HAZMAT HQ

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What's Inside:

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Recent HazMat Incidents Highlight Critical Need for Preparedness

Over the past three weeks, several hazardous materials (HazMat) incidents across the United States have underscored the urgent need for improved preparedness and response strategies. These events, ranging from chemical spills to industrial fires, have posed significant threats to public health and safety, revealing critical gaps in existing safety protocols and emergency response plans.

Houston Chemical Spill (June 29, 2024)

On June 29, a chemical spill in Houston, Texas, occurred at a plant handling volatile organic compounds (VOCs). A storage system malfunction led to the release of a substantial amount of a hazardous VOC, resulting in the evacuation of nearby residential areas. The volatile nature of the chemical posed significant inhalation risks. Swift action by local HazMat teams mitigated the impact, but the incident raised serious concerns about the adequacy of current safety measures and the readiness of local authorities to handle such emergencies. Environmental and health officials have since called for a thorough review of safety protocols at chemical plants and improved emergency response coordination.

Ohio Train Derailment (July 7, 2024)

On July 7, a train derailment in Ohio resulted in the spillage of various industrial chemicals, including flammable liquids and corrosive substances. The derailment, caused by a structural failure in the rail tracks, led to the overturning of several tanker cars. State and federal HazMat teams worked to contain and neutralize the hazardous substances, while local authorities issued evacuation orders for residents within a one-mile radius. This incident has sparked a debate over the safety of rail transport for hazardous materials and led to calls for stricter regulations and more robust infrastructure inspections to prevent future accidents.

Los Angeles Warehouse Fire (July 12, 2024)

On July 12, a warehouse fire in Los Angeles released toxic fumes from stored chemicals, including solvents and industrial cleaning agents. The fire spread quickly due to the flammable nature of the chemicals, posing significant risks to firefighters and nearby residents. Several firefighters and civilians were hospitalized due to inhalation of toxic fumes. This incident highlighted the need for comprehensive training in chemical decontamination and emergency response, emphasizing the importance of equipping first responders with the necessary tools and knowledge to handle such complex situations safely.

Key Takeaways

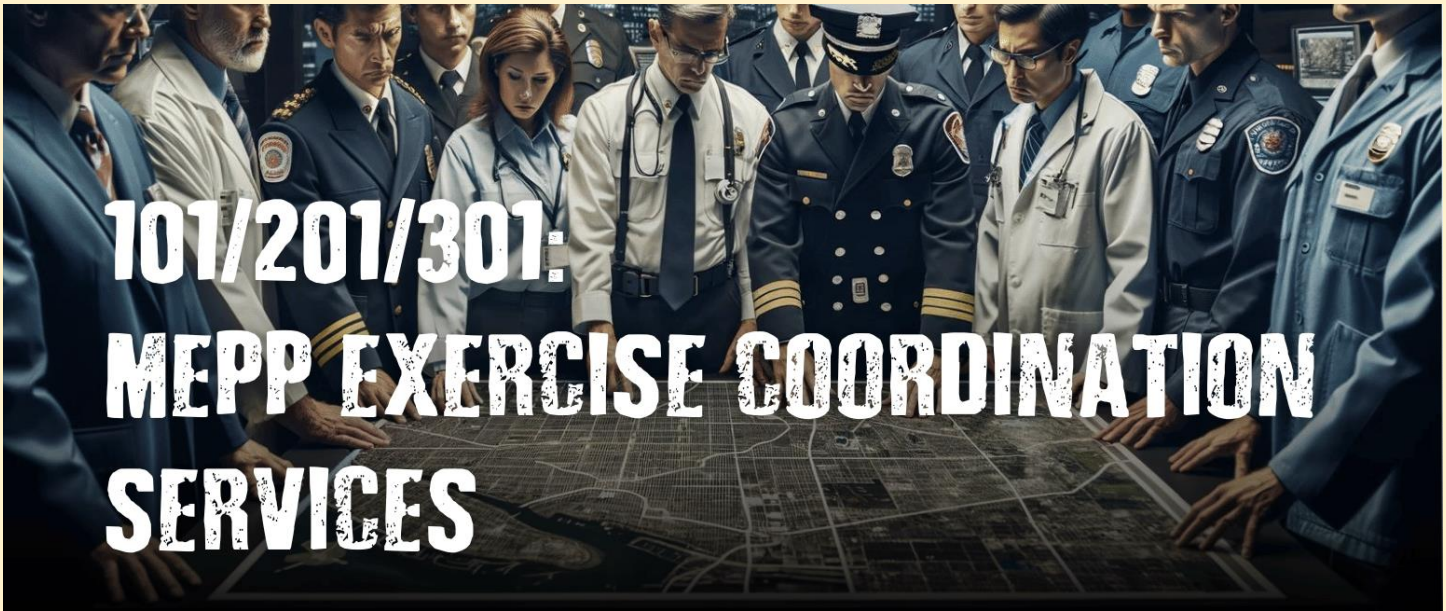
1. Preparedness is Crucial: These incidents highlight the importance of robust emergency response plans and regular safety audits.

2. Training is Essential: Comprehensive training programs for first responders are vital to ensure effective and safe handling of HazMat incidents.

3. Regulatory Review Needed: There is a pressing need for stricter enforcement of safety regulations and regular inspections to prevent future accidents.

4. Enhanced Coordination: Improved communication and coordination between local, state, and federal agencies can significantly enhance response times and effectiveness.

Investing in preparedness, advanced response strategies, and proper training is essential to safeguard public health and safety and prevent future HazMat incidents.



101/201/301: MEPP EXERCISE COORDINATION SERVICES

Our MEPP Exercise Coordination Services provide comprehensive support for organizations and agencies seeking to enhance their emergency preparedness and response capabilities in mass evacuation and protective planning scenarios.

