiveness in an event?

Note: The hospital would not likely be a part of the Unified Command on scene. Patient destination is an EMS/Control Facility decision (the Control Facility may be a hospital that is not affected or close to the scene). The hospital would most likely have a liaison in the County EOC as part of the Medical/Health Branch under Operations Section. This may vary depending on local policy and procedure.

- How well does local Fire/HazMat help with medical response training and exercise for chemical events?
- How would the local community Emergency Manager support the overall resource needs and coordination efforts with the community response, e.g., regional support and liaison with law and mass casualty transport and supply requests?
- Is the hospital's triage, decon, chemical injury treatment knowledge and equipment ready to go at a moment's notice?
- Has the hospital command and control plan for chemical injury treatment – respiratory, skin burns, advanced decon, and triage assessment been exercise/updated recently?
- How can local Fire/HazMat help them with this?
- Who coordinates requests for transport and treatment at specialty centers play?
- Where is the nearest Burn Center, Trauma Center, and/or Pediatric Center and are they mapped out and pre-planned to accept victims of a chemical exposure event?
- At what point will the hospital decompress to a Skilled Nursing Facility in order to be able to receive a high volume of patients?

    - Does the hospital have plans that have been shared and exercised with the SNF to accomplish this move quickly and safely?
- Are there plans in place to utilize Critical Access Hospitals to receive injured victims of a chemical event?
    - Have these plans been exercised?

6. Does the local LEMSA/EMS /Fire Agencies practice the policy and procedures for a response of this nature in an exercise on a regularly scheduled basis?

Med/Health Considerations later in the response:

- The Surge on the EMS system locally, regionally, and statewide.
- The Surge impact on both the local area hospitals and the hospitals outside of the affected area.
- Are plans in place for both Regional and/or statewide organizations to support the management of surge demand?
- What is Public Health's role in the long term?
- How does the public health and Environmental Response liaison with field command and the local area emergency manager?
- Who handles the Behavioral Health needs during long term patient and community recovery?
- Other local/regional med/health system recovery concerns?

One Plan Ammonia Response Tenet Challenges

CHALLENGE TENET 12. Mid- Page 47 to the Mid-Page 50. Develop an Accurate and Timely Medical CONOPS between the Field Command, Local Emergency Manager, and the Hospital.

The AHJ review of Tenet 12 information is highly tuned to the local and regional public health and safety response readiness leadership. A multi-casualty ammonia event is very rare, but nevertheless very challenging because of several reasons listed below:

1. The odor of ammonia is inherently scary to humans because the smell of ammonia is easy to detect at 5 parts-per-million (PPM) and doesn't become immediately dangerous until 300 PPM. The human body takes in 17,000 mg of ammonia per day by breathing, drinking water, and eating food. A healthy liver can process about 350,000 mg of ammonia for natural purposes, e.g. breaking down food to protein that works through the blood system to sustain human growth...excess amounts of ammonia are released through human urine and/or feces.

2. The need for good information about the health and well-being of ammonia victims must be accurately assessed. The internet links are provided at the bottom of page 47. Medical responder information can be found in the footer of the One Plan Playbooks offered by ASTI.

Tenet Comments:

1. First Arriving Command and Coordination of and emergency event should start and continue with the Bullet point for EVERY emergency event...and it is especially important for life threatening response risks.

   The AHJ should insure that the system for receiving public safety support is organized and dispatched in accordance with pages 48 and the top of page 49.
2. The AHJ should address each of the bullet points on page 49 and the top of page 50.
3. ASTI has completed the Ammonia Response CONOPS with 6 key points.
4. We ask that the AHJ provide more key points and expound on the ones we have already addressed. Please send us your "Final Tenet Comments with your feedback about the need for additions, edits, and improvements.

   Send your comments to asti@ammonia-sfety.com or phone 831-761-2935; or send your comments directly to Gary Smith, President and CEO of ASTI - gary.smith@ammonia-safety.com 831-818-1321

Final Tenet Comments:

Conclusion and Summary Thoughts

"Prevent them all" (summary of pages

First priority Ammonia CONOPS Goal – "Keep ammonia in the pipes" – prevent, mitigate, and prepare for a primary loss of ammonia containment.

The following message is from Gary Smith, President/CEO and Co-founder of ASTI with 45 years of ammonia emergency management experience.

The value of the local AHJ-Tripod year-around commitment to the Tenets of the Ammonia One Plan CONOPS.

"The facility commitment to safety and emergency response readiness begins and ends with well trained and experienced system operators, Senior Supervisors, and employer assigned command team members who follow and enforce safety and PPE readiness protocols without fail. The command team senior supervisors and operators place high priority on staying in tune with system status and are immediately alerted when a fire or ammonia detection alert occurs. All employees and contractors are trained to recognize and report any emergency event including a slight odor of smoke or ammonia. ALL operators and command team members communicate their situation status with a CAN report (Conditions, Actions, and Needs). Any Loss Of Primary Containment (PLOC) of ammonia or smoke odor of ammonia is worthy of operator investigation.

The operator's confidence, afforded by good training and proper PPE readiness, does NOT mean that the operator would increase their level of ammonia exposure. Instead, the operator would immediately call the facility command team leader (senior supervisor) for ALL FEMA Complexity level 5, 4, or 3 events. Only the public safety I.C. can initiate a level 2 or 1 FEMA Complexity request. The facility Notification Unit Leader would follow protocol for notifying the AHJ authorities in accordance with CONOPS Tenet 7. Remember, the calls give the local, state, and federal responders a chance to track complexity 4 and 3 events and would likely result in immediate response to a Level 2 or 1 complexity event initiated by the local public safety Incident Commander.

Senior supervisors in charge of emergency response operations have pre-event training and readiness to address all five FEMA levels of Complexity and they have documented HRT understanding for each facility DESIGNATED HAZARD ZONE.

The facility command team leaders rely on the lead operator(s) to use preventative safeguards to "quickly detect, and SAFELY respond to a Loss of Primary Containment (LOPOC), by using system controls, LOCATED OUTSIDE OF THE IDLH HAZARD ZONE to stabilize the loss of ammonia hazard containment" while the LIFE SAFETY IMPACTS ARE SMALL.

