

SAFETY DIGEST: EMERGENCY PLANNING AND RESPONSE

THE IMPORTANCE OF PREPARATION, TRAINING, AND COMMUNICATION



U.S. Chemical Safety and Hazard Investigation Board

Over the past decade of investigating chemical incidents, the U.S. Chemical Safety Board (CSB) has found that effective emergency response training and planning, as well as communication between the company, emergency responders, and the community, are critical to preventing injuries and fatalities from chemical incidents. First responders, companies, and residents all play a crucial role in ensuring that the risks and hazards that are present in the community are well-understood, and that there are ongoing discussions on how to mitigate or respond to them. The CSB video, entitled “Emergency Preparedness: Findings from CSB Accident Investigations,” highlights several key responsibilities of first responders, communities, and companies pertaining to responding to chemical incidents:¹

Responsibilities of First Responders

- Have proper hazmat training and equipment;
- Conduct frequent drills and exercise plans to respond to possible chemical releases;
- Communicate with the companies in their communities that deal with chemicals; and
- Know the key facility contacts in an emergency.

¹ The CSB safety video is available here: <https://www.youtube.com/watch?v=R2Ez7lkjg1Y> (accessed September 25, 2018).

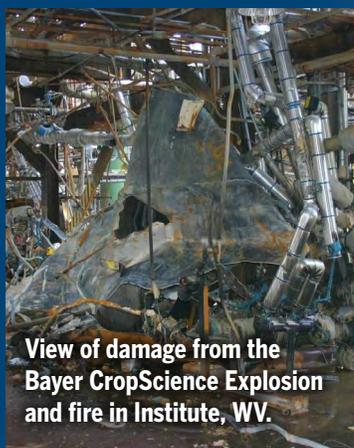
Responsibilities of Communities

- Understand the hazards of the chemicals used at the facilities in your community;
- Support and maintain active local emergency planning committees (LEPCs) and up-to-date community response plans and teams;
- Develop detailed evacuation and shelter-in-place plans that identify when and how community members are to respond to different types of emergencies; and
- Establish redundant communication systems to notify residents of a chemical emergency.

Responsibilities of Companies

- Maintain current emergency response plans;
- Communicate frequently and openly with residents, businesses, and emergency management officials about chemical hazards in their community and emergency response plans; and
- Train employees to respond properly to chemical emergencies and to evacuate when appropriate.

The following investigation summaries highlight key findings surrounding these critical areas of emergency planning and response.



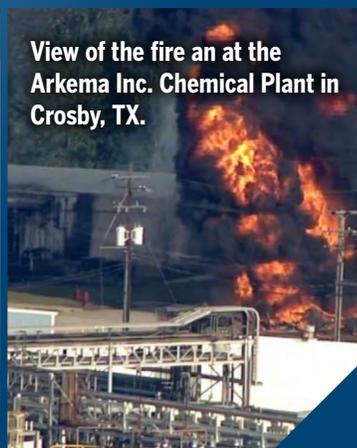
View of damage from the Bayer CropScience Explosion and fire in Institute, WV.



Animation still from the CSB's video "Dangerously Close: Explosion in West, TX"



Aerial view of the chemical plume at the MGPI Processing plant in Atchison, Kansas



View of the fire at the Arkema Inc. Chemical Plant in Crosby, TX.

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Bayer CropScience Pesticide Waste Tank Explosion

- > **Incident Date: August 28, 2008**
- > **Two Fatalities, Eight Injuries**
- > [Full Report and Video on CSB Website](#)