Our team of experienced MEPP planners offers expert guidance in developing realistic exercise scenarios, coordinating with relevant stakeholders, and crafting effective evacuation and protective plans. We facilitate resource allocation, conduct participant response evaluations, and maintain meticulous documentation throughout the exercise process.

Additionally, we contribute to the creation of insightful after-action reports, identifying lessons learned and recommendations for improving emergency readiness. Our MEPP Exercise Coordination Services are tailored to meet the specific needs of your organization, ensuring a heightened level of preparedness and effectiveness in mass evacuation and protective operations.

FUNDAMENTAL TOPICS

- Scenario Development
- Coordination
- Evacuation Planning
- Protective Measures
- Resource Allocation
- Evaluation and Feedback
- Documentation
- After-Action Report (AAR)
- Training and Preparedness

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The lost art of mentorship, are we failing our own?

By: Bob Coschignano

Mentorship comes in many different forms and from many different places. Some of these are formal but many are informal. Those bonds that are made during this process are those that will last for an indefinite amount of time. The big problem is, are we still mentoring or failing our own?

Photo Credit: Dave Williams

The following is a story of a mentorship that started with a simple question asked one day in

the apparatus bay and has continued for 30 years.

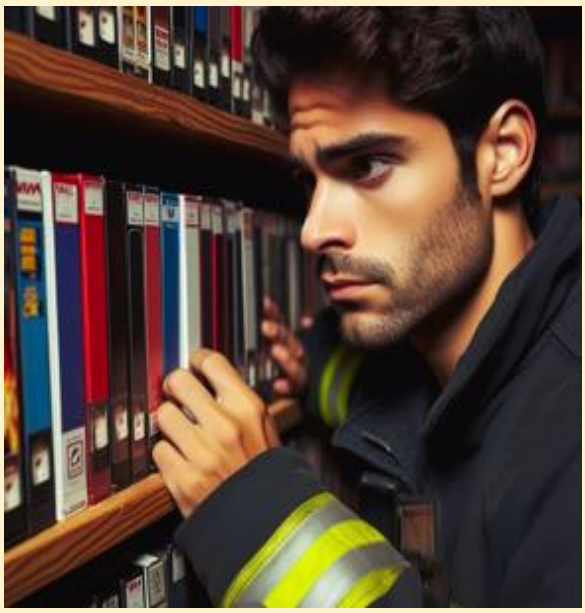
A young firefighter who was assigned to a truck company that also did hazardous materials, was curious as to his future and the path at which he should take. He asked the hazmat officer who was assigned to the same station but on a different unit, what he thought that path should be and was he going in the right direction? This young firefighter really had no desire to do hazmat. It was only by default, because of the apparatus he was on, that he was "the grunt in the suit." The hazmat Lieutenant explained to the young firefighter that there are many options that he could take for his career, all of which would be up to him. He never gave an answer, only suggestions and allowed the firefighter to make his own decisions and path. After a period of time, this

young firefighter was promoted to driver and was now assigned to the hazmat engine where he drove this senior hazmat Lieutenant. He watched his Lieutenant perform his duties in a manner that seemed to be of great ease, to the point where he said, “hey this hazmat stuff doesn't seem that bad.” As time went on, it was awful funny that the hazmat Lieutenant was always gone when the real hazmat calls were happening. What was not so funny was that the young, now driver was riding up as Lieutenant and was having to make some decisions. He still only had a desire to get back on a truck company as a Lieutenant. While learning more about the hazardous material side of the house, he realized that there were other opportunities that might open up for him in the future. And he was actually starting to enjoy the hazmat side of the house. During this time, several federal classes started to emerge. Anniston, AL.

Dugway, Utah New Mexico, Nevada Test site and others that this young driver of the hazmat rig was encouraged to go to and actually learned a great deal.

On September 11th, 2001, the hazmat Lieutenant was off teaching nationally. And after the planes had struck the towers and the Pentagon, the Lieutenant called back to his driver, who was riding up and gave him some extremely specific instructions on what to do and what to tell the chief officers. The driver felt very uneasy giving directives to the chiefs. But knowing where it had come from, they listened intently. A brief period of time after those tragic events, and that of the anthrax incidents later in October, the hazmat Lieutenant told his driver to come to City Hall the next morning as there was to be a big announcement. The big announcement was

that this metropolitan fire department was creating its first special operations Chief position and to formulate our plan for special operations and WMD events. This new position was given to the engineer’s Lieutenant. His Lieutenant looked over at him to watch the blood drain from his driver's face because the driver was on the lieutenant's list and realized that now he was going to be sitting in the seat that had so much knowledge and prestige. He



thought, holy hell, what am I going to do? I don't know anything. The newly promoted hazmat Lieutenant is now sitting in a seat that he once looked over at. He decided to grab every videotape he could find in the hazmat office and watch as many as he could over a weekend to grab some nugget, some

something, some form of information so that when he returned back to shift, he would hopefully make a more educated decision and not get anybody hurt or killed.