The ASTI Year-Around training plan will sustain the command team's OSHA "First Responder Operations" certification so that they can interact effectively with in-coming public safety and governmental responders. The following is a list of six (6) critical rules of One Plan response:

1. **Prevention Opportunity – "Do NOT deviate from the norm" -** Trained and equipped RETA certified operators that follow the IIAR best practice standards of operation.
2. **Prevention Opportunity - "Safety Profitability Model –** Make sure that your system's safe operating window is clean and appropriately strong enough to handle peak energy demand loads.
3. **Safe Operations "NO deviation from the Operating Window norms" –** Employer action required when the operating system escapes the operating window and is within the design window – it's profitable to sustain a safe and reliable system that stays within the Operating Window
4. **Operator Response Readiness – "know your system and maintain it for maximum efficiency" e**.g., defrost, oil draining, and on-going compliance with safe operating procedures.
5. **Working within the design envelop**
6. Early detection and system stabilization -

Thank you for considering the One Plan Ammonia Response CONOPS as an AHJ coordination and communications plan.
Join the ASTI team at a Safety Day, CONOPS Tabletop training, and/or the 32 Hour live ammonia training event. Details available on the ASTI website: www.ammonia-safety.com
https://youtu.be/BbjpiNd17E4?si=DFEGm9gOmLMSVq6i

Appendix I: OSHA Safety and Command Team Training Requirements

First Responder Awareness, OSHA Operator, and Tech responder training for hazardous waste and hazardous chemical response. https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.120

1910.120(q)(3)(iii) **Based on the hazardous substances** and/or conditions present, **the individual in charge of the ICS shall implement appropriate emergency operations and assure that the personal protective equipment worn is appropriate for the hazards to be encountered**. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29 CFR 1910.156(e) when worn while performing firefighting operations beyond the incipient stage for any incident.

1910.120(q)(3)(iv) **Employees engaged in emergency response and exposed to hazardous substances** presenting an inhalation hazard or potential inhalation hazard **shall wear positive pressure self-contained breathing** apparatus while engaged in emergency response, **until such time that the individual in charge of the ICS determines through the use of air monitoring** that a decreased level of respiratory protection will not result in hazardous exposures to employees**. ASTI and IIAR recommend that the NIOSH 14G rated Air Purifying Respirator would be the minimum level of respiratory protection that should be considered by the Incident Commander.**

1910.120(q)(3)(v) **The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site**, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. **However, operations in hazardous areas shall be performed using the buddy system in groups of two or more**.

1910.120(q)(3)(vi) **Back-up personnel shall stand by with equipment ready to aid** or rescue. Advance first aid support personnel, as a minimum, shall also stand by with medical equipment and transportation capability.

1910.120(q)(3)(vii) **The individual in charge of the ICS shall designate a safety official**, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand. **ASTI recommends that the AHJ consider the Incident Commander as the Safety officer during the Discovery and Initial Response stages while performing evacuation and system stabilization operations outside of the IDLH Hot Zone.**

1910.120(q)(3)(viii) **When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities.** The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene.

1910.120(q)(3)(ix) After emergency operations have terminated, the individual in charge of the ICS shall implement **appropriate decontamination procedures**.

1910.120(q)(3)(x) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

OSHA Command Team Training Options – Linked to the Employer's Emergency Plan Expectations

1910.120(q)(6)(v) ***On scene incident commander***. Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, shall receive at least **24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:**

1910.120(q)(6)(v)(A) Know and be able to implement the employer's incident command system.

1910.120(q)(6)(v)(B) Know how to implement the employer's emergency response plan.

1910.120(q)(6)(v)(C) Know and understand the hazards and risks associated with employees working in chemical protective clothing.

1910.120(q)(6)(v)(D) Know how to implement the local emergency response plan.

1910.120(q)(6)(v)(E) Know of the state emergency response plan and of the Federal Regional Response Team.

1910.120(q)(6)(v)(F) Know and understand the importance of decontamination procedures.

ASTI Note: The Incident Commander (I.C.) should meet the same level of emergency response training that those he/she is commanding so that the command team is in sync with the operations and response team e.g. The I.C. would be (at a minimum) First Responder Operations trained when commanding any incident that does not require entering the IDLH Hot Zone.

The I.C. would be trained as a Tech Responder when commanding a team that is engaging and Incident Action Plan within an IDLH Hot Zone.

1910.120(q)(6)(ii) **First responder operations** level. First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:

1910.120(q)(6)(ii)(A) Knowledge of the basic hazard and risk assessment techniques. 1910.120(q)(6)(ii)(B) Know how to select and use proper personal protective equipment provided to the first responder operational level. (more on next page)

1910.120(q)(6)(ii)(C) An understanding of basic hazardous materials terms.

1910.120(q)(6)(ii)(D) Know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.

1910.120(q)(6)(ii)(E) Know how to implement basic decontamination procedures.

1910.120(q)(6)(ii)(F) An understanding of the relevant standard operating procedures and termination procedures.

1910.120(q)(6)(iv) Hazardous materials specialist	Tech-Responder – Entry Team, I.C., and Safety Officer
Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local and other government authorities in regard to site activities. Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify: **1910.120(q)(6)(iv)(A)** Know how to implement the local emergency response plan. **1910.120(q)(6)(iv)(B)** Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment. **1910.120(q)(6)(iv)(C)** ***Know of the state emergency response plan.*** **1910.120(q)(6)(iv)(D)** Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist. **1910.120(q)(6)(iv)(E)** Understand in-depth hazard and risk techniques. **1910.120(q)(6)(iv)(F)** Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available. **1910.120(q)(6)(iv)(G)** Be able to determine and implement decontamination procedures. **1910.120(q)(6)(iv)(H)** Have the ability to develop a site safety and control plan. **1910.120(q)(6)(iv)(I)** Understand chemical, radiological and toxicological terminology and behavior.	**Hazardous materials technician** are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch or otherwise stop the release of a hazardous substance. Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify: **1910.120(q)(6)(iii)(A)** Know how to implement the employer's emergency response plan. **1910.120(q)(6)(iii)(B)** Know the classification, identification and verification of known and unknown materials by using field survey instruments and equipment. **1910.120(q)(6)(iii)(C)** Be able to function within an assigned role in the Incident Command System. **1910.120(q)(6)(iii)(D)** Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician. **1910.120(q)(6)(iii)(E)** Understand hazard and risk assessment techniques. **1910.120(q)(6)(iii)(F)** Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit. **1910.120(q)(6)(iii)(G)** Understand and implement decontamination procedures. **1910.120(q)(6)(iii)(H)** Understand termination procedures. **1910.120(q)(6)(iii)(I)** Understand basic chemical and toxicological terminology and behavior. 1910.120(q)(6)(iv)

Appendix II: NFPA Regulatory Standards of Operation

The purpose of the NFPA 470 Standard is to ensure that first responders know their responsibilities when dealing with hazardous materials and weapons of mass destruction (WMD) incidents. The

standard also covers the competencies and professional qualifications of emergency medical services personnel.

Hazardous Materials/Weapons of Mass Destruction (WMD) can be purchased from NFPA at the following website: https://www.nfpa.org/product/nfpa-470-standard/p0470code

The following is a summary of high point information that would apply to the public safety responder expectations for operational and emergency response CONOPS.

Section 3.3.54 Mission-Specific Competencies – 3.3.55 Modes of Operations (nonintervention, Defensive, and Offensive).

3.55.1 Nonintervention Mode. An operating mode used where the risk to emergency responders is greater than the benefit, in which responders do not operate near the hazardous materials/weapons of mass destruction or container, focusing on public protective actions only and allowing the container or product to take its natural course.

3.55.2 Defensive Mode. An operating mode characterized as medium risk to emergency responders, in which responders do not have direct contact with hazardous materials/weapons of mass destruction, focusing safely controlling or limiting the effects of a release.