Incident Summary

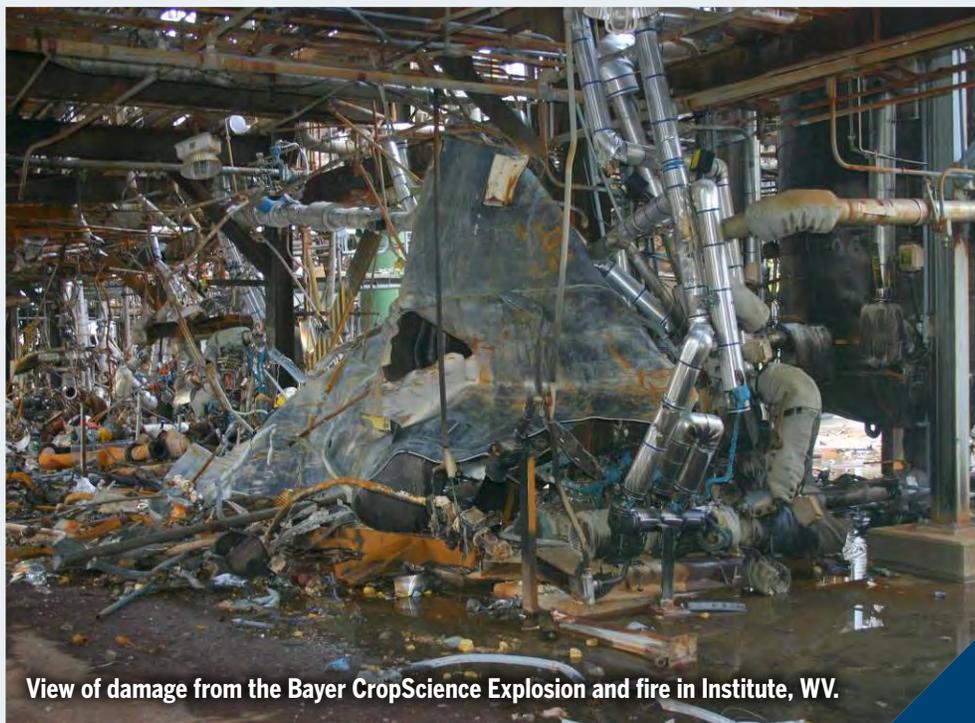
On August 28, 2008, at approximately 10:35 pm, a runaway chemical reaction occurred inside a 4,500-gallon pressure vessel known as a residue treater, causing the vessel to explode violently in the methomyl unit at the Bayer CropScience facility ("Bayer") in Institute, West Virginia. Highly flammable solvent and toxic insecticide residue sprayed from the vessel and immediately ignited, causing a fire that burned for more than four hours. Two employees were killed. A shelter-in-place order was issued for approximately 40,000 residents, which was lifted roughly three hours later.

Key Findings Concerning Emergency Response and Planning

The CSB found that poor communications during the incident between Bayer incident command system personnel and the local emergency response agency confused emergency response organizations and delayed the community shelter-in-place notification. The CSB noted that Bayer did not assign a Public Information Officer to directly communicate with the public and Metro-9-1-1 (the local 911 dispatch

service). The Kanawha Putnam Emergency Management Plan did not adequately address emergency response personnel responsibilities and communications between the facility incident command system personnel and outside emergency response organizations when a facility owner leads the incident command system during an on-site emergency involving hazardous chemicals.

The Kanawha Valley, where Bayer is located, has many facilities that handle large quantities of hazardous materials. Yet, the CSB noted that the local government does not have the authority to directly participate in facility safety planning and oversight even though many community stakeholders have campaigned for such authority. The CSB recommended that the local government establish a program to improve stakeholder awareness, evaluate emergency response plans and written safety plans, and provide for public participation and collaboration. That recommendation has not yet been implemented.



View of damage from the Bayer CropScience Explosion and fire in Institute, WV.

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West Fertilizer Explosion and Fire

- > **Incident Date: April 17, 2013**
- > **15 Fatalities, More Than 260 Injuries**
- > [Full Report and Video on CSB Website](#)

Incident Summary

On April 17, 2013, a fire and massive explosion occurred at the West Fertilizer Company (“West”), a fertilizer storage and distribution facility in West, Texas. The incident killed 12 volunteer firefighters and three members of the public. The blast destroyed the West facility and caused widespread damage to more than 150 offsite buildings. The explosion occurred approximately 20 minutes after the first signs of a fire were reported to the local 911 emergency response dispatch center. Several local, volunteer fire departments responded to the facility, which had a stockpile of between 40 and 60 tons of fertilizer grade ammonium nitrate, or FGAN.