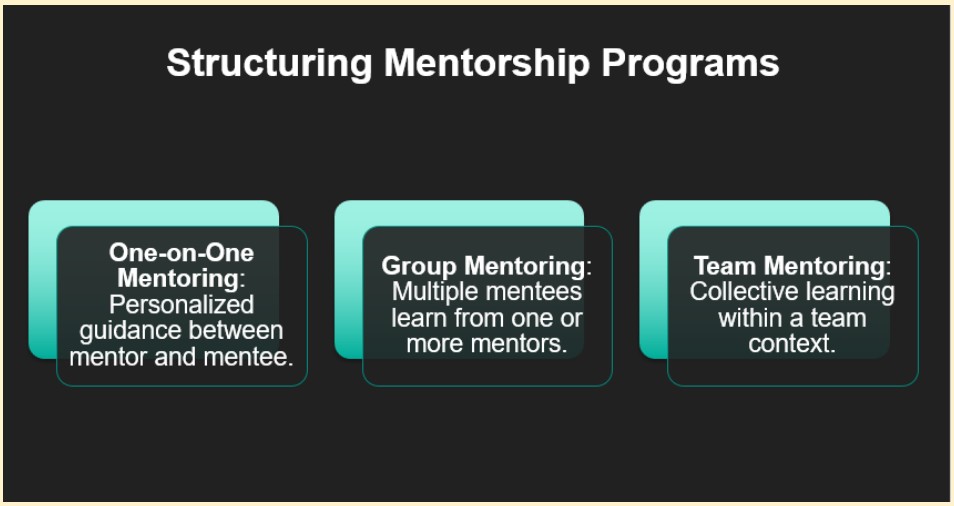
The newly promoted special OPS chief came over to talk to the new hazmat Lieutenant. He explained to him some basic information. ***Number one, if you don't know, know who to call.*** We called this the Hazmat Walk. The hazmat walk is essentially walking away from a group of people. Grabbing your cell phone and calling that friend. To help advise or simply to confirm the actions that may be happening. There is no one person that knows everything. Decisions can be made and should be made in a timely manner, but with guidance from others when the answer is not staring you in the face. It is not a form of incompetence but rather, that of professionalism and maturity and an

understanding that we don't know all. Many times, for the first year or two, the new hazmat Lieutenant would call his mentor the Special OPS Chief. Even in the middle of the night, if nothing more to confirm what actions he was taking were correct. And he knew that that phone would always be answered.

The story I just told you was that of myself and my mentor, Toby Bevilacqua. Both of us retired from the City of Orlando Fire department. This friendship has lasted for over 30 years. He gave me guidance as a young firefighter, as his driver, and as a new hazmat Lieutenant. He gave me the building blocks to be successful. He also helped me guide my new path. That has led me to being an instructor for

almost 25 years in the hazmat community to include our mentorship program. To which I've met some of the greatest people that I will ever know. Many I call friends.

So, what are some of the key components for a mentorship program or simply just an informal mentorship? You can have mentorship informally with your crew or you can establish a mentorship program that helps not only firefighters, but maybe new lieutenants and new chief officers. There are many forms of mentorship. There are many ways of going about it. The path and plan are up to you.



Here is just a short outline of some of the things that we should consider when either being mentored or mentoring someone else.

- Match Mentors and Mentees:
  - Consider skills, personality, and compatibility.
  - Facilitate introductions.
- Provide Resources:
  - Training for mentors and mentees.
  - Regular check-ins and feedback.
- Evaluate and Adjust:
  - Monitor progress.
  - Adapt based on feedback and outcomes.
- Define Clear Goals:
  - Identify objectives (e.g., career growth, diversity, leadership).
  - Ensure goals are measurable and attainable.
- Create Program Guidelines:

- Set start and end dates.
- Outline mentoring workflow.
- Allow flexibility for individual needs.

Five key steps to <u>YOUR</u> success:

- ***Have a Goal***
  - ***Pursue something that you like to do***
- ***Be Passionate***
  - ***You will continue to grow if your passion drives you***
- ***Jump in***
  - ***Discomfort is the side effect of personal growth, do new things***
- ***Focus***
  - ***Anyone can achieve anything over time, it's the long haul***
- ***Mentor***
  - ***Find one and never stop learning***

In conclusion, Mentorship is not just a lost art; it's a powerful tool for growth, connection, and knowledge transfer. Let us revive this art and create a culture where mentorship thrives!

Bob@hazmat101consultants.com

Mr. Coschignano has been in the fire service for over 30 years, most of which have been in Special Operations. Mr. Coschignano has served on both state and local hazardous materials related committees. Mr. Coschignano is an instructor and evaluator for several local and state competency drills and has lectured around the country. He was the program manager for the Hazardous Materials Technician program at Valencia College. Mr. Coschignano is also DEA certified in Clandestine Labs. Mr. Coschignano is Co-Author of Chemical Card Guide and Risk Based Response Quick Chemical Access Cards published by RedHat publications Contributor for National Emergency Response Drills by The HazMat Guys on Amazon. Mr. Coschignano is Co-host of The HazMat Guys Roundtable. Mr. Coschignano is also President of HazMat101 Consultants and 2022 recipient of the International Association of Fire Chief's Hazardous Materials Level A

award for instruction. Mr. Coschignano is co-editor of HAZMAT HQ Digital Magazine. Mr. Coschignano holds an A.S. degree in Fire Science and is retired Hazardous Materials Team Lieutenant from the City of Orlando Fire Department

Lithium-Ion Battery Toxicity:

A Quick Rundown

By Chris Pfaff Fire Captain and prevention officer at West Pierce Fire & Rescue

NFPA 921, the Fire Investigator's Guide, explains that smoke is "The airborne solid and liquid particulates and gases evolved when a material undergoes pyrolysis or combustion, together with the quantity of air that is entrained or otherwise mixed into the masses." This definition is applicable to traditional structure fires, flammable liquid fires, flammable gas fires, and even exposures to lithium-ion battery fires. However, it doesn't fully capture the complexity of off-gassing from lithium-ion batteries.

When a lithium-ion battery burns, the previous definition fits. But what about when a battery vents without burning? No combustion means no smoke. This falls into the hazmat category of vapor. The big question is: what's the big

deal? Smoke and vapor are both hazardous, right? Absolutely, and it's crucial to understand what is released from these batteries when they vent and when they burn.