3.55.3 Offensive Mode. An operating mode characterized as higher risk to emergency responders, in which responders could have direct contact with the hazardous materials/weapons of mass destruction (WMD), taking aggressive actions to control the release of hazardous materials/WMD.

3.61.1. Emergency Response Plan (ERP). A plan developed by the authority having jurisdiction (AHJ) with the cooperation of all participating agencies and organizations, including a jurisdiction with emergency responsibilities and those outside the jurisdiction who have entered into response/support agreements, that identifies goals and incident objectives for the emergency type , agency roles, and overall strategies.

3.61.2.1 Action Plan. Creation of a plan to determine strategies and tactics within an Incident Action Plan (IAP) and is a detailed proposal that will safely accomplish incident objectives, favorably influence outcomes, and increase the safety of responders and the public.

3.62. Planned Response. The incident action plan, with the site safety and control plan, consistent with the emergency response plan and/or standard operating procedures for a specific hazardous materials/Weapons of Mass Destruction (WMD) incident.

3.3.69 Qualified. Having knowledge of the installation, construction, or operation of apparatus and the hazards involved.

3.3.73 Response. That portion of incident management in which personnel are involved in controlling hazardous materials/weapons of mass destruction (WMD) incidents.

3.3.75 Risk-Based Response. Systematic process, based on the facts, sciences, and circumstances of the incident, by which responders analyze a problem involving hazardous materials/weapons of mass destruction (WMD) to assess the hazards and consequences, develop an incident action plan (IAP) and evaluate the effectiveness of the plan.

3.3.80. Stabilization. The point in an incident when the adverse behavior of the hazardous material, or the hazardous component of a weapon of mass destruction (WMD) is controlled.

NFPA Annex A

A.3.4.2.1.3 Operations Level Responders. The source of this definition is OSHA 29 CFR 1910-120, "Hazardous Waste Operation and Emergency Response." These responders can have additional competencies that are specific to their response mission, expected tasks, and equipment and training as determined by the authority having jurisdiction (AHJ).

A.6.1.1.3 Operations Level Responders who are expected to perform additional missions should work under the direction of a Hazardous Materials Technician, written emergency response plan or standard operating procedures, or an allied professional.

A6.1.1.3 Operations Level Responders can respond either as an individual or as a member of a unit/team operating under the direction of a supervisor. Regardless of how Operations Level Responders respond to a hazardous materials (WMD) incident, the following tasks should be completed:

(1) Predict the likely behavior of a hazardous materials (WMD) and its container, including hazards associated with that behavior

(2) Estimate the potential outcomes at hand at a hazardous materials/WMD incident.

Note: This NFPA section (A6.1.1.3) has Table A.6.1.1.1 Operations Level Responder Matrix has Ops Responder Tasks (summarized) as follows:

Table Header Columns: The table shows the PPE, Decontamination, air monitoring, victim rescue, and drug lab

- Firefighters expected to perform basic defensive product control measures
- Emergency responders assigned to a decontamination
- Emergency responders assigned to a unit providing rapid rescue and extraction from a contaminated space
- Emergency responders assigned to provide staffing or support to a Hazardous Materials Response Team, and requirements for first responders from law enforcement, public health, and environmental health

A.16.4.1 (2) PPE the PPE is based upon the abilities and task assignments (strategic and tactical options)

- Operational Safety competencies

Note: NFPA and Occupational Safety and Health Administration (OSHA) have a relationship in that OSHA uses NFPA standards as a guide for their own electrical safety standards, and employers can use NFPA standards to help them comply with OSHA standards.

OSHA does not, per se, enforce the NFPA standard... OSHA considers NFPA standards to be a recognized industry practice.

Appendix III: Tenets and Goals for AHJ Construction of a Local Framework to Build the One Plan Ammonia Response CONOPS.

The AHJ leader may request ASTI to help facilitate the first draft of the local AHJ Tripod agreement. Contact ASTI at www.ammonia-safety.com or call 831-761-2935 for the cost of performing live or on-line support for providing facilitation and a draft of the proclamation work plan needs that would lead to final approval of the ASTI One Plan CONOPS certificate of compliance with the Tenets and Goals.

The ASTI facilitator will provide insight about the Tenets and Goals and will draft a first version of an ASTI supported Ammonia Response CONOPS proclamation that will have ASTI feedback on the details needed for the final ASTI approval of the Tripod AHJ members.

ASTI Associate Evaluators will perform an annual evaluation of the facility One Plan CONOPS compliance evaluation that, if successful, will result in a One Plan Compliance Certificate that be used by the facility owner to show the local AHJ, EPA, and OSHA a status report of compliance with the One Plan CONOPS annual status.

The training and emergency planning experiences that assure ASTI One Plan CONOPS compliance will require one hour per month training that will include assurance that the CONOPS is on target to accomplish the emergency plan requirements of the facility emergency plan and the local area CONOPS expectations. The training will include tabletop exercises, and specific assignments for operators and emergency response command and entry team member certification for Senior Supervisor, Lead Responder, Notification Unit Leader, and Evacuation Group Supervisor.

Tenets and Goals for the Tripod AHJ Template for Developing a Local Ammonia Response CONOPS

Each of the following **Black Font "Tenet -Page: __"** items are internally linked to the page(s) that provide the goals and details associated with the Tenet Topic. Each of the following Tenets has "AHJ Challenges" that will trigger a discussion needed to ensure accuracy and understanding for the local CONOPS adoption by the AHJ stakeholders having jurisdictional CONOPS involvement.

Establishing a Local One Plan Ammonia Response CONOPS

First Step: The local AHJ leader should email or call ASTI Office Manager Amanda Meyers at asti@ammonia-safety.com or phone 831-761-2935 to attain the latest version of the Ammonia One Plan CONOPS document and she will send the AHJ leader a 30-Minute Plan and a One Plan CONOPS Resources list for other documents that the AHJ Leader may need.

Second Step: Amanda will set up a connection between the local AHJ Leader and an ASTI One Plan Ammonia Response Facilitator that can help the AHJ leader set up the first draft of the local response to the 21 CONOPS Tenets and goals.

Third Step: The ASTI CONOPS Facilitator will review the Tenet and goal expectation with the AHJ leader to ensure that the AHJ Leader is ready to begin addressing the Tenets with challenges described in the first two Tenets (pages 1 thru 11).

Fourth Step: The ASTI Facilitator will work with the AHJ to set up a plan for ASTI support to help complete the One Plan Ammonia Response CONOPS. The support will be at the sole discretion of the AHJ. The range of options will range from providing an ASTI CONOPS Facilitator stand-by support to address key challenges to an on-going relationship to support the completion of the entire CONOPS process, from creation of the first draft to providing support to help explain the CONOPS content for AHJ adoption with local, regional, state, and federal agreements.

Appendix IV – OSHA Interpretation Regarding First Responder Operations

2023 EPA and OSHA Update on Non-Response: https://www.osha.gov/laws-regs/standardinterpretations/1994-11-08#:~:text=The%20function%20of%20the%20First,or%20activating%20emergency%20control%20systems.