Key Findings Concerning Emergency Planning and Response

The CSB found that this incident demonstrated the need for effective pre-incident planning and firefighter training, noting that firefighters are expected to make risk assessments and decisions under time pressure with limited visibility during an actual response to a fire, which is almost impossible without adequate training. The CSB found that the West Volunteer Fire Department did not conduct pre-incident planning or response training in West,

was likely unaware of the potential for FGAN detonation, did not take recommended incident response actions at the fire scene, and did not have appropriate training in hazardous materials awareness and response or FGAN-related fire emergencies. The CSB identified seven key factors that contributed to the firefighters’ and emergency responders’ fatalities in West:

1. Lack of incident command system.

None of the responding emergency response personnel formally assumed the position of Incident Commander who would have been responsible for conducting and coordinating an incident command system.

2. Lack of established incident management system.

Emergency response personnel who responded to the incident did not take time to set up, implement, and coordinate an effective incident management system plan that would have ensured evacuation of nearby residents. In addition, emergency alert systems for the public were not activated before the explosion. Without a formal evacuation order to the entire affected community, many residents were unaware of the risk and chose to watch the fire from inside their homes or vehicles, placing them within range of the high-pressure blast wave and in the line of flight of debris.

3. Lack of hazardous materials and dangerous goods training.

The CSB found that no standardized training requirement applies to volunteer firefighters across the nation, while career firefighters have a standardized basic minimum training requirement. Some volunteer firefighters therefore do not receive any major type of course training, and most of their initial training is usually on-the-job experience.

4. Lack of knowledge and understanding of the detonation hazards of FGAN.

The firefighters did not have sufficient time and information to properly assess the West facility and evaluate the behavior of the FGAN-related fire. Consequently, they



Animation still from the CSB's video "Dangerously Close: Explosion in West, TX"

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had no expectation of a possible FGAN explosion. The CSB evaluated training for firefighters in Texas and found that FGAN explosion hazards were not covered at all. The lack of adequate hazardous materials training and the lack of FGAN firefighting guidance contributed to the deaths of the emergency responders.

5. Lack of situational awareness and risk assessment knowledge on the scene of an FGAN-related fire.

None of the firefighter hazardous materials field training courses provide sufficient information on firefighter situational awareness and risk assessment for the plant, which would have assisted them to make informed decisions while at the fire scene. As a result, the firefighters did not have the tools to effectively perform the situational awareness and risk assessment that would have enabled them to make an informed decision to not fight the fire.

6. Lack of pre-incident planning at the West facility.

The fire department did not have a formal pre-incident planning program for FGAN at West, nor did they anticipate a possible FGAN explosion. Onsite pre-incident planning with clear information on the magnitude of the hazards may have identified the possible FGAN explosion hazard.

7. Limited and conflicting technical guidance on ammonium nitrate.

Conflicting information in various emergency response guidelines prevented emergency responders from fully understanding the hazards of FGAN.

As a result, the CSB made several recommendations concerning adequate FGAN training to the Federal Emergency Management Agency (FEMA), the Texas Commission on Fire Protection, the State Firefighters' and Fire Marshals' Association of Texas, and the Texas A&M Engineering Extension Services ("TEEX"). In 2016, FEMA awarded two grants of a million dollars each to the Georgia Tech Research Institute and the International Association of Fire Fighters to develop and deliver training focused on FGAN hazards. Due to the responsiveness and speed with which FEMA acted upon the CSB's recommendations and its responsiveness to the lessons learned from the West investigation, the Board voted to designate the two recommendations to FEMA as "Closed-Exceeds Recommended Action." In 2017, TEEX finalized extensive training on FGAN which they provide several times a year to firefighters across the state of Texas.