Battery Construction and Terminology

First, a quick reminder about how a lithium-ion battery is constructed and why terminology matters. A lithium-ion battery is not a lithium metal battery. Lithium metal batteries, while dangerous, are typically not as large or prolific as lithium-ion batteries. We commonly encounter lithium metal batteries as button or coin cell batteries. These primary batteries are non-rechargeable and pose a significant toxic and fire threat due to the pure lithium, which is water-reactive. A recent example is the catastrophic fire at a manufacturing facility in South Korea on June

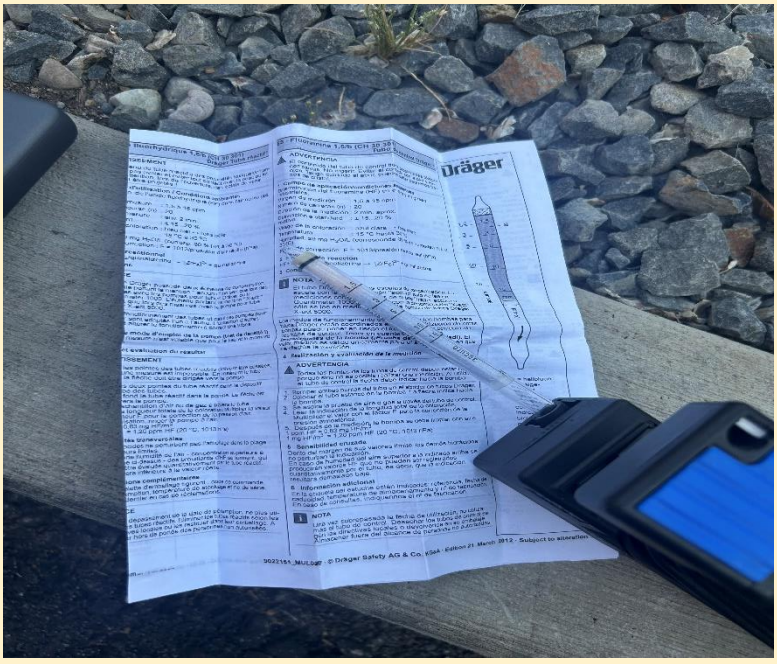
24th, where 23 workers tragically lost their lives.

In contrast, lithium-ion batteries do not contain pure lithium, which means the lithium in these rechargeable batteries is not water-reactive. The lithium is chemically bonded in the “black mass” that coats the copper anode and aluminum cathode of the battery and within the electrolyte, lithium hexafluorophosphate.

For those paying close attention, lithium hexafluorophosphate sounds a bit alarming, and rightfully so. For a lithium-ion battery to function, it requires this electrolyte to transfer the lithium ions, hence its name. However, salts are solids, and if the electrolyte were

solid, it would be a solid-state battery. To make it a liquid, it is mixed with a liquid containing multiple volatile organic compounds, including hydrocarbons and other exotic chemicals. This is where these batteries have created the problems we are discussing.

Released Gases and Products of Combustion



With a basic understanding of lithium-ion battery construction, we can identify some of the released gases and possible products of combustion. There are countless others, but

this article focuses on the significant groups. When batteries vent before igniting, there are two plumes: one heavy and one light. The lighter compounds typically (but not always) include hydrogen, hydrogen fluoride, ethane, carbon monoxide, hydrogen cyanide, and various other products. The heavier-than-air vapors consist of serious toxins, including sulfur dioxide, many flammable volatile organic compounds, and metal oxides such as cobalt, manganese, lead, antimony, nickel, and strontium.

Depending on the energy involved and the chemical makeup, these batteries may quickly go into full thermal runaway. When these fires burn, many hazardous toxins are converted into more traditional forms of combustion. This

is one reason why the tactic of letting the fire burn has gained traction. However, carbon monoxide and hydrogen cyanide still exist, as do the metal nanoparticles.

Considerations for Firefighting

Depending on the fire's location, nature of exposures, public perception, and other factors, including the ability to extinguish the fire, it may be better to extinguish or at least suppress the flames. Our goal is always to save lives. We need to step in and do our jobs while understanding the risks involved. The toxins from these fires are much worse than normal fire smoke.

Chemical | IDLH | PEL/REL | Est. Amount Released (20kWh battery)

Chemical	IDLH	PEL/REL	Est. Amount Released 20kWh battery
Carbon Monoxide	1200PPM	50 ppm / 35 ppm	1300-4950ppm
Hydrogen Cyanide	50PPM	10 ppm / 4.7 ppm	
Hydrogen Fluoride	30PPM	3 ppm/ 3 ppm	30-1250ppm
Cobalt	20mg/m3	0.1mg/m3 / 0.05mg/m3	1700-2700mg/m3
Nickel	2000 mg/m3	1mg/m3 / 0.015mg/m3	
Manganese	500 mg/m3	5mg/m3 / 1 mg/m3	

Willstrand, O., Bisschop, R., Blomqvist, P., Temple, A., & Anderson, J. (2020). Toxic Gases from Fire in Electric Vehicles. Retrieved from https://urn.kb.se/resolve?urn=urn:nbn:se:ri:diva-52000

Understanding that these products release significantly high amounts of severe toxins should give us pause. But we must remember

the fire service's ultimate goal: life safety. It is our job as hazmat technicians to inform our agencies and provide guidance. If we overreact, the message will not be heard, and injuries will occur. Conversely, if we treat this as a normal fire, we could get hurt from the toxic vapors produced.

Response Strategies

If there are victims in a lithium-ion battery event, such as an EV/hybrid fire or structure fire, we need to be aggressive, smart, and deploy fast tactics to give victims the best chance of survival. If there is no rescue component or if we are dealing with a reignition event or overpacking, our tactics

need to change. This article isn't about providing tactics but rather about informing us of the hazards responders face when dealing with batteries in thermal runaway.