EPA understands that there is a **wide spectrum of planning, preparedness, and response arrangements available to facilities and local communities, and that the two categories of "responding" and "non-responding" facilities do not fully capture this continuum.** As explained above, there is **some overlap between the obligations of non-responding and responding facilities**.

For example, both non-responding and responding facilities must have mechanisms or procedures in place to notify emergency responders about accidental releases, and both types of sources must conduct and document annual coordination activities with local responders.

Because the outcome of these coordination activities may result in different types of response arrangements involving regulated facilities and communities, EPA understands that a facility's designation as "responding" or "non-responding" does not, by itself, explain all facets of emergency preparedness and response for the facility.

Standard Number: 1910.120

OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at https://www.osha.gov.

OSHA Interpretation Letter regarding the purpose of the First Responder Operations and the need for an employer appointed Senior Supervisor (or trained Incident Commander) to be in charge of a hazmat emergency event : November 8, 1994 - Robin Moorcroft, P.E. Manager, Operations Engineering Mission Operation and Maintenance, Inc. Suite 300 12500 Fair Lakes Circle Fairfax, Virginia 22033

Dear Mr. Moorcroft:

Thank you for your letter of May 10, concerning the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation, 29 CFR 1910.120.

You request **clarification on HAZWOPER emergency response training requirements**. It appears from your letter **that your workers will only be trained to the First Responder Operations Level**. **The function of the First Responder Operations Level is to take defensive action to contain an uncontrolled release, acting at a safe distance from the point of release. Defensive activities include**

placing of sorbent, shutting off valves outside the danger area, or activating emergency control systems. The standard does not allow Operations Level First Responders to actually enter the danger area to attempt to stop a release. Therefore, if **you choose not to train your people beyond the First Responder Operations Level, you must arrange in advance to call in an outside HAZMAT team in the event your employees are unable to control a release through the use of defensive action.**

We will now address your specific questions.

Question 1) Our operating personnel are trained to the level of First Responder Operations. **Is it a requirement that one individual on each shift be trained as an "Incident Commander" or would it suffice for plant management, called out to the plant, to be trained as the incident commander?**

The second part of this question) If there is an "Incident Commander" on the scene, either from the shift or a plant supervisor called in, and the Plant Manager or some other senior manager arrives on site, must he be "Incident Commander" trained or can he defer to the individual who is trained and handling the situation?

There must be someone on-site designated and trained to be in charge of the incident, HAZWOPER describes this individual as the Senior Official. It is **not acceptable** to designate and train the plant manager or supervise as the Senior Official **if this person needs to be called in from off-site. (ASTI interpretation of this paragraph: the incident response can not go unsupervised while waiting for an off-site designated Senior Official to arrive)**

Your facility emergency response plan must detail the procedures to be followed, roles and duties of responders, and lines of authority and communication. **All activity must be coordinated through the Incident Command System, which specifies that one individual be in charge of coordinating and supervising emergency response efforts. The Incident Command System is to include a preestablished chain of command, in which control of the incident is passed up the chain of command as more senior officers arrive. For example, in the event it is necessary to call in the outside HAZMAT team, your Senior Official would turn over control of the incident to the head of the outside HAZMAT team.**

You must specify in advance whether you intend for the on-site Senior Official to turn over control of the incident to the plant supervisor or manager who arrives from off-site. OSHA would **not require** that **your senior managers who arrive from off-site take over control** of the incident. **However**, whoever serves **the role of Senior Official must have full authority to coordinate and supervise emergency response activities**. Off-site senior managers will not need to be trained to head up the incident response if they truly defer to the on-site Senior Official.

It may be of interest to you that, since your **Senior Official is coordinating and supervising first response** only, the **full training of the On-Scene Incident Commander may not be needed**. The Senior Official (both on-site and, if you so decide, your off-site plant managers) must be **trained based on the duties and function to be performed** The type and extent of training would **depend on the facility and the complexity of defensive emergency prevention measures.** In situations where it is necessary to call

in the outside **HAZMAT team, the role of Senior Official would be passed** up the preestablished lines of authority to the head of the outside HAZMAT team. **The head of the HAZMAT team must be certified as an On-Scene Incident Commander as described in 29 CFR 1910.120(q)(6)(v).**

2) The regulations state that the **Hazardous Materials Specialist:** ... **would also act as a liaison with Federal, state, local and other government authorities in regard to site activities**...

Does this mean we must have a Hazardous Materials Specialist on each shift to Provide this liaison or can our First Responder Operations-trained individuals or our "Incident Commander" provide this liaison?

You are not required to have a Hazardous Materials Specialist on your response team. **However, the role of liaison with government authorities should be designated in your emergency response plan**. You should **coordinate in advance with local emergency planning authorities to determine what information needs to be reported to them in the event of an incident. It would be the responsibility of the Senior Official (described in response to your first question) to determine whether outside assistance is needed. Your emergency response plan must define what scenarios your plant can and cannot handle without the aid of an outside hazmat team, and your workers, particularly the Senior Official, must be trained to understand the limits of their response capabilities.**

3) After the completion of the emergency response phase of an incident, a **contractor would normally be hired to provide the clean-up and disposal services**. **Is it necessary for our plant management to be trained as "On-Site Management and Supervisors" if their involvement is telling the contractor to "clean up the problem?"**

These management personnel would be responsible for arranging the contract, monitoring contract expenditures and monitoring procedures followed by the contractor to insure general compliance with OSHA and other regulations. They might go to the site of the incident simply as an observer. They would have previously received First Responder Operations level training.

The On-Site Management and Supervisory training to which you refer is intended for on-site management personnel who are directly responsible for clean-up operations. Contract management personnel who simply instruct the contractor to "clean up the problem" would not require this level of training.

However, access to contaminated areas of clean-up operations is generally limited to personnel who are certified under paragraph (e) of the standard. First Responder Operations Level Training would not be applicable because clean-up by outside contractors is regulated separately from emergency response activities. Clean-up operations are regulated under paragraphs (b) through (o) of HAZWOPER. Clean-up workers must have 24 or 40 hours of training as specified in paragraph (e)(3). This training is a prerequisite to the training specified in (e)(4) for on-site management and supervisors.

Regarding your concerns about monitoring compliance with OSHA regulations, the standard requires that there be a "Site Safety and Health Supervisor" for all clean-up operations, who has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

You should ensure that any clean-up contractor you hire has a qualified Safety and Health Supervisor and will be able to comply with the other safety and health requirements for clean-up operations and may wish to specify this in your contractual agreement.

We hope this information is helpful. If you have any further questions please feel free to contact the Office of Health Compliance Assistance at (202) 219-8036.

Sincerely,

Ruth McCully, Director Office of Health Compliance Assistance

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Appendix V – Planning for a 2025 CRADA Supported CONOPS

Introduction: The 2025 CRADA is now officially going to be initiated on January 1, 2025.

