

CASE STUDY

Fire and Community Evacuation in Apex, North Carolina



2007-01-I-NC
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Photograph courtesy of Wake County Fire/Rescue Services

Introduction

This case study examines a fire at a hazardous waste facility located in Apex, North Carolina. City officials ordered thousands of local residents to evacuate for two days. About 30 people sought medical attention. The CSB makes recommendations to the US Environmental Protection Agency and Environmental Technology Council to address emergency planning and fire protection requirements for hazardous waste facilities.

Environmental Quality Company

Apex, North Carolina

October 5, 2006

Key Issues:

- Facility Fire Detection
- Facility Fire Protection
- Emergency Planning

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1.0 Incident Description

This case study examines a fire at the Environmental Quality Company (EQ) hazardous waste facility in Apex, North Carolina, and the subsequent community evacuation.

At 9:38 pm on October 5, 2006, a citizen driving past the EQ facility called 911 to report a haze with a “strong chlorine smell.” The Apex 911 center dispatched emergency personnel to investigate.

Responding Apex Fire Department personnel discovered a chemical cloud coming from one of several businesses on Investment Boulevard. The Apex Fire Chief, acting as the Incident Commander (IC), sent two firefighter reconnaissance teams in personal protective equipment to investigate the source of the cloud.

Firefighters located a small “sofa-size” fire in one of the hazardous waste bays at the EQ facility. Within minutes, the fire spread to the flammable liquid storage area, causing 55-gallon drums of flammable hazardous waste to explode and sending fireballs hundreds of feet into the air. The hazardous waste building ultimately collapsed (cover photograph).

During the incident, about 30 people (including 13 first responders) sought medical attention at local hospitals for respiratory distress and nausea. Some were treated; none was admitted.

1.1 Emergency Response

Because of the unknown nature of the burning chemicals and the exploding drums, the IC chose to take only defensive actions to

- minimize the risk to emergency personnel and community residents, and
- allow the fire to burn and consume the chemicals within the facility.

The defensive actions included

- ordering a precautionary evacuation of thousands of residents in the surrounding community,¹
- controlling access on roads leading into the evacuation area,
- stopping rail traffic through the community, and
- closing the air space over the facility.

EQ contracted an industrial firefighting and environmental cleanup company with specialized equipment to extinguish the fire and clean up the site. The contractor

- built sand berms to minimize water runoff that could possibly contaminate an adjacent stream,
- removed the roof and structural steel to access the burning waste,
- extinguished the fire with foam, and
- removed all debris and hazardous waste from the site.

1.2 Community Evacuation

The evacuation area included about 3,300 residences, the town hall, a fire station, and the town 911 center.² Officials established

¹ A call down, or reverse 911 system, called homes in the evacuation area and disseminated the order with a recorded message. Several television stations also ran a ticker notification message.

² Apex 911 personnel transferred incoming 911 calls to the Raleigh, NC, 911 center.

an Emergency Operations Center (EOC) outside of the evacuation area to provide a safe gathering place for emergency responders, state and federal officials, and media representatives.

Evacuees from the community sheltered at designated elementary schools, in hotels, or with relatives outside the evacuation area. The Red Cross, other community organizations, and businesses assisted residents by providing bedding, food, and communication services.

The IC continued the evacuation order for two days because of potential re-ignition and persistent smoke from the smoldering rubble.

1.3 Environmental Impact

The North Carolina Department of Environmental and Natural Resources (NCDENR) Divisions of Air Quality, Water Quality, Environmental Health, and Waste Management and the US Environmental Protection Agency (EPA) responded to the incident. In the early morning of October 6, 2006, (about five hours after the fire was first reported) the NCDENR and the EPA began air monitoring within the evacuation area. In addition to ground level monitoring, the EPA conducted 10 fly-overs with its Airborne Spectral Photographic Environmental Collection Technology (ASPECT) aircraft.

EQ also contracted with a company specializing in environmental monitoring, testing and assessment to conduct ground level atmospheric monitoring beginning October 6, 2006.