Consider these two events. Last year in Eastern Washington, a Tesla left a highway at approximately 80 MPH. The ensuing fire was so intense that nearly all battery cells and the victim were consumed. This was partially due to the slow response of the volunteer department and the lack of a continuous water supply. The decision to let the fire burn was the only option available. Post-soil metal contamination found little environmental contamination. There are no study results on contamination of personnel or PPE, so draw your own conclusions.

Earlier this year, in Western Washington, a nearly identical event occurred, still under research. In this case, a Tesla in a high-speed accident was responded to quickly by a career fire department with a continuous water supply. The fire was knocked down, but the subsequent cleanup was more challenging. Soil contamination of heavy metal particulates was “astronomical” compared to background readings. No PPE or personnel exposure figures were obtained, but there were reports of responders experiencing headaches and respiratory issues weeks after the incident.

Health Impacts

As hazmat technicians, we must undergo annual physicals, including a heavy metal blood draw. This isn’t because we respond to multiple smelter accidents; it's due to the nature of metals in our body and our difficulty excreting them. Metals stay in our system. Consider the focus on lead exposure and mercury poisoning. The same applies to all metals found in lithium-ion batteries.

Between traditional hazardous gases and metal nanoparticles, much is still unknown about the combustion and off-gassing of these batteries. Later this summer, TEEX, in conjunction with Southwest Research Institute, will release

metal contamination testing to see if CO2 extraction can remove contaminants. UCLA has been working with the San Diego Fire Department on general testing, and FSRI has partnered with North Carolina State University for more testing.

Conclusion

In the meantime, check out some of the most recent international research. A recent article, “Review of gas emissions from lithium-ion battery thermal runaway failure—Considering toxic and flammable compounds,” is available online. Below is a snippet from my friend Todd Smith (CFI). Many articles are found in this

attached link on health impacts to responding firefighters.

Health Impacts to responding Firefighters

Capt. Pfaff has multiple degrees in the field of firefighting and emergency response and his most recent degree is from Oklahoma State University with a master's in Fire & Emergency Management Planning. Since becoming a prevention officer, Capt. Pfaff has worked with Seattle Fire, the Washington State Patrol, ATF, TEEX, FSRI, and others to build a body of research in relation to Lithium-Ion battery safety. Concepts, presentations, and technical panels that Capt. Pfaff has either worked on, or is currently working on are; Fire Code Action Committees & ad-hoc committees for the International Code Council specific to - Electric Vehicles, Battery Recycling, & Micro-mobility devices; Underwriters Laboratory, Technical committees – 1642, Lithium, Household and Commercial Batteries; 2251, Plugs, Receptacles, An Couplers For Electric Vehicles; 4900 – Micromobility Charging Equipment. Presentations and discussions Capt. Pfaff have been across the United States, Canada and worldwide via online presentations, to include: The Spokane Li-Ion Town Hall (Oct 2023), Pasco, WA Energy Symposium (2023), Washington State Hazmat Workshop (2023, 2024), International Association of Arson Investigators, WA, OR (2023), Washington Fire Prevention Institute (2023), Houston Hotzone (2023), Ontario Hazmat

Preplanning for Hazardous Materials (HM) Emergencies: A Comprehensive Guide

By The HazMat Guys

In recent times, our team has engaged in conversations with various regions nationwide regarding the implementation of comprehensive exercises and simulated scenarios. These discussions aimed to assess the preparedness levels of different departments and communities. Our findings revealed a greater need for proactive planning and preparation for potential hazardous material incidents than initially anticipated. As a result, we collaborated to develop a comprehensive checklist. This resource is

designed to assist you in preparing your local area for future emergencies.

Why Preplan?

Preplanning is essential for several reasons:

Improved Size-Up

Quick Assessment: Preplanning equips responders with detailed information about potential hazards, allowing them to quickly and accurately assess the situation upon arrival. This includes knowing the types of hazardous materials present, their locations, and the specific risks they pose.

Enhanced Decision-Making: With a preplan in place, responders can make informed decisions rapidly, reducing the time spent on gathering and analyzing information during the

emergency. This can be crucial in preventing the escalation of hazardous situations.

Safety Measures: Knowing the layout of the facility and the potential hazards enables responders to establish safe zones, decontamination areas, and evacuation routes more efficiently, protecting both the public and the responders.

Guided Firefighting

Strategic Direction: A preplan provides a clear strategy for firefighting efforts tailored to the specific hazards of the site. This includes identifying the best approaches for fire suppression, containment, and ventilation.

Resource Allocation: Preplanning helps determine the necessary resources and equipment needed for effective firefighting.

This ensures that the right tools and personnel are available when they are needed most.

Fire Control: Understanding the behavior of hazardous materials in a fire scenario allows responders to anticipate potential reactions, control the fire more effectively, and minimize the risk of secondary explosions or releases.

Rescue Assistance

Critical Information: Preplans offer essential information about the facility layout, including access points, escape routes, and the locations of

potential victims. This helps rescuers navigate the site more efficiently and safely.

Coordinated Efforts: By having a preplan, rescue operations can be better coordinated, ensuring that all teams are working towards common goals and reducing the risk of confusion and miscommunication.

Victim Safety: Preplanning identifies the safest and most effective methods for rescuing victims, taking into account the specific hazards posed by the materials involved. This includes planning for decontamination procedures and medical treatment for exposure to hazardous substances.

The Philosophy Behind Preplans

A well-crafted preplan aims to control fires and mitigate hazards. It should clearly outline the

steps responders need to take during an emergency involving hazardous materials.

Key Considerations for HM Preplanning

1. *Expectations of a Preplan*

Identify Involvement: A detailed account of all hazardous materials present at the site is essential. This includes:

Inventory: An accurate inventory of all hazardous materials, including quantities, locations, and
storage conditions.