The U.S. Department of Homeland Security https://www.dhs.gov/ will be initiating an agreement between ASTI and CSAC (Chemical Security Analysis Center) to engage an operational plan

Purpose and Approach

This collaboration enables the Parties to conduct cooperative research and development at the intersection of advancing chemical hazard knowledge and enhancing emergency response procedures. CSAC (Sponsor) will collaborate with the IPAWS Program and the Office of Emerging Threats at FEMA to integrate IPAWS-OPEN and CBRNResponder for developing a One Plan for Ammonia Response Concept of Operations (CONOPS) framework with ASTI (Collaborator). The collaborator will communicate with regional West Coast emergency response services to identify realistic scenarios that could inform the implementation of training doctrines with operational impacts. Collaborator will work with Sponsor to incorporate the resulting knowledge products into emergency response procedures and ammonia incidents conducted as part of Collaborator training and safety activities.

The Parties will cooperatively research and design a live simulation of an emergency response event in a water-proximate environment to assess how the chemical hazard information might be integrated with the COP to improve the hazmat incident response and increase the effectiveness of hazmat communication that can provide life-saving information to the public.

Sponsor and Collaborator will meet virtually or in person to discuss issues related to increasing hazard awareness of anhydrous ammonia, hydrogen, and methanol on the West Coast of the U.S. The specific focus will be on the Port of Los Angeles, considered a likely green corridor by many clean maritime fuel stakeholders, and the Ports of Tacoma and Seattle, which are part of the Pacific Northwest Hydrogen Hub. Both the Ports of Los Angeles and Long Beach are projected to handle hundreds of millions of tons of methanol and ammonia in the coming years. The technical discussions through forums and roundtable meetings will gather relevant information on dispersion modeling gaps in water environments, emergency response across multiple jurisdictions, rapid communication within response communities, and alerts for the impacted public. These efforts will lead to better preparedness for emerging chemical threats, securing the region for hosting the 2026 FIFA World Cup, 2028 Summer Olympics, and the development of hydrogen hubs as a green corridor.

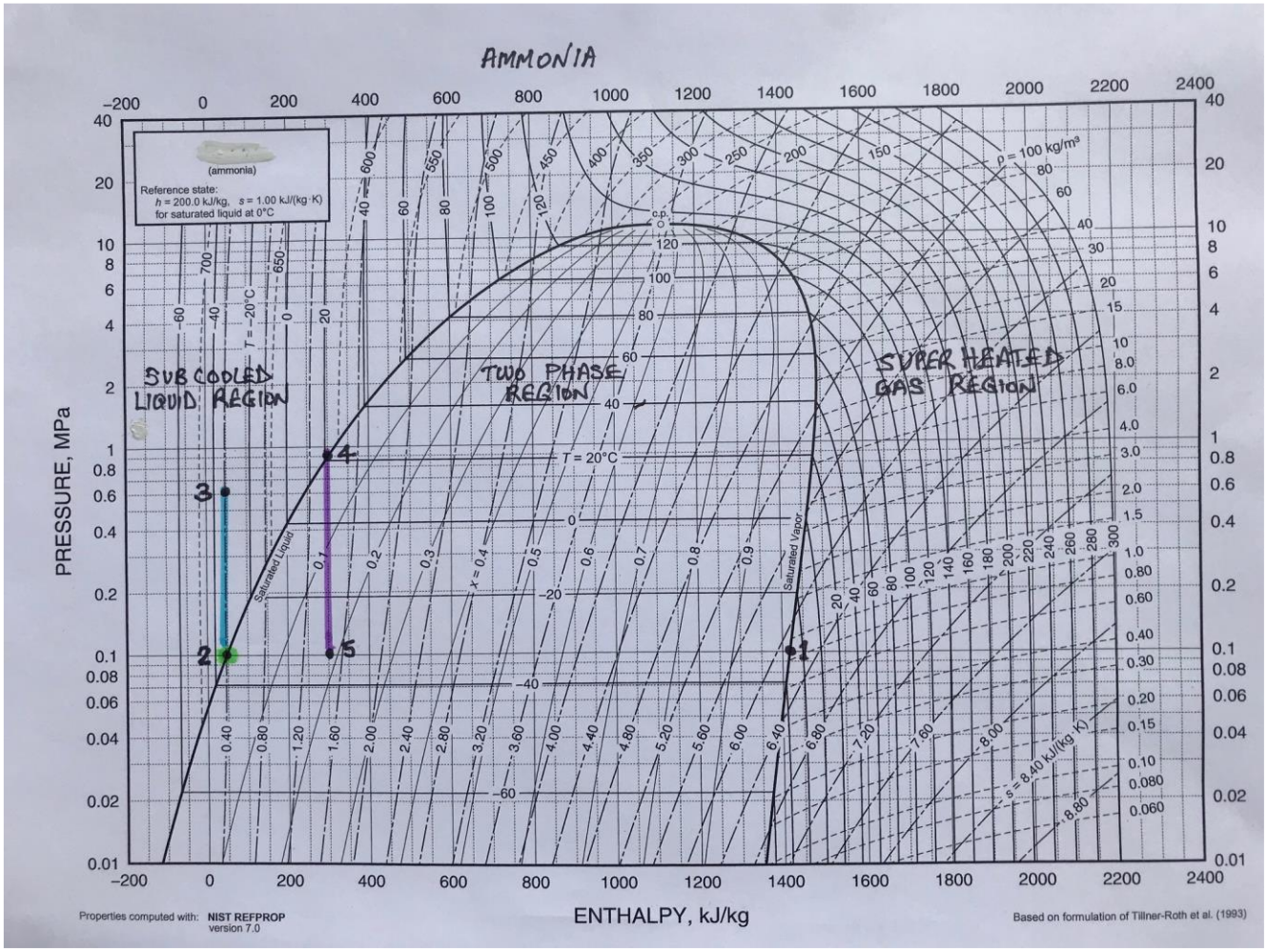
ASTI conducted experimental releases of subcooled and saturated liquid releases that are being scientifically analyzed by the Nanyang Technical University MESD (Maritime Energy and Sustainable Development Centre of Excellence). ASTI is also working with John Mott of the Australia Energy Association https://ammoniaenergy.org/articles/ammonia-hydrogen-2-0-conference-panel-discussion-recap/ to coordinate and support the design of the experimental releases.

The joint effort between ASTI and the Asia Pacific ammonia energy leaders will also involve the Japanese Energy Association (JERA) https://www.jera.co.jp/en/ continue in 2025.