In the weeks following the incident, the NCDENR looked for residual contamination by conducting soil, indoor environmental, and exterior swipe sampling for a range of organic and inorganic materials.³ On November 17, 2006, the NCDENR reported that “environmental tests show no offsite contamination from EQ fire.”

³ NCDENR sampling reports are available at http://www.enr.state.nc.us/html/eq_offsite.html.

2.0 Background

2.1 The Environmental Quality Company

Headquartered in Wayne, Michigan, EQ operates hazardous and non-hazardous waste treatment, storage, and disposal facilities at 20 locations in the United States.

The EQ facility in Apex, North Carolina,⁴ (known as EQ North Carolina, or EQNC) provided hazardous and non-hazardous waste bulking,⁵ solidification, storage, and transfer. Businesses served included research and development facilities, educational institutions, manufacturing companies, government entities, retail stores, and medical facilities.

Enviro-Chem Environmental Services, Inc. constructed and operated the Apex hazardous waste facility beginning in 1992. EQ acquired the facility in December 2002 and began operating under the Enviro-Chem Environmental Services, Inc. permit in January 2003. In May 2003, the NCDENR issued EQ a permit to operate the facility.

EQNC normally operated Monday through Friday from 7:00 am to 4:00 pm with a staff of 15 EQNC and 12 contract employees. The facility included two buildings:

- a two-story building with offices, employee change room, chemical laboratory, and non-hazardous waste processing area; and
- a one-story building for hazardous waste handling.

The hazardous materials building had a metal pitched roof, metal walls enclosing opposite ends, and open sides. Inside the building were six bays for handling and storing the hazardous waste. An elevated shipping and receiving dock in the center of the building and six-inch-high by three-foot-wide curbs separated the bays. EQNC designated each bay for a specific waste type (Figure 1) to separate incompatible materials.⁶

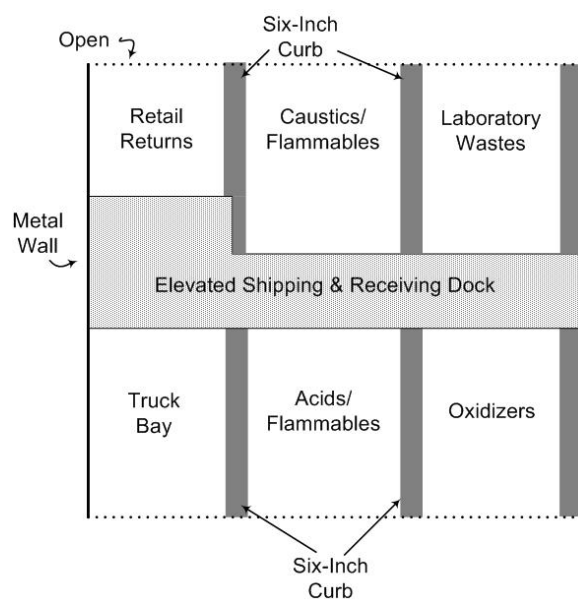


Figure 1. EQNC hazardous materials building

Portable fire extinguishers located on each side of the central dock provided fire protection for the building. A chain-link fence with a padlocked gate secured the facility.

2.2 Environmental Technology Council

⁴ Following the October 5, 2006, fire, EQ discontinued operations at the Apex, NC, facility.

⁵ Bulking refers to combining small containers of similar materials into a larger container.

⁶ When mixed, incompatible materials may react with each other, producing heat, fire, and/or toxic vapors.

The Environmental Technology Council (ETC) is a trade association of commercial environmental firms that recycle, treat, and dispose of industrial and hazardous waste, and includes firms specializing in contaminated site cleanup. ETC member companies handle about 80 percent of the hazardous waste market in the United States. EQ is a member of ETC.

2.3 State of North Carolina

The North Carolina Department of Environment and Natural Resources (NCDENR), Division of Waste Management regulates hazardous waste facilities.

Following the October 5, 2006 incident in Apex, the Governor of North Carolina formed a Hazardous Materials Task Force to examine the regulations for hazardous waste storage facilities. This task force made 16 regulatory recommendations and six funding recommendations, which became the basis of changes to the North Carolina hazardous waste statutes enacted by the NC legislature in June 2007.⁷

⁷ The Governor's Task Force report and legislative changes are available at respectively:
<http://www.enr.state.nc.us/docs/HazardousWasteTaskforceReport.pdf>
<http://www.ncga.state.nc.us/Sessions/2007/Bills/House/HTML/H36v4.html> .