Material Properties: Information on the physical and chemical properties of each material, including potential reactions with other substances.

Hazard Classification: Clear identification of the hazard class for each material (e.g., flammable, corrosive, toxic).

Action Steps: A well-defined set of actions that responders should take during an emergency. This should cover:

Initial Response: Immediate actions to contain and control the situation, such as isolation zones and containment strategies.

Detailed Procedures: Step-by-step instructions for handling different types of emergencies involving hazardous materials, including fire suppression, spill control, and evacuation procedures.

Emergency Contacts: A list of key contacts, including local hazardous materials experts, emergency services, and regulatory authorities.

Quality and Clarity: The preplan must be clear and comprehensive to ensure it can be easily understood and followed by responders. This involves:

Concise Language: Use straightforward, unambiguous language to avoid confusion.

Visual Aids: Incorporation of diagrams, maps, and flowcharts to visually represent critical information and procedures.

Regular Updates: Ensuring the preplan is regularly reviewed and updated to reflect changes in inventory, facility layout, and best practices.

2. *Evaluating a Preplan*

Criteria: Establishing clear criteria for what makes a preplan acceptable. This involves:

Completeness: Ensuring all relevant information is included and no critical aspects are overlooked.

Accuracy: Verifying that the information provided is accurate and up-to-date.

Usability: Assessing the ease of use and understanding of the preplan by responders.

Response Objectives: Defining likely response outcomes and reduction in losses. This includes:

Goal Setting: Setting clear, achievable goals for the emergency response, such as minimizing casualties, containing spills, and preventing secondary incidents.

Performance Metrics: Establishing metrics to measure the effectiveness of the response,

such as response time, containment success, and recovery time.

3. *Forms of Preplans*

Documents: Example preplan documents from local jurisdictions can serve as templates or references. These documents should include: Standard Operating Procedures (SOPs) Detailed instructions on handling specific hazardous materials and scenarios.

Emergency Response Plans: Comprehensive plans outlining the steps to be taken during different types of emergencies.

Training Exercises: Practical drills to test and refine the preplan, such as:

Live Drills: Simulated emergencies like pit fires with gasoline to provide hands-on experience and identify potential gaps in the plan.

Tabletop Exercises: Scenario-based discussions where responders walk through the preplan and discuss their actions in a hypothetical situation.
Training Films and Aids: Visual and printed resources to aid learning, such as:
Training Videos: Instructional videos demonstrating proper procedures and responses.
Manuals and Textbooks: Printed materials that provide detailed information on hazardous materials and emergency response techniques.
Simulation Software: Digital tools that allow responders to practice their skills in a virtual environment.

Evaluation Criteria for Preplans

A good preplan should:

1. *Identify Objectives:*

Operational Goals: The preplan should clearly outline the primary objectives that responders need to achieve during an emergency. These goals should be specific, measurable, achievable, relevant, and time-bound (SMART). Examples include:

- Containment: Prevent the spread of hazardous materials.
- Evacuation: Safely evacuate affected personnel and civilians.
- Mitigation: Minimize environmental impact and property damage.
- Rescue: Provide immediate assistance to injured or trapped individuals.

- Recovery: Facilitate a return to normal operations as quickly as possible.
- Prioritization: Establish a hierarchy of objectives to guide responders in prioritizing their actions based on the severity and type of emergency.

2. *Describe Decision Factors:*

Supporting Data:

- The preplan should provide comprehensive data to support decision-making processes, including:
- Material Properties: Detailed information on the physical and chemical properties of each hazardous material, such as reactivity, toxicity, flammability, and potential health effects.

- Site Layout Maps and diagrams of the facility highlighting key areas, such as storage locations, access points, and emergency exits.
- Resource Availability: Information on available resources, including equipment, personnel, and external support (e.g., local fire departments, hazmat teams).
- Decision Criteria: Clearly defined criteria that responders can use to evaluate the situation and make informed decisions. This includes:
- Risk Assessment: Identifying and assessing potential risks and hazards.
- Response Options: Evaluating different response strategies and their potential outcomes.

- Environmental Impact: Considering the environmental consequences of various response actions.

3. *Predict HM Behavior:*

Behavior Modeling: The preplan should include predictions of how hazardous materials might behave under different conditions, such as exposure to fire, water, or other chemicals. This involves:

- Reaction Scenarios: Descriptions of possible chemical reactions and their effects.
- Dispersion Models: Predictive models for the spread of hazardous materials in air, water, or soil.
- Event Sequences: "Mental movies" or visualizations of potential event sequences,

helping responders anticipate and prepare for various scenarios.

- Simulation Tools: Utilize simulation software and other tools to model hazardous material behavior and train responders on likely scenarios.

4. *Highlight Limitations:*

- Operational Constraints: The preplan should clearly outline any limitations or constraints that responders might face during an emergency. This includes:
- Resource Limitations: Availability of equipment, personnel, and external support.
- Environmental Factors: Weather conditions, terrain, and other environmental factors that could impact response efforts.

- Regulatory Constraints: Legal and regulatory requirements that may affect the response strategy.
- Realistic Expectations: Set realistic expectations for what can be achieved with the available resources and under the given conditions.

5. *Facilitate Adaptive Behavior:*
   - Flexibility: Encourage responders to be flexible and adapt their actions based on the evolving situation. The preplan should:
   - Scenario Planning: Include multiple scenarios and response options to prepare responders for different possibilities.
   - Decision Trees: Provide decision trees or flowcharts to guide responders through

complex situations, allowing for quick adaptation.