Current Considerations for improvements in the ammonia hazard analysis and response CONOPS

The following information will be considered for inclusion into the 2025 Ammonia Response CONOPS considerations for the

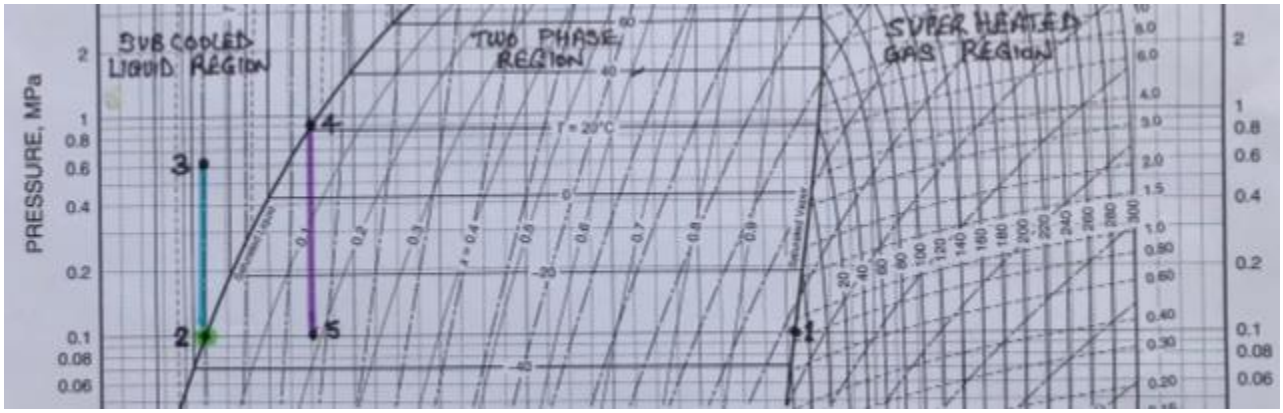
A "P-H diagram" refers to a **pressure-enthalpy diagram**, which is a graphical representation of a fluid's thermodynamic state by plotting its absolute pressure (**P**) on the y-axis and its specific enthalpy (**H**) on the x-axis. A P-H diagram are a very important tools for the analysis of refrigeration and heat pump systems and can also be very helpful in other industries to analyze compression, expansion, phase change, flash gas and boil off gas.



The ammonia P-H diagram show above has three different colored processes:

Purple: From point 4 (on the saturated liquid line) reducing in pressure down to point 5 (atmospheric pressure). This would simulate a leak from a non-refrigerated pressure

vessel holding ammonia liquid under pressure and indicates arriving at point **5** and a dryness fraction of 0.18. This means that 18% of the leak mass flow will instantaneously turn to flash gas in the breach which will violently propel the ammonia into an aerosol resulting in a very dangerous dense gas cloud which is heavier than air.



Blue: From point **3** (in the sub-cooled liquid region) reducing in pressure down to point **2** (atmospheric pressure on the saturated liquid line). This would simulate a leak from a relatively short, insulated liquid transfer line used to pump ammonia from one fully refrigerated, atmospheric pressure ammonia tank to another. This indicates that very little or no flash gas would be formed. However, depending on the pressure and shape of the breach, atomization of the liquid could occur generating an aerosol.

Green: Point **2** at atmospheric pressure and on the saturated liquid line. This would simulate a leak from a fully refrigerated ammonia liquid storage tank with the liquid running out under gravity and forming a pool in the bunded area around the tank. Heat coming into the pool from the surroundings will gradually boil off some of the liquid into clear, light gas which will rise into the atmosphere. Water should never be sprayed onto the pool.

See https://www.engproguides.com/pressure-enthalpy-diagram.html **for More information about how to interpret a pressure enthalpy diagram.**

October 2024 32 Hour – Swirl Vortex Vapor Movement

Here are the coordinates for the release point at the edge of the helipad: see the attached jpg.
36° 37’ 08.81’’ N and 121° 45’ 08.41’’ W

The 21 second image on page 2 of the Word document with the white vector arrows shows the actual discharge point that was ten feet from the tank connection valve. The tanks were mounted to a bob-tail truck. The emission point was at the NW edge of the helipad. The discharge nozzle is a ¾” schedule 80 pipe with a threaded cap at the

end. A 0.234” orifice drilled through it. The leading edge of the nozzle was chamfered so the actual through thickness of the orifice is approximately 1/4” inch.

The supply pressure is 111.8 PSIA (97.1 psig)
The pipe temperature was was 78.9°F - unfortunately we had to use surface contact transducers – the exterior temp had to have an influence on the read out. I haven’t had the opportunity to look into the delta-T from inside the pipe to the exterior.

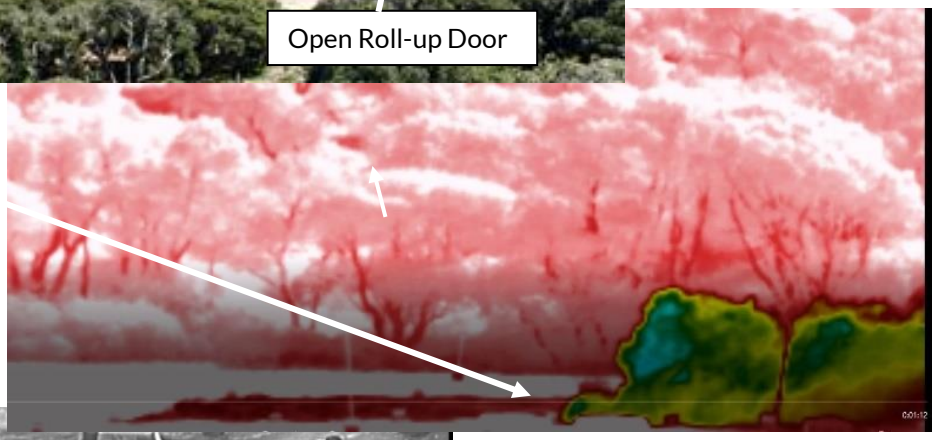
Vapor Vortex Swirl Impact

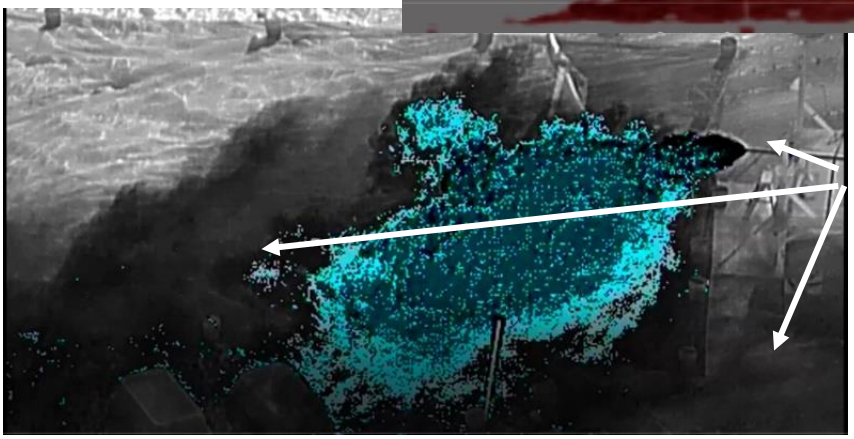
On October 5th we released a saturated liquid release through a ¼ inch orifice at 120 psi. We had a 40’X50’ tarp laid out on the ground to measure the amount of rain out of liquid. A variable light wind (estimated at 1 to 5 mph).