MGPI Processing, Inc. Toxic Chemical Release

- > **Incident Date: October 20, 2016**
- > **Over 120 MGPI Employees and Members of the Public Sought Medical Attention**
- > [Full Report and Video on CSB Website](#)

Incident Summary

On **October 21, 2016**, a chemical release occurred at the MGPI

Processing, Inc. ("MGPI") facility in Atchison, Kansas, when a chemical delivery truck, owned and operated by a different company, inadvertently connected its sulfuric acid hose to a tank containing sodium hypochlorite, better known in its less concentrated form as bleach. The chemicals reacted and generated a toxic vapor cloud, which led to a shelter-in-place order for thousands of residents. At least 120 MGPI employees and members of the public sought medical attention as a result of the incident.

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Key Findings Concerning Emergency Response and Planning

The CSB found that neither the city nor the county adequately trained for such a catastrophic incident. A majority of recent emergency response training and exercises focused largely on infectious diseases, active shooter situations, and severe weather events. These training exercises did not include incidents at chemical facilities or incidents involving accidental releases of unknown chemicals in the community.

Following the incident, city and county emergency responders conducted a post-incident evaluation to examine issues identified during the response. The After-Action Report and Improvement Plan (AAR & IP), issued by the Atchison County Department of Emergency Management (ACDEM), identified several areas for improvement. For example, there were challenges communicating the incident to the public as well as updating the local hospital; and the CodeRED community notification system, which is a mass notification system that can alert and inform subscribers of emergencies through many channels, failed to send notifications out at the time of the incident. Local emergency responders used social media and local radio and television instead to communicate details about the incident. ACDEM noted that the CodeRED notifications did not get sent due to a lack of training on the system.

Hospital staff reported that they were not kept informed of the status of potential victims and decontamination procedures for the chemicals released during the incident. In addition, incident command system personnel did not directly communicate information regarding the released chemicals to the hospitals until up to two hours after the incident began. According to



Aerial view of the chemical plume at the MGPI Processing plant in Atchison, Kansas

ACDEM, a plan has been established with local hospitals to have a representative at the emergency operations center or command post to ensure that the representative is up-to-date on all information.

The AAR & IP also identified the need for more operational coordination and a liaison to communicate exposure information during similar incidents. Following the incident, MGPI increased its involvement with local emergency planners and responders. Less than two months after the incident, MGPI hosted training with local emergency responders to discuss the hazards of chemicals used at the MGPI facility. Three separate sessions were held. In addition, in October 2017, MGPI attended and participated in a Tabletop Exercise in Hiawatha, Kansas, where a chlorine gas release resulting from a railcar derailment was simulated.

Emergency responders and facilities have also increased participation in the Atchison County LEPC, and in March 2017, the LEPC conducted a tabletop exercise of the incident that occurred at MGPI. MGPI also requested that its Emergency Response Plan be discussed at the end of each year.

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Arkema Inc. Chemical Plant Fire

- > **Incident Date: August 29, 2017**
- > **Exposures to Emergency Responders, Community Evacuation, and Property Damage**
- > [Full Report and Video on CSB Website](#)