- Training and Drills: Regular training and drills to reinforce adaptive behavior and ensure responders are comfortable adjusting their actions as needed. This includes:
- Live Drills: Realistic, hands-on training exercises that simulate different emergency scenarios.
- Tabletop Exercises: Discussion-based exercises where responders walk through hypothetical situations and discuss their response strategies.
- Feedback Mechanisms: Implement feedback mechanisms to monitor the

effectiveness of the response and make real-time adjustments. This includes:

- Real-Time Data: Collect and analyze real-time data during the emergency to inform decision-making.
- After-Action Reviews: Conduct after-action reviews to identify strengths and areas for improvement in the response plan.

6. *Guide for Execution:*

Step-by-Step Procedures: The preplan should provide detailed, step-by-step

procedures for executing the response. This includes:

- Initial Response: Immediate actions to contain and control the situation.
- Operational Phases Clear phases of the response, such as containment, mitigation, evacuation, and recovery.
- Coordination: Instructions for coordinating with other agencies and stakeholders.
- Operational Command: Clearly define the command structure and roles of each responder. This includes:
- Incident Command System (ICS): Utilizing the ICS framework to ensure clear communication and coordination.

- Chain of Command: Establishing a clear chain of command to avoid confusion and ensure accountability.

Conclusion:

Preplanning for hazardous materials emergencies is a critical component of ensuring the safety and well-being of communities and responders. By thoroughly identifying hazards, establishing clear response objectives, and facilitating adaptive behavior, a well-crafted preplan can significantly enhance the effectiveness of emergency responses. Regular training, evaluation, and updates are essential to maintaining the relevance and effectiveness of the preplan. By investing in comprehensive preplanning efforts,

communities can be better prepared to handle hazardous materials emergencies and minimize the associated risks and impacts.

THE HAZMAT GUYS
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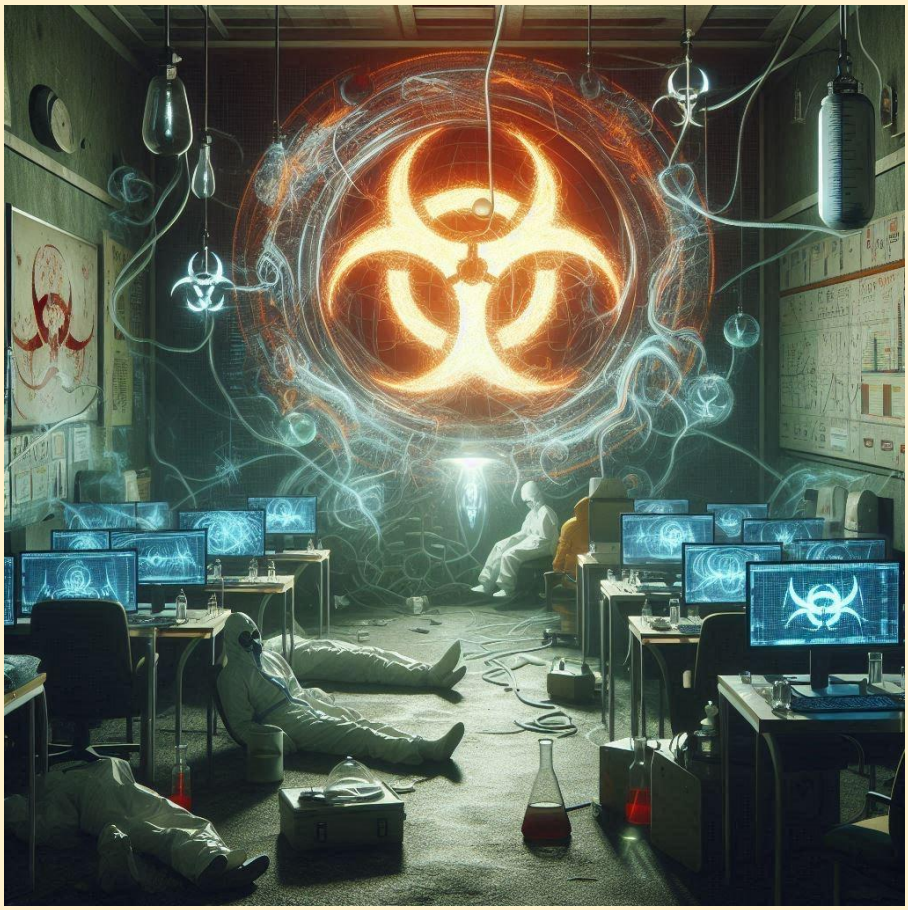
In 2015, our journey began with a podcast aimed at connecting responders in our field through engaging content. Since then, we've evolved from offering basic insights to becoming a comprehensive hub for audio, video, online learning, in-person training, and beyond. As our team expands, we remain dedicated to collaborating with the finest experts in the field. We all know the pain of enduring a monotonous class; our mission is to inject excitement and excellence by making Haz Mat Great Again, one dynamic

The Biological Weapon Threat- (Part 1) Defining the Problem

By Kevin Ryan



Biological Weapons continue to be a threat to jurisdictions across the USA. The use of these weapons can be used on an international or domestic basis. Biological weapons form a subset of a larger class of weapons sometimes referred to

as unconventional weapons or weapons of mass destruction, which also includes chemical, nuclear and radiological weapons. The use of biological agents is a grave concern, and the risk of using these agents in a terrorist attack is thought to be increasing.

Bioweapons have been in use since the dawn of civilization. In the year 1155,

Emperor Barbarossa poisoned water wells with

human bodies in Tortona, Italy. Moving forward to the World War II era, the Japanese had unit 731

which used human subjects to conduct bioweapons testing. A more recent example was the Anthrax attacks of 2001. Several anthrax letters were sent to various VIP's including Senator Tom Daschle. The study and use of Bioweapons has been well documented over the years and can be easily found when doing research via internet or printed books(nih.gov).