Our objective was to track the path of the release until it went to steady state. We didn’t anticipate the impact that the low speed wind would have on a powerful aerosol stream.

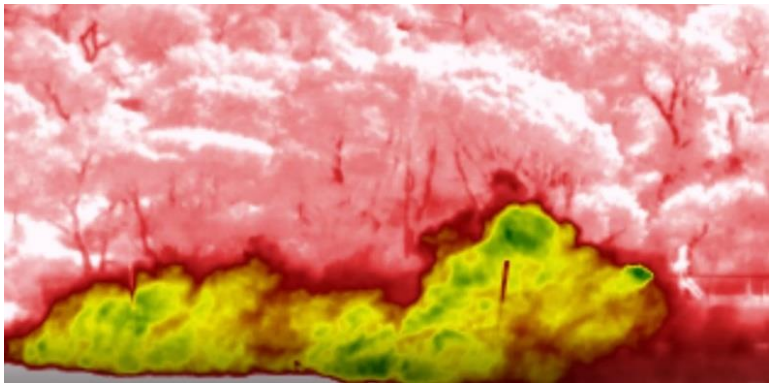
The ammonia gas entered the open door and moved into the cooler air inside the metal building.

Here’s what happened during the first **5 seconds. T**he release begins with a head and nose (as usual) ...the nose sets the pathway for the head to follow...while trailing a flow of aerosol and dense steady gas.

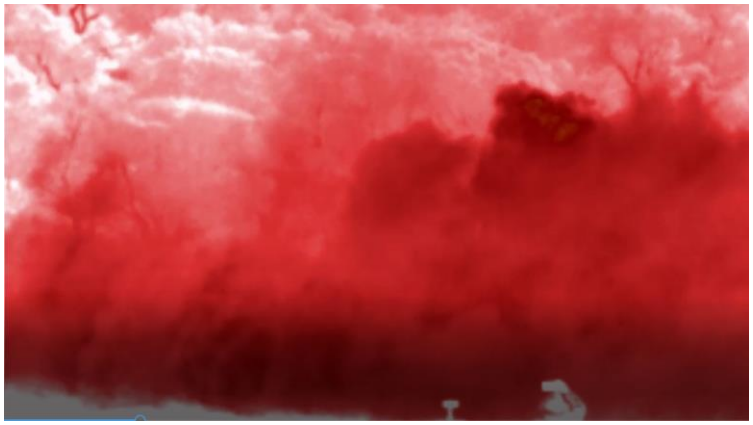




This is a FLIR Zoom picture which shows the release at **21 seconds**. You can see the dark gray vapor moving upwind against and over the dense vapor. This shows the power of a light warm wind as it pushes the aerosol dense gas cloud into a very cold dense vapor cloud.

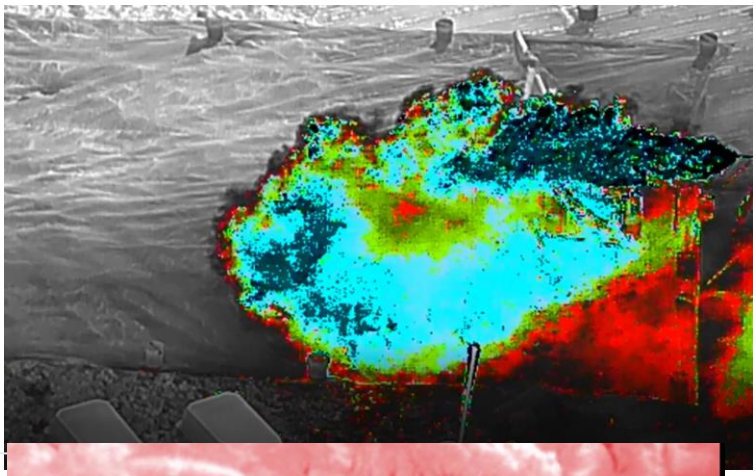


The nose is this **20 second picture** shows how the cold aerosol dense vapor cloud is moving at ground level as the cold gas spreads off the top of the dense vapor and then spreads at ground level upwind; the head and nose of the release continues to track downwind while the warmer dense gas vapor forms a tall puff cloud that vents ammonia vapor and gas around the metal building.



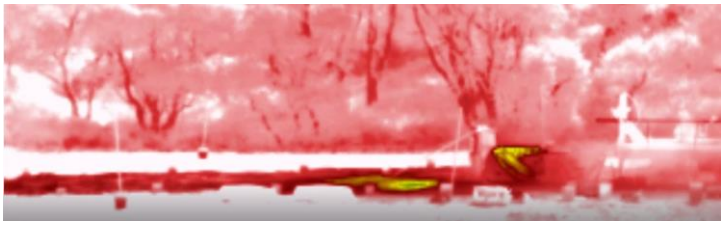
This is a 30 second picture. The majority of this picture is not visible. I am standing at about 50' lateral to the aerosol release and I don't see the ammonia gas cloud coming my way...only a slight odor (20 ppm).

Within a couple of seconds, the vapor reached a choking level as I attempted to call for Scott Silva (system operator) to shut-down the release. I put on my mask and moved downwind to the staging area.

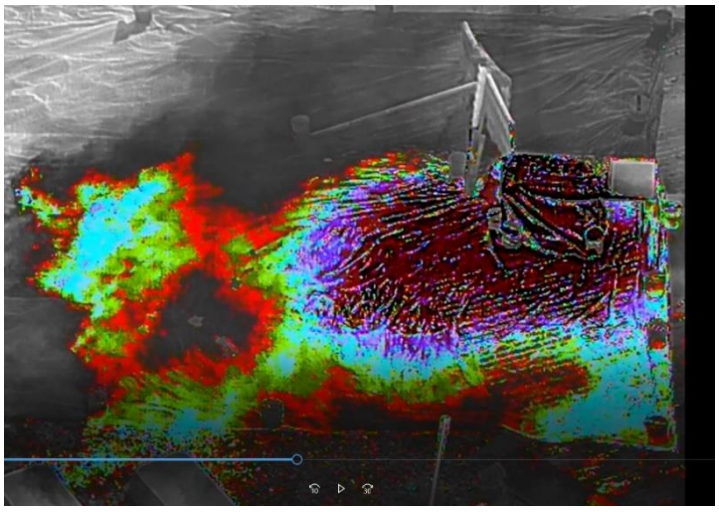


The FLLIR Zoom camera shows the **40 second** cloud movement. Most of the gaseous vapor moving off the top of the dense gas/vapor plume and travels upwind towards Side A of a metal building, deflecting as it rolls along to the A-B corner where it moves along side B with the wind movement that is moving the vapor towards Side C.

At **50 Seconds** the release was shut down and everyone has moved to the evacuation staging area. The only visible ammonia is dense vapor near the release point. Scott Silva had his respirator and a Lakeland Level B chemical suit on. He did not have any discomfort as he escaped the release.