3.0 Analysis

3.1 Hazardous Waste Facility Fires and Releases

3.1.1 EQNC Incidents

NCDENR Incident Reports and employee interviews document prior incidents at EQNC, including leaking and broken containers as well as smoking and spontaneously combusting materials.⁸

Employees discovered all of these incidents during normal working hours and they were corrected without outside assistance.

3.1.2 EQ Romulus Michigan Fire

On August 9, 2005, an EQ hazardous waste facility in Romulus, Michigan, caught fire and burned. Although the causes were different from the EQNC fire, the firefighters in Romulus also chose to take only defensive actions due to the intensity of the fire and their lack of knowledge about the facility's contents. Romulus officials also ordered a precautionary evacuation of residents within one mile of the facility. One EQ employee was injured.

3.1.3 Industry Incidents

In addition to the EQ incidents, the CSB found 21 other fire and chemical release incidents⁹ at hazardous waste facilities in the United States in the last five years. Fourteen of the incidents involved fires and/or explosions and seven were release-only incidents. These incidents resulted in two fatalities, 16 injuries, and eight community evacuations, shelter-in-place events, or transportation disruptions.

⁸ These incidents included a fire on July 3, 2006, in a cubic-yard box packed with laboratory waste, debris, and flammable solids.

⁹ None of these incidents occurred in North Carolina

3.2 Fire Detection

Even though the facility stored hundreds of 55-gallon drums of flammable and combustible materials, the EQNC hazardous waste building was not required to be equipped with fire or smoke detection sensors nor monitored after hours (nights or weekends).

Continuous monitoring by personnel or with remotely monitored sensors can alert company personnel and first responders at the inception of a fire. This may provide first responders additional time to initiate emergency actions before the situation grows out of control.

3.3 Fire Control Equipment

Portable fire extinguishers were the only fire control equipment in the EQNC hazardous waste building. The facility included segregated areas (storage bays) for different waste types separated by six-inch-high curbs. The curbs could contain spills within the bays, but would not prevent a fire from spreading from one bay to another.

The initial "sofa-size" fire observed by firefighters was in the oxidizer bay where a fiberboard container of unspent aircraft oxygen generators¹⁰ and containers of solid chlorine-based pool chemicals were awaiting final shipment.¹¹ Figure 2 shows an oxygen generator found in the debris with its activation pin in place, indicating that it was unspent when the fire started. Because oxygen generators were located at or near the origin of the fire and, when exposed to

¹⁰ The CSB issued a Safety Advisory in June 2007 addressing the hazards associated with transporting and storing expired, unspent aircraft chemical oxygen generators.

¹¹ The cause of the initial fire was never determined.

fire, produce oxygen that significantly increases the intensity of a fire, the CSB concluded that the unspent oxygen generators most likely contributed to the rapid spread of the fire to the adjacent bay where flammable hazardous wastes were stored.



Figure 2. Oxygen generator with activation pin circled

While not required, had EQNC used fire barriers (walls) to separate the segregated waste bays, the fire would likely have been contained within the oxidizer bay, significantly mitigating the incident's consequences.

The National Fire Protection Association (NFPA) publishes fire protection standards for many industrial facility types¹² (e.g. NFPA 820, "Standard for Fire Protection in Wastewater Treatment and Collection Facilities"). These standards address fire protection requirements specific to the facility type. However, no standard specifically addresses fire protection for

hazardous waste treatment, storage, and disposal facilities.

A review by CSB of fire protection practices in use at 12 other hazardous waste facilities¹³ showed wide variation. Some facilities use active fire suppression systems to control or extinguish fires, some use fire barriers, and others, like EQNC, rely only on portable fire extinguishers.