Incident Summary

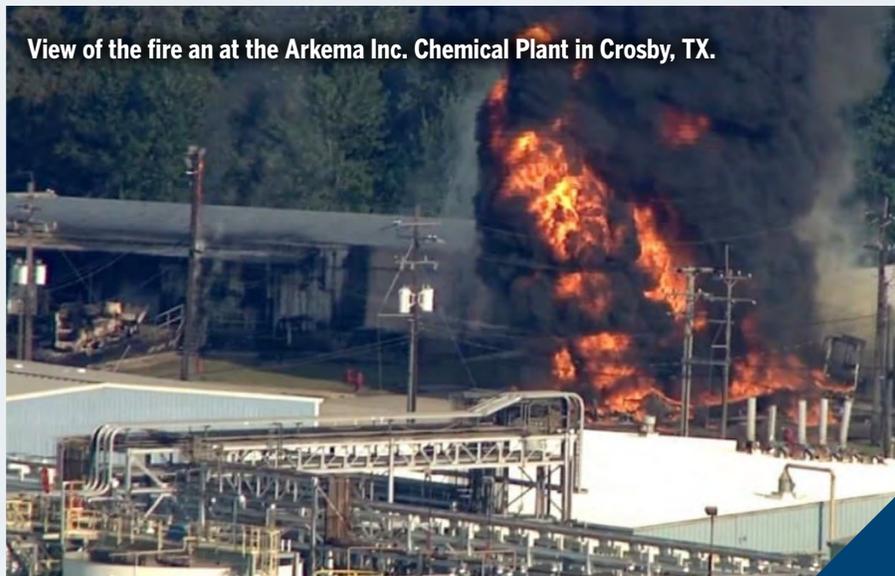
On August 24, 2017, Hurricane Harvey made landfall in southeast Texas and produced unprecedented amounts of rainfall over the area, causing substantial flooding. This flooding exceeded the equipment design elevations at the Arkema Inc. (“Arkema”) facility in Crosby, Texas, and caused the plant to lose power, which disabled the critical organic peroxide refrigeration system. The flooding eventually forced all Arkema employees to evacuate the facility. Additionally, residents within a 1.5-mile radius of the facility were evacuated. On August 31, 2017, the organic peroxide products stored inside a refrigerated trailer decomposed causing the peroxides and trailer to burn. Twenty-one people sought medical attention from exposure to fumes generated by the decomposing products when the vapor travelled across a public highway adjacent to the plant. Emergency response officials initially decided to keep the highway open even though it ran through the established evacuation zone around the Arkema facility.

Key Findings Concerning Emergency Response and Planning

At the time that the organic peroxide products began to decompose and combust, the highway adjacent to the facility was still open. On August 30, 2017, two officers drove through a white smoke cloud on that

highway. Emergency responders shut down the highway, but soon reopened it after two members of the Crosby Volunteer Fire Department assessed the scene and did not see a white cloud or other signs of organic peroxide decomposition. Reopening the highway allowed more emergency responders and residents to be potentially exposed to the fumes emitting from the facility. Only after emergency responders later confirmed the organic peroxide decomposition did they shut down all lanes of the highway. The CSB concluded that during an emergency, emergency responders should be conservative when making health and safety decisions to protect themselves and the public.

The CSB recommended that Harris County update its emergency operations training using lessons learned from the Arkema incident to help ensure that personnel enforcing evacuation perimeters are not harmed by exposure to hazardous chemical releases. The CSB advised that the county update existing protocols and revise training curricula to include the use of analytical tools, air monitoring, and personal protective equipment, to provide appropriate protection when emergency equipment or personnel need to be moved through an evacuation zone during a hazardous materials release.



View of the fire at the Arkema Inc. Chemical Plant in Crosby, TX.

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Emergency Response and Planning: Final Key Takeaways

In at least 16 CSB investigations, there are important key lessons to aid in planning for and responding to an emergency involving hazardous materials that when implemented will help minimize the number of fatalities and injuries. These include:

- > Everyone in the community should be aware of the chemicals used in their community and the risks they pose.
- > Local emergency responders should receive adequate hazardous materials training to help them best respond to a hazardous materials emergency and allow them to identify and understand risks as they respond.
- > Local emergency responders and facilities should conduct and participate in emergency response exercises to help prepare for emergencies involving hazardous materials. Lessons learned from previous chemical incidents should be used whenever possible.
- > There must be effective communications and information sharing between facilities with hazardous chemicals, emergency responders, and community members before, during and after chemical emergencies.
- > There should be continuous planning for emergencies. Communities should have redundant communication systems in place to notify residents of a chemical emergency. Emergency plans should be clear on the magnitude of the hazards and flexible to help adapt to different situations.