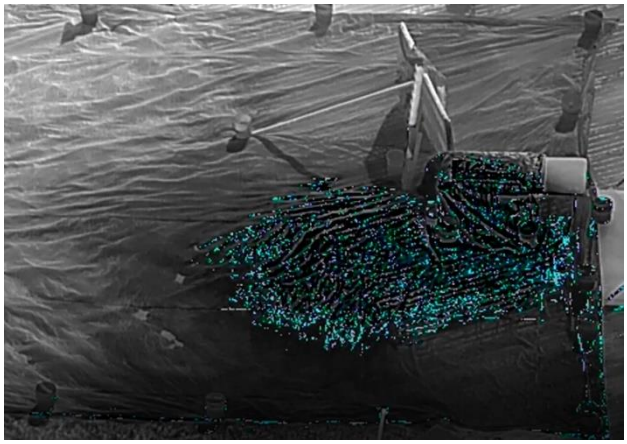


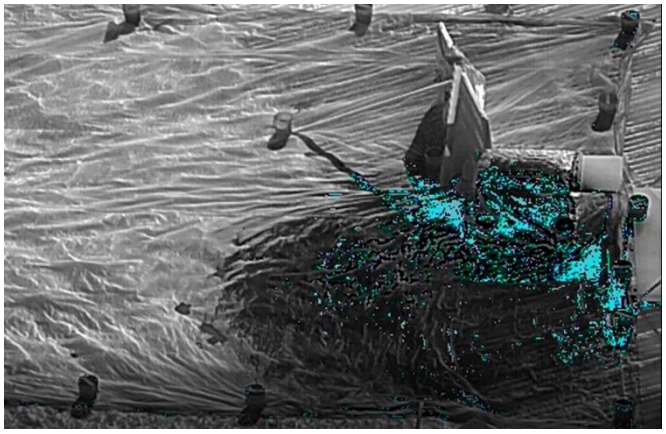
At 1 Min. and 11 seconds the gaseous vapor evaporates from the liquid that rained out during the release. The vapor is weakening and it traveled around the metal building and through the Side D roll-up doorway and then into the cooler air within the building...as the rest of the vapor escapes to the atmosphere.



The release is stopped and the surrounding area is stabilized. The tarp has some small puddles and shows the cold footprint of the ammonia.

The left **picture is 1 minute and 31 seconds after the ammonia shut down and the right picture is 2 minutes and 25 seconds after shutting down**.





Summary Thoughts: After viewing the infrared video, I could see how the **warm atmospheric air moved the invisible gas aggressively towards the much colder upwind aerosol vapor much like the vortex of a tornado**. The vortex swirl circulated to the right air deflects toward the right in the Northern Hemisphere (called the Coriolis effect) https://oceanservice.noaa.gov/education/tutorial_currents/04currents1.html

The invisible gaseous transition created a very active and strong swirl that absorbed more ammonia, giving it shape and physical character that quickly created a visible dense gas puff cloud.

The invisible vapor spun off off the retrograde vapor puff cloud and rolled towards the metal building (**side A**), where it deflected and continued to swirl downwind and around the end of the building (**Side B**) and then moved upwind within the shaded area next to **Side C** of the metal building. The momentum of the invisible vapor continued to move down **Side C** and around **Corner C/D.**

The vapor quickly moved through the the open roll up door on **Side D** of the metal building. The heated air drove the vapor into the much cooler room where it continued to swirl inside the room. Some of the invisible vapor also moved downwind into the road area for about 30 to 50 feet where it dissipated vertically into the upper atmosphere. There was only about 30 seconds of intense vapor exposure. No one was injured.

We will develop a full report of this event for the next CRADA report that we will likely begin in January of 2025.

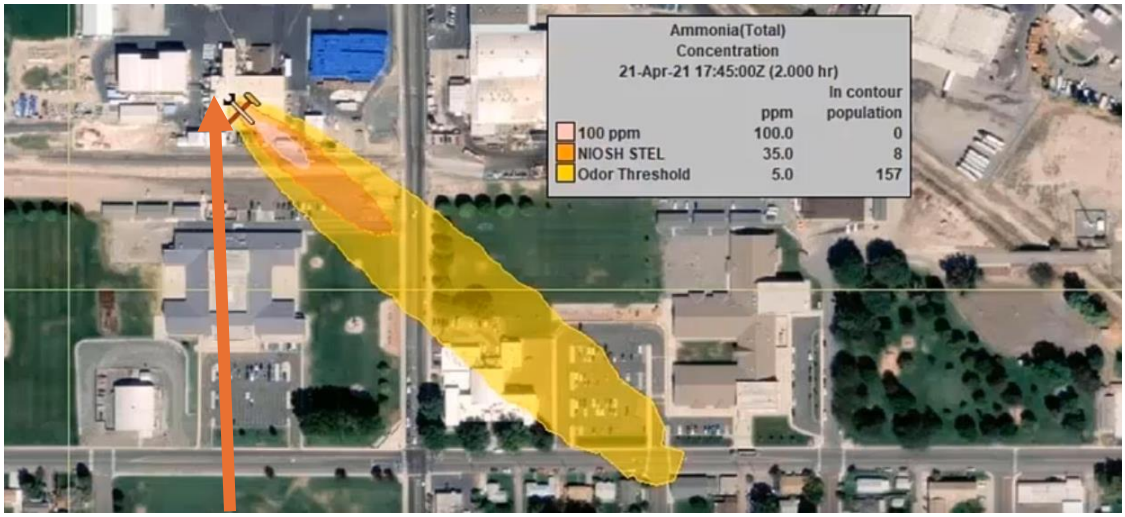
This picture shows a puff cloud that resulted from an ammonia 1" hose line that broke open due to high heat and pressure while pumping down an ammonia receiver.

The aerosol release is headed downwind where it fades into a less visible vapor. A FLIR infrared camera (designed to show gas and vapor), would show how the invisible vapor swirls back to the vortex release point (aerosol/dense vapor release point). The three men walking towards the release will smell the odor of ammonia (less than 25 ppm) and then with a few more steps they could walk into a much higher invisible gas concentration.

The wind DOES NOT HAVE the power to move the dense gas vapor away from the wet marsh.

Ammonia vapor is attracted to the marsh/wetlands water and green reeds, so a light wind helps the vapor move to and lay within the moist and cool setting.

The wind takes the dense vapor over a Dodge pickup. The ammonia vapor within the pickup was very survivable ~200 ppm for five minute of exposure and the vehicle was still running.



A release from the roof top with a steady 5 to 10 Mph Wind directed release to the downwind community.

It's easy to track the visible aerosol/dense gas cloud, but what happens with the invisible gas/vapor?

Tracking the Invisible Dense gas/vapor clouds: *What direction will the invisible vapor and gas move as it escapes from the top and end-point of the visible plume and at the end-point of the visible plume.*

Remember the Coriolis atmospheric impact *in the Northern Hemisphere. The wind should swirl to the right and as it drives the buoyant dense (invisible) light gas/vapor in a swirl cloud that will be attracted to cool environmental locations, (entering through open doors, windows, air intakes that lead will draw faster to cool, un-heated building, vegetation, and bodies of water.*