3.4 Emergency Planning

Apex fire personnel identified the EQNC facility as the source of the chemical cloud and fire; however, EQNC had not provided any detailed written information on the types, quantities, and location of hazardous materials in the facility to fire personnel or the Local Emergency Planning Committee (LEPC). Additionally, since the EQNC facility was unoccupied at the time of the incident, no emergency coordinator was on-site to initiate the facility contingency plan¹⁴ or assess the extent of the release or emergency.

Other companies in the Town of Apex provided information to the fire department on the types, quantities, and location of hazardous materials the companies handled. The fire department used this information for emergency planning and conducted joint emergency drills with several of these companies.

When companies provide written information on the approximate quantity, hazards, and location of materials within their facilities to fire departments, police departments, hospitals, and LEPCs, responders can preplan for emergencies.

¹³ This number includes facilities in North Carolina and several other states.

¹⁴ An emergency plan required for permitted hazardous waste facilities (section 4.1.3).

¹² Also known as occupancy standards.

4.0 Regulatory Analysis

4.1 The Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) authorizes the EPA to regulate the generation, treatment, storage, and disposal of hazardous waste. EPA regulations implementing RCRA provide a “cradle-to-grave” management system for hazardous waste. The intent of this system is for generators, transporters, and facilities that treat, store, and dispose of hazardous waste to take responsibility for hazardous waste throughout its life cycle through final disposal to protect the public and the environment.

In most cases, the EPA authorizes states to implement the RCRA hazardous waste management program. State regulations must be at least as stringent as, and may be more stringent than, the federal regulations.

4.1.1 Implementing Regulations

EPA regulations implementing RCRA require businesses that generate hazardous waste to send the waste to a treatment, storage, or disposal facility (TSDF) permitted by the EPA or state environmental regulatory authority (NCDENR, in this case) to store, treat, or otherwise dispose of the waste. The EPA regulations establish minimum requirements for TSDF permits.¹⁵ The permit is a facility-specific document that grants the facility the authority to store, treat, or dispose of hazardous waste as described in its permit application for a period of ten years. Permit requirements include, but are not limited to,

- waste analysis plan;
- site security;
- inspection procedures;
- ignitable, reactive, and incompatible waste control plan;
- emergency preparedness and prevention, including fire protection and communication;
- contingency plan and emergency procedures;
- arrangements with local authorities that include sharing copies of the contingency plan;
- operating records;
- management of containers, tanks, surface impoundments, and waste piles; and
- providing financial assurance for closure/post-closure and liability.

The regulatory authority routinely inspects permitted TSDFs.¹⁶ Inspections include review documentation and operations to verify TSDF compliance with permit requirement.

4.1.2 Fire Protection Requirements

EPA regulations¹⁷ state:

All facilities must be equipped with the following, *unless* [italics in original] it can be demonstrated to the [EPA] Regional Administrator that none of the hazards posed by waste handled at the facility could

¹⁵ 40 CFR 264, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.”

¹⁶ NCDENR inspected the EQNC facility several times each month.

¹⁷ 40 CFR 264.32

require a particular kind of equipment specified below: ...

(c) Portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment; and

(d) Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.

These are the only fire protection measures that EPA regulations require for TSDFs. Additionally, EPA regulations do not require a fire protection professional or local fire officials to review the fire protection measures.

Although required by EPA and NCDENR regulations the EQNC permit application did not describe “fire control equipment” nor include a justification for not installing it in accordance with 40 CFR 264.32 paragraph (c). Despite hundreds of gallons of flammable liquids and strong oxidizers routinely handled onsite, the EQ facility operated with only portable fire extinguishers, which provided limited protection for the facility and community.

4.1.3 Emergency Planning Requirements

EPA regulations require TSDFs to have a contingency plan outlining actions facility personnel will take in case of emergency, the arrangements the facility has with local authorities, and the location of emergency equipment within the facility. TSDFs must share the contingency plan with local

authorities, including fire and police departments.¹⁸

In addition to the contingency plan, EPA regulations (40 CFR 264.37) require facilities to make

“[a]rrangements to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility, and possible evacuation routes.”

Although this requirement mandates that the facility operator familiarize local authorities with the facility, its layout, and its hazards, the requirements do not explicitly state what information must be shared, if the information must be written, or if updates are necessary.

EQ met these requirements simply by having the Apex Fire Chief tour the facility once.