A responder in a small community might think that this problem could not affect them in any way. The reality of it is that any community, small or large, may be confronted with this problem. Information on these types of weapons can be found anywhere on the internet. A 70-year-old woman in Shelburne VT attempted to use Ricin at an upscale senior village in 2017. She stated she wanted to test

the effectiveness of her concoction by putting it in the food and drink of other residents. The news article can be found here: https://www.necn.com/news/local/vermont/vermont-retirement-community-ricin-incident-arrest/23107/. Shelburne VT is a town of approximately 7700 people. A smaller jurisdiction on the local level probably does not have the resources to handle an incident of this nature. County, State and Federal resources would have to be called in to assist. Resource assistance could include law enforcement for investigation and the health department to ascertain the extent of the contamination.

What defines a biological attack? According to dhs.gov, A biological attack is the intentional release of a pathogen (disease causing agent) or biotoxin (poisonous substance produced by a

living organism) against humans, plants, or animals. An attack against people could be used to cause illness, death, fear, societal disruption, and economic damage. An attack on agricultural plants and animals would primarily cause economic damage, loss of confidence in the food supply, and possible loss of life.

DHS also distinguishes between 2 types of biological agents:

1. Transmissible agents that spread from person to person (e.g., smallpox, Ebola) or animal to animal (e.g., foot and mouth disease).

2. Agents that may cause adverse effects in exposed individuals but that do not make those individuals contagious to others (e.g., anthrax, botulinum toxin).

The CDC further defines 3 categories of Bio Agents:

Category A

The U.S. public health system and primary healthcare providers must be prepared to address various biological agents, including pathogens that are rarely seen in the United States. High-priority agents include organisms that pose a risk to national security because they

-can be easily disseminated or transmitted from person to person.

-result in high mortality rates and have the potential for major public health impact.

-might cause public panic and social disruption; and

-require special action for public health preparedness.

-Ex-anthrax, plague, smallpox

Category B

Second highest priority agents include those that:

- *are moderately easy to disseminate.*
- *result in moderate morbidity rates and low mortality rates; and*
- *require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.*

Ex- glanders, Q fever, ricin toxin

Category C

Third highest priority agents include emerging pathogens that could be engineered for mass dissemination in the future because of

- *availability.*
- *ease of production and dissemination; and*
- *potential for high morbidity and mortality rates and major health impact.*

Ex- hantavirus, nipah virus

In addition, the CDC and USDA maintain the Federal select agent program. Here is the FSAP description from the website:

The Federal Select Agent Program (FSAP) regulates the possession, use, and transfer of

biological select agents and toxins that have the potential to pose a severe threat to public, animal, or plant health. Examples of select agents and toxins include the organisms that cause anthrax, smallpox, foot-and-mouth disease, as well as the toxin ricin.

Program overview link:

https://www.selectagents.gov/overview/index.htm

select agent list link:

https://www.selectagents.gov/sat/index.htm

BioSafety Lab Levels also play a part in the handling and use of these agents. The levels 1-4 are based on the agents being used in the lab and the necessary engineering controls that need to be in place for safe handling. The CDC

has put together a nice infographic to explain the various levels. It can be viewed here: https://www.cdc.gov/cpr/infographics/biosafety.htm. More information on the lab levels and descriptions can be found here: https://consteril.com/biosafety-levels-difference/.

Bio warfare agents are broken down into pathogens and toxins. Here is the definition of each:

Pathogens- *an organism causing disease to its host, with the severity of the disease symptoms referred to as virulence. Pathogens can be viruses or bacteria. Microscopic single-celled organisms lacking a distinct nucleus are known as bacteria (Merriam Webster Dictionary). A virus is an infectious agent of small size and*

simple composition that can multiply only in living cells of animals, plants, or bacteria (Britannica.com). The main difference between the two is that viruses need a host of living cells to replicate. Once in the cell, viruses take over the cell mechanisms to reproduce the virus. Bacteria, unlike viruses, do not need a host and can live inside or outside the body. Flu is a virus. The virus needs to invade the host cells to replicate. The body's defense mechanism is to increase body temperature. The increased temperature is an attempt to make the environment inhospitable for the invading virus. Various other symptoms appear when a body is under attack from a virus. Anthrax is an example of a bacteria. Bacillus anthracis is the

causative agent for disease-causing bacteria. Each pathogen utilizes different mechanisms to invade a foreign body. There are bacteria(anthrax) and viruses (smallpox) that are listed as Category A agents by the CDC.

Toxins- *substances created by plants and animals that are poisonous (toxic) to humans. Toxins may also include some medicines that are helpful in small doses, but poisonous in copious amounts (Medline Plus Medical Encyclopedia). Toxins can be derived from bacteria, fungi, algae, and plants. These types*

are described by the CDC Lab Response to Toxins infographic here: https://www.cdc.gov/biomonitoring/pdf/Toxins_Fact_Sheet.pdf.

Each jurisdiction should preplan and know how to get their samples from emergency incidents into the Lab Response Network (LRN). The LRN ultimately can get samples to the CDC for evaluation. The state lab for Maryland is in East Baltimore at the Johns Hopkins Hospital complex. Samples from incidents can be sent to the lab through various agencies that are a contact point for the LRN. Local hazmat teams and responders need to know how to access this vital link in a possible bio incident.

Part I of this series on Biological Weapons covered some history, defined a bio attack,

listed DHS and CDC categories. Bio Safety Lab levels as well as the difference between pathogens and toxins were discussed. Part II will look at recognition of a biological attack.

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CONFERENCE DATES

Pennsylvania Hazardous Materials Conference

Aug 22 – 25 2024

Virginia Hazardous Materials Conference

Sept 17 – 20 2024

Florida Hazmat Symposium

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