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Report of the Week

"The rockets' red glare..."
7/2/09

Report Number: 08-319

Report Date: 07/05/2008 1118

Synopsis

Defective mortar explodes during public firework display.

Demographics

Department type: Paid Municipal

Job or rank: Fire Chief

Department shift: 24 hours on - 48 hours off

Age: 61+

Years of fire service experience: 30+

Region: FEMA Region VI

Service Area: Rural

Event Information

Event type: Other

Event date and time: 07/04/2008 2105

Hours into the shift:

Event participation: Involved in the event

Weather at time of event: Clear and Dry

Do you think this will happen again?

What were the contributing factors?

- Equipment

What do you believe is the loss potential?

- Property damage
- Life threatening injury

Event Description

Our municipal fire department is responsible for planning, preparing, and displaying the annual 4th of July fireworks display before an audience of 6,000-10,000 spectators. All shooters of this display are certified Display Shooters, certified by the Pyrotechnics Guild International. The display is set up and loaded per NFPA 1123-Code for Fireworks Display, 2006 Edition.

All 6, 8, 10, and 12 inch shells are buried into the ground. The 4 and 5 inch shells are loaded in mortars mounted in racks, banded in bundles, and set upon a trailer. The show is fired electronically. Just prior to the beginning of the finale sequence of the display, a 4 inch diameter shell detonated in its mortar without exiting the mortar. This explosion caused extensive damage to the surrounding mortars and racks and completely destroyed approximately 12 to 15 racks and about 12 mortars. Several unfired shells in the surrounding mortars were ignited and launched horizontally in several directions missing the shooting crew by very narrow margins. The system was immediately disarmed and the electrical connections of all damaged mortars and racks were immediately disconnected. The array of mortars, racks, and the trailer were inspected for signs of

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smoldering and/or fire. The system was rearmed and the remaining undamaged segments of the system were fired without further incident. No personal injury resulted. However, the imminent danger of life threatening injury and death exists during every fireworks display and historical documentation exists verifying these hazards, risks, and incidents.

After the display was complete, approximately one and one-half hours were spent inspecting the damage and ensuring no unfired shells remained in the display array. The trailer was left in position until the following morning for photography during daylight hours, cleanup, and storage.

At approximately 0200 hours (about 3 hours later) we responded to a report of fire at the location of this trailer. The trailer was fully involved. We extinguished it but the trailer and all remaining mortars and racks were totally destroyed.

Due to the extensive destruction, amount of water used during extinguishment, and the extensive foot traffic around the scene prior to the fire and during extinguishment, no evidence of intentional fire setting could be discovered.

I was the lead shooter of the display that was set up in two separate locations and separated by approximately 1500 feet. I was calling each shot of the display using a non-repeated UHF frequency that is normally repeated for medical patient reporting to our local hospital. I was located at the uninvolved firing location when the incident occurred. At the end of the display, approximately 10 minutes after the incident, I verified that there were in fact no injuries and responded to the site of the incident.

Lessons Learned

This incident provided an important lesson for all the shooting crew involved who has never experienced an adverse event involving display fireworks. The largest shells we fire are 12 inches in diameter. The shell that was responsible for this extensively damaging incident was a 4 inch shell. This is a very small shell when compared to the larger shells in the display. This incident eliminated the possibility of complacency in any of the display shooters who were present. The shell was defective, and there was no way of anticipating or preventing this explosion from occurring. It is a hazard and risk inherent in the task of presenting a professional fireworks display. This incident reinforces the value of NFPA 1123 display shooting standards and the use of all available PPE. Proper distancing and use of PPE prevented injury in this incident.

Occasionally in past years, we removed the trailers after the display and stored them in a city garage or other building until the next morning for dismantling and cleanup. Leaving the trailers in place overnight proved invaluable and fortunate. The delayed fire secondary to the explosion, would have resulted in the destruction not only of the trailer and equipment but also of the building in which it would have been stored. Our policy will be revised to require leaving the equipment in place at the shooting site overnight.

Discussion Questions

Fireworks can be unpredictable even under "perfect" planning and preparation. The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration classifies fireworks in two categories under its explosives classification; Explosives 1.3 for larger display fireworks and Explosives 1.4 for general public use (Source: <http://www.fireworksafety.com/ffclass.htm>). For

transportation purposes, they are categorized as explosives because of their chemical composition and fire hazard. The hazards associated with this classification are no less important once the quantities are broken into their various firing arrangements. Once you have reviewed the entire account of 08-319, consider the following:

1. How involved is your department in the planning phase of fireworks' displays?
2. If you participate in the ignition of fireworks, are you a certified display shooter?
3. What contingencies are in place when you provide fireworks coverage (e.g., brand patrol, engine hooked to hydrant and handlines pulled, pre-piped deluge gun ready for service, etc.).
4. What are the contingencies based on: calculated fire flow for the worse case scenario, or "just the way we've always done it?"
5. How do you emphasize and reinforce the effect best practices had on the outcome of this near miss? Does the message translate to other events as well?

Related Reports

06-357

07-731

Note: The questions posed by the reviewers are designed to generate discussion and thought in the name of promoting firefighter safety. They are not intended to pass judgment on the actions and performance of individuals in the reports.