4.2 The Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA) requires companies to notify local authorities (including fire departments and LEPCs) regarding certain chemicals that are stored and used onsite. EPA regulations implementing EPCRA improve community preparedness for chemical emergencies at local facilities by

1. informing the public,
2. facilitating response, and

¹⁸ EQNC could not provide any documented evidence that this requirement was met.

3. ensuring that emergency responders are aware of onsite hazards.

The EPA reporting requirements for hazardous chemicals greater than specified quantities under the Community Right-To-Know program include

1. supplying Material Safety Data Sheets (MSDS) or a list of all hazardous chemicals present at the facility, and
2. submitting an annual inventory report to local authorities and the fire department.

The Community Right-to-Know reporting requirements apply only to facilities required to keep MSDS on their hazardous chemicals in accordance with the “Occupational Safety and Health Administration (OSHA) Hazard Communication Standard” (29 CFR 1910.1200). However, OSHA excludes hazardous wastes from the requirements of this standard, including MSDS requirements. Therefore, unlike most industrial facilities, a TSDF is not required to submit a list of waste chemicals onsite nor an annual inventory of hazardous materials to local authorities.

5.0 Conclusions

5.1 Fire Prevention

The EQNC hazardous waste building was not equipped with fire or smoke detection sensors, automated fire suppression equipment, or fire barriers, even though the facility stored hundreds of 55-gallon drums of flammable and combustible materials.

EPA regulations implementing RCRA require that facilities be equipped with “fire control equipment;” however, no EPA guidance or industry standard is available to facility owners, permitting agencies, and local fire officials to establish appropriate fire prevention, detection, control, and suppression measures.

5.2 Emergency Planning

EQNC had limited contact with the Apex Fire Department prior to the October 5, 2006 fire. EQNC had not provided the fire department or county emergency agency with written information on the types, quantities, and locations of the hazardous materials in the facility prior to the incident.

Although EPA regulations implementing RCRA require companies to familiarize local authorities with the facility, its layout, and its hazards, the regulations do not explicitly state what information must be shared, whether the information should be written, or if updates are necessary.

6.0 Recommendations

6.1 US Environmental Protection Agency

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Ensure that the emergency response planning required for permitted hazardous waste treatment, storage, and disposal facilities (40 CFR 264.37) includes providing written information to state and local emergency response officials on the type, approximate quantities, and locations of materials within the facility (similar to reporting requirements of the Emergency Planning and Community Right-to-Know Act). Additionally, ensure that permit holders periodically update this information throughout the ten-year permit period.

6.2 Environmental Technology Council

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Petition the National Fire Protection Association, following the guidelines of their “Codes and Standards Development Process” (<http://www.nfpa.org/index.asp>), to develop a fire protection standard (occupancy standard) specific to hazardous waste treatment, storage, and disposal facilities. This standard should address fire prevention, detection, control, and suppression requirements.

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Develop standardized guidance for the handling and storage of hazardous waste to reduce the likelihood of releases and fires at hazardous waste treatment, storage, and disposal facilities.

7.0 References

- 29 CFR 1910.1200, “Hazard Communication Standard”; Occupational Health and Safety Administration, US Government Printing Office: Washington, DC, 2007
- 40 CFR 264, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities”; Environmental Protection Agency, US Government Printing Office: Washington, DC, 2007 .
- 40 CFR “Subchapter J--Superfund, Emergency Planning, and Community Right-To-Know Programs”; Environmental Protection Agency, US Government Printing Office: Washington, DC, 2007.
- U.S. Chemical Safety and Hazard Investigation Board (USCSB), 2007. *Safety Advisory, Dangers of Unspent Aircraft Oxygen Generators*, Report No. 2007-I-NC-01-SA, June 2007.

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No part of the conclusions, findings, or recommendations of the CSB relating to any chemical accident may be admitted as evidence or used in any action or suit for damages. See 42 U.S.C. § 7412(r)(6)(G). The CSB makes public its actions and decisions through investigation reports, summary reports, safety bulletins, safety recommendations, case studies, incident digests, special technical publications, and statistical reviews. More information about the CSB is available at www.csb.gov